



GEI-100360A
(Supersedes GEI-100360)

GE Industrial Systems



AV-300iTM

.75 to 200 Horsepower

User's Guide

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Safety Symbol Legend

Warning:

Indicates a procedure, condition, or statement that, if not strictly observed, could result in personal injury or death.

Caution:

Indicates a procedure, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Attention:

Indicates a procedure, condition or statement that should be strictly followed in order to optimize these applications.

Note:

Indicates an essential or important procedure, condition or statement.

Table of Contents

0. Safety Precautions - Precautions de sécurité	0-1
1. Function and feature (overview)	1-1
2. Inspection procedure, Component Identification and Standard Specification	2-1
2.1. Inspection Procedures	2-1
2.1.1. General	2-1
2.1.2. Inverter type designation	2-1
2.1.3. Nameplate	2-2
2.2. Component identification	2-3
2.3. Standard Specifications	2-5
2.3.1. Permissible environmental conditions	2-5
Disposal of the Device	2-6
2.3.2. AC Input/Output Connection	2-6
2.3.3. AC Input current	2-8
2.3.4. AC Output	2-8
2.3.5. Open-Loop and Closed-Loop Control Section	2-10
2.3.6. Accuracy	2-11
3. Installation Guidelines	3-1
3.1. Mechanical Specification	3-1
3.2. Watts Loss, Heat Dissipation, Internal Fans and Cabinet Openings for Cooling	3-4
3.3. Installation Mounting Clearance	3-6
3.4. Motors and Encoders	3-7
3.4.1. Motors	3-7
3.4.2. Encoders	3-8
4. Wiring Procedure	4-1
4.1. Accessing the Connectors	4-1
4.1.1 Removing the Covers	4-1
4.2. Power Section	4-3
4.2.1. PV33-.. Power Card	4-3
4.2.2. Terminal Assignment on the Power Section / Cable Cross-Section	4-6
4.3 Regulation Section	4-7
4.3.1 RV33 Regulation Card	4-7
4.3.2. Terminal Assignments on Regulator Card	4-9
4.4. Serial Interface	4-12
4.4.1. Serial Interface Description	4-12
4.4.2. RS 485 Serial Interface Connector Description	4-13
4.5. Standard Connection Diagram	4-14
4.5.1. AV-300 Connections	4-14

4.6. Circuit Protection	4-17
4.6.1. External Power Fuses	4-17
4.6.2. AC Input Contactors	4-18
4.6.3. External Fuses of the DC Power Section	4-19
4.7. Chokes / Filters	4-20
4.7.1. AC Input Chokes	4-20
4.7.2. Output Chokes-	4-20
4.7.3. Interference Suppression Filters	4-21
4.8. Braking Units.....	4-22
4.8.1. Internal Braking Units.....	4-22
4.8.2 External Braking Resistors	4-23
4.8.3. Calculation of External Braking Resistance	4-27
4.9. Buffering the Regulator Supply	4-28
4.10. AV-300i Power Dip Ride Through Data and Restart Setup	4-30
4.11. Discharge Time of the DC-Link	4-32
5. Drive Operation	5-1
5.1. Keypad	5-2
5.1.1. LEDs & Buttons	5-2
5.1.2. Moving Inside a Menu	5-4
5.1.3. Displaying Parameters	5-5
5.1.4. Changing / Saving Parameters / Password	5-5
5.1.5. Operating the Drive Via the Keypad	5-8
5.1.5.1. Starting and Stopping the Drive with the Keypad	5-8
5.1.5.2. Failure Register / Acknowledge Alarms	5-9
5.1.5.3. Motor Potentiometer Function	5-10
5.1.5.4. Jog Function	5-12
5.2. Menu Structure	5-12
5.2.1 Main Menu and Submenu	5-13
5.2.2 Main Menu, Submenu and Parameters	5-15
5.3. Start Up	5-31
5.3.1 Pre-power Checks	5-31
5.3.1.1 Setting Jumpers and Switches	5-31
5.3.1.2 Checking the Wiring and Auxiliary Voltages.....	5-31
5.3.2 Power-up Checks.....	5-33
5.3.2.1 Basic Settings of the Drive for all the Regulation Modes.....	5-33
5.3.2.2. Setting Motor Parameters	5-34
5.3.2.3. Verify Speed Feedback	5-36
5.3.3. Self tuning	5-37
5.3.3.1 List of Self Tune Error Messages	5-40
5.3.3.2 Measurement Error Messages	5-40

5.3.4 MANUAL TUNING	5-41
5.3.4.1 V/f Control Mode	5-41
5.3.4.1.1 Magnetizing Current in V/f Mode	5-41
5.3.4.1.2 Tuning of Voltage Compensation Parameters	5-41
5.3.4.2 Sensorless Vector Mode	5-41
5.3.4.2.1 Tuning of Voltage Compensation Parameters	5-41
5.3.4.2.2 Manual Tuning of Magnetizing Current	5-42
5.3.4.2.3 Fine Tuning of Sensorless Parameters	5-42
5.3.4.2.4 Manual Tuning of Regulator Loops	5-42
5.3.4.2.4.1 Manual Tuning of the Current Regulator	5-43
5.3.4.2.4.2. Manual Tuning of the Flux Regulator	5-44
5.3.4.2.4.3. Manual Tuning the Speed Regulator	5-46
5.3.4.3 Field oriented mode	5-47
5.3.4.3.1 Additional Tuning of Magnetizing Current	5-47
5.3.4.3.2 Manual Tuning of Rotor Resistance	5-48
5.3.5 Enhanced Regulator Features	5-50
5.3.5.1. Setting the Speed Zero Logic	5-50
5.3.5.2 Anti Drift Function	5-50
5.3.5.3 Adaptive Speed Function	5-51
5.3.5.4 Speed-up Function	5-52
5.3.6 Troubleshooting.....	5-52
6. Function Description	6-1
6.1. Enable Signals	6-2
6.1.1. Enable Drive	6-2
6.1.2. Start/Stop	6-3
6.1.3. Fast Stop	6-4
6.1.4. Quick stop	6-5
6.1.5. External fault	6-5
6.2. Basic Menu	6-6
6.3. Monitor	6-10
6.4. Drive Parameters	6-14
6.4.1. Motor Nameplate Data	6-14
6.4.2. Motor Parameters	6-20
6.4.2.1. Self Tuning	6-22
6.4.2.2. Sensorless	6-25
6.4.2.3. V/f control	6-26
6.4.2.3.1. Voltage Boost	6-27
6.4.2.3.2. Slip Compensation	6-28
6.4.2.3.3. V/f Speed Search	6-29
6.4.2.3.4. Energy Saving Function	6-31

6.5. Input Variables	6-32
6.5.1. Ramp Reference	6-32
6.5.2. Speed Reference	6-34
6.5.3. Torque Current Reference	6-35
6.6. Limits	6-37
6.6.1. Speed Limits	6-37
6.6.2. Current limits	6-38
6.6.3. Flux limit	6-41
6.6.4. Voltage limits	6-41
6.7. Ramp	6-42
6.7.1. Acceleration, Deceleration, Quick Stop	6-43
6.7.2. Ramp Shape and Control Commands	6-44
6.8. Speed Regulation	6-47
6.8.1. Speed Regulator	6-48
6.8.2. Speed Zero Logic	6-49
6.8.3. Anti Drift Function	6-51
6.8.4. Speed up	6-52
6.8.5. Droop Function	6-52
6.8.6. Inertia/Loss Compensation	6-54
6.9. Current Regulation	6-56
6.10 Flux Regulation	6-58
6.11. Reg Parameters	6-61
6.12 Configuration	6-64
6.12.1. Operating Mode Selection	6-64
6.12.2. Speed Base Value, Full Load Current	6-66
6.12.3. Regulation Mode	6-66
6.12.4. Magnetizing Boost Current, Magnetizing Ramp Time	6-67
6.12.5. Configuration of the OK Relay	6-67
6.12.6. Encoder Type Selection	6-68
6.12.7. Line Voltage, Ambient Temp, Continuous Current, Software Version	6-72
6.12.8. Dimension Factor, Face Value Factor	6-73
6.12.9 Programmable Alarms	6-76
6.12.10. Bus Operation	6-82
6.12.11. Switching Frequency	6-82
6.12.12. Password	6-83
6.12.13 Qstp Opt Code	6-84
6.12.14 Serial Answer Delay	6-84

6.13. I/O CONFIG	6-85
6.13.1. Analog Outputs	6-85
6.13.2. Analog Inputs	6-88
6.13.3 Digital Outputs	6-95
6.13.4. Digital Inputs	6-96
6.13.5 Speed Reference From Encoder Input	6-98
6.14. Additional Speed Functions	6-101
6.14.1. Auto Capture	6-101
6.14.2. Adaptive Speed Regulator	6-101
6.14.3 Speed Control	6-103
6.14.4. Speed Zero	6-105
6.15. Functions	6-107
6.15.1. Motor Potentiometer	6-107
6.15.2. Jog Function	6-108
6.15.3. Multi Speed Function	6-111
6.15.4. Multi Ramp Function	6-115
6.15.5 Stop Control	6-119
6.15.6 Speed Draw Function	6-121
6.15.7. Motor Setup Function	6-124
6.15.8. Overload Control	6-127
6.15.9. Braking Unit Function	6-131
6.15.10. Powerloss Stop Function	6-132
6.15.10.1: Power Loss Stop Function.	6-132
6.16. Special Functions.....	6-139
6.16.1. Test Generator.....	6-139
6.16.2. Temperature Compensation of the Rotor Resistance	6-140
6.16.3 Saving Parameters. Loading Default Factory Settings, Life Time	6-141
6.16.4. Failure Register	6-141
6.16.5. Signal Adaptation (Links Function)	6-142
6.16.6. Pads	6-145
6.16.7. DC Braking	6-148
6.17 Options.....	6-151
6.17.1 Option 1	6-151
6.17.1.1 Process Data Channel.....	6-152
6.17.2 Option 2	6-155
6.17.3. PID Function	6-156
6.17.3.1 General	6-158
6.17.3.2. Inputs / Outputs	6-158
6.17.3.3. Feed - Forward	6-159

6.17.3.4. PID Function	6-161
6.17.3.5. Proportional - Integral Block	6-163
6.17.3.6. Proportional - Derivative Block	6-167
6.17.3.7. Output Reference	6-169
6.17.3.8. Initial Diameter Calculation	6-171
6.17.3.9. Procedure for Calculating Initial Diameter	6-173
6.17.3.10. Examples	6-174
6.17.3.11. Generic PID	6-189
6.17.3.12 Application Notes	6-193
6.18. Drivecom	6-195
6.18.1. Control Word, Status Word, Malfunction Code	6-195
6.18.2. Speed	6-196
6.18.3. Speed Limitation	6-197
6.18.4. Acceleration / Deceleration	6-198
6.18.5. Factor Function	6-199
6.19. Service	6-200
7 Maintenance	7-1
7.1. Care	7-1
7.2. Service	7-1
7.3. Repairs	7-1
7.4. Customer Service	7-1
8. Troubleshooting	8-1
Failure Alarms on the Keypad Display	8-1
Other faults	8-4
9. Block Diagram	9-1
AV-300i Inverter Overview	9-1
Digital inputs/Outputs & Mapping Standard and Option cards	9-2
Analog Inputs/Outputs & Mapping	9-3
Speed Reference Generation	9-4
Speed / Torque Regulation	9-5
Ramp Reference Block	9-6
Speed Regulator	9-7
Speed Regulator PI Functions	9-8
Droop Compensation	9-9
Inertia / Loss Compensation	9-10
Torque Current Regulator	9-11
Speed Feedback	9-17
Motor Control	9-13
Motor Parameters	9-14

Sensorless Parameters	9-15
V/Hz Functions	9-16
Speed Threshold / Speed Control	9-12
Adaptive Speed and Speed Zero Logic	9-18
PID Function	9-19
Start and Stop Management	9-20
Power Loss Stop Control	9-21
Jog Function	9-22
Motor Potentiometer	9-23
Multi Speed	9-24
Dual Motor Setup	9-25
Brake Unit Function	9-26
DC Braking Function	9-27
Dimension Factor / Face Value Factor	9-28
PAD Parameters	9-29
Links Function	9-30
Test Generator	9-31
Alarm Mapping	9-32
10. Parameters Lists	10-1
10.1. List of all Parameters	10-1
10.2. List of all Parameters in Numeric Order	10-28
10.3. Parameters list in Alphabetical Order	10-54
10.3. List of High Priority Parameters	10-67
11. Renewal Parts List	11-1
I Index	I-1

List of Figures

0. Safety Precautions - Precautions de sécurité	0-1
1. Function and Feature (Overview)	1-1
2. Inspection Procedure, Component Identification and Standard Specification	2-1
Figure 2.1.2.1: Inverter Type Designation	2-1
Figure 2.1.3.1: Identification Nameplate	2-2
Figure 2.1.3.2: Firmware & Card Revision Level Nameplate	2-2
Figure 2.1.3.3: Nameplates Position	2-2
Figure 2.2.1: Basic Setup of the Frequency Inverter	2-3
Figure 2.2.2: Drive View & Components	2-4
3. Installation Guidelines	3-1
Figure 3.1.1: Drive Dimensions	3-1
Figure 3.1.2: Mounting Methods	3-1
Figure 3.1.3: Drive Dimensions and Weights	3-1
Figure 3.1.5: Keypad Positioning	3-3
Figure 3.2.1: UL Type Fan Connections	3-5
Figure 3.2.2: UL Type Fan Connections	3-5
Figure 3.2.3: External Fan Jumpers	3-5
Figure 3.3.1: Max. Angle of Inclination	3-6
Figure 3.3.2: Mounting Clearance	3-6
4. Wiring Procedure	4-1
Figure 4.1.1: Removing the Covers	4-1
Figure 4.1.2: Removing the Covers	4-2
Figure 4.2.1.1: PV33-1 Power Card Jumpers & LEDs	4-3
Figure 4.2.1.2: PV33-2-L Power Card Jumpers & LEDs	4-3
Figure 4.2.1.3: PV33-3 Power Card Jumpers & LEDs	4-4
Figure 4.2.1.4: PV33-4 Power Card Jumpers & LEDs	4-4
Figure 4.2.1.5: PV33-5 Power Card Jumpers & LEDs	4-5
Figure 4.3.1.1: RV33 Regulation Card Switch & Jumpers	4-7
Figure 4.3.1.2: Potentials in the Control Section	4-11
Figure 4.4.1.1: RS485 Serial Interface	4-12
Figure 4.5.1.1: Control Sequencing	4-14
Figure 4.5.1.2: Example of Relay Interface	4-15
Figure 4.5.1.3: Typical Connections	4-16
Figure 4.8.1: Operation with the Braking Unit	4-22
Figure 4.8.1.1: Connection with the Internal Braking Unit and External Braking Resistor	4-22
Figure 4.8.2.1: Limit Operating Braking Cycle with Typical Triangular Power Profile	4-23
Figure 4.8.2.2: Braking Cycle with TBR / TC = 20%	4-24

Figure 4.8.2.3: Generic Braking Cycle with Triangular Profile	4-25
Figure 4.8.3.1: Power Resistor Overload Factor	4-27
Figure 4.9.1: Buffering the Regulator Supply by Means of Additional Capacitors	4-29
5. Drive Operation	5-1
Figure 5.1: Parameters Sets Management	5-1
Figure 5.1.1: Keypads and LED Module	5-2
Figure 5.1.2.1: Moving Inside the Navigation Menu	5-4
Figure 5.3.2.1.1: Voltage / Frequency Characteristics	5-35
Figure 5.3.4.1: Current in Phase U.	5-43
Figure 5.3.4.2: Current in Phase U. Current P is too Small.	5-43
Figure 5.3.4.3: Current in Phase U.Current P is too High.	5-44
Figure 5.3.4.4: Current in Phase U .Current P is set correctly.	5-44
Figure 5.3.4.5: Current in Phase U.Current I is too high.	5-44
Figure 5.3.4.6: Current in phase U . Current P/I are set correctly.	5-44
Figure 5.3.4.7: F Current Reference	5-45
Figure 5.3.4.8 F Current Reference; Flux P too High.	5-45
Figure 5.3.4.9: Flux P Set Correctly	5-45
Figure 5.3.4.10: Flux I too High	5-45
Figure 5.3.4.11: Flux P&I Set Correctly.	5-46
Figure 5.3.4.12: Speed P too Low	5-47
Figure 5.3.4.13: Speed P too High.	5-47
Figure 5.3.4.14: Speed I too High.	5-47
Figure 5.3.4.15: Speed P&I Set Correctly	5-47
Figure 5.3.4.16: Rate Incorrect	5-49
Figure 5.3.4.17: Correct Rotor Resistance	5-49
Figure 5.3.5.4.1: Speed-Up Function	5-52
Figure 5.3.5.4.2: Speed-Up Function	5-52
6. Function Description	6-1
Figure 6.1.1: Enable Via Contacts	6-2
Figure 6.1.2: Enable Via PLC	6-2
Figure 6.4.1.1: Motor Nameplate Data	6-15
Figure 6.4.2.1: Motor Paramters	6-20
Figure 6.4.2.2.1: Sensorless Parameters	6-26
Figure 6.5.1.1: Ramp References	6-33
Figure 6.5.2.1: Speed References	6-34
Figure 6.5.3.1: Torque References	6-36
Figure 6.6.2.1: T lim +/- , T Lim Not Gen	6-39
Figure 6.6.2.3: Current Limit in Sensorless Mode	6-40
Figure 6.7.1: Ramp	6-42

Figure 6.7.1.1: Accel, Decel, and Quick stop	6-43
Figure 6.7.2.1: Ramp Shape	6-45
Figure 6.7.2.2: Ramp Delay	6-45
Figure 6.7.2.3: Ramp Control	6-46
Figure 6.8.1: Speed Regulator	6-47
Figure 6.8.2.1: Speed Adaptive and Speed Zero Logic	6-50
Figure 6.8.5.1: Droop Compensation	6-53
Figure 6.8.6.1 Inertia/Loss Compensation	6-54
Figure 6.9.1: Torque Current Regulator	6-56
Figure 6.10.1: Motor Control	6-58
Figure 6.11.1: Reg Parameters for Sensorless	6-63
Figure 6.12.6.1: Speed Feedback	6-69
Figure 6.12.8.1: Calculations Using Dimension and Face Value Factors	6-74
Figure 6.12.9.1 : Drive Enabling Sequence: Main Commands = Terminals	6-80
Figure 6.12.9.2 : Drive Enabling Sequence: Main Command = Digital	6-81
Figure 6.13.1.1: Standard Analog Outputs and Option Card Blocks	6-86
Figure 6.13.2.1: Analog Input	6-92
Figure 6.13.2.2: Window Comparator	6-93
Figure 6.13.3.1: Digital Outputs and Option Card	6-95
Figure 6.13.4.1: Digital Input and Option Card	6-97
Figure 6.13.5.1: Tach Follower	6-96
Figure 6.13.5.2: Encoder as Reference	6-99
Figure 6.14.2.1: Adaptive Speed Regulation	6-103
Figure 6.14.3.1: “Speed Threshold” (above) and “Set Speed” (below)	6-105
Figure 6.14.4.1: Speed Zero	6-106
Figure 6.15.1.1: Example of the Motor Potentiometer Function.	6-107
Figure 6.15.2.1: Example of the Jog Function	6-110
Figure 6.15.3.1: Selection of Different Reference Values Via Terminal Strip	6-112
Figure 6.15.3.2: Multi Speed Function	6-114
Figure 6.15.4.1: Multi Ramps Via the Terminal Strip	6-118
Figure 6.15.4.2: Multi ramp Selection	6-119
Figure 6.15.5.1: Start/Stop Management	6-120
Figure 6.15.6.1 Speed Draw Block Diagram	6-121
Figure 6.15.6.2 Rubber Calender Example	6-123
Figure 6.15.7.1: Dual Motor Setup	6-124
Figure 6.15.9.1: Brake Unit Function	6-131
Figure 6.15.10.1: Power Loss Stop Function	6-136
Figure 6.15.10.2: Power Loss Stop Function	6-137
Figure 6.15.10.3: Power Loss Stop Function	6-138

Figure 6.16.1.1: Test Generator Output	6-139
Figure 6.16.5.1: Structure of the Signal Adaptation Function	6-143
Figure 6.16.6.1: Bus Pads	6-148
Figure 6.16.7.1: DC Braking Function	6-149
Figure 6.17.3: PID Function	6-157
Figure 6.17.3.1: Feed-forward Block	6-159
Figure 6.17.3.2: Feedback Block	6-161
Figure 6.17.3.3: PI Block	6-163
Figure 6.17.3.4: PD Block	6-167
Figure 6.17.3.5: Output Reference Block	6-169
Figure 6.17.3.6: Diameter Calculation Block	6-171
Figure 6.17.3.7: Diameter Calculation	6-172
Figure 6.17.3.8: Nip-roll Control with Dancer	6-174
Figure 6.17.3.9: Nip-rolls Control with Load Cell	6-177
Figure 6.17.3.10 Winder/Unwinder Control with Dancer	6-180
Figure 6.17.3.11: Diameter Calculation	6-184
Figure 6.17.3.12 Winder/Unwinder Control With Diameter Sensor	6-185
Figure 6.17.3.13: Transducer Signal and Winder/Unwinder Diameter	6-185
Figure 6.17.3.14: Pressure Control for Pumps and Extruder	6-186
Figure 6.17.3.15 Small and Large Diameters	6-193
Figure 6.17.3.16: Relation Between PI I gain PID and PI I output PID	6-195
Figure 6.18.4.1: Accel and Decel	6-198
7 Maintenance	7-1
8. Troubleshooting	8-1
9. Block Diagram	9-1
AV-300i Inverter Overview	9-1
Digital inputs/Outputs & Mapping Standard and Option cards	9-2
Analog Inputs/Outputs & Mapping	9-3
Speed Reference Generation	9-4
Speed / Torque Regulation	9-5
Ramp Reference Block	9-6
Speed Regulator	9-7
Speed Regulator PI part	9-8
Droop Compensation	9-9
Inertia / Loss Compensation	9-10
Torque Current Regulator	9-11
Speed Feedback	9-12
Motor Control	9-13
Motor Parameters	9-14

Sensorless Parameters	9-15
V/Hz Functions	9-16
Speed Threshold / Speed Control	9-17
Adaptive Speed and Speed Zero Logic	9-18
PID Function	9-19
Start and Stop Management	9-20
Power Loss Stop Control	9-21
Jog Function	9-22
Motor Potentiometer	9-23
Multi Speed	9-24
Dual Motor Setup	9-25
Brake Unit Function	9-26
DC Braking Function	9-27
Dimension Factor / Face Value Factor	9-28
PAD Parameters	9-29
Links Function	9-30
Test Generator	9-31
Alarm Mapping	9-32
10. Parameters Lists	10-1
11. Renewal Parts List	11-1

List of Tables

0. Safety Precautions - Precautions de sécurité	0-1
1. Function and Feature (overview)	1-1
2. Inspection Procedure, Component Identification and Standard Specification	2-1
Table 2.3.1.1: Environmental Specification	2-5
Table 2.3.2.1: AC Input/Output Specifications	2-7
Tables 2.3.3.1: Nominal Drive Current	2-9
3. Installation Guidelines	3-1
Table 3.1.1: Drive Dimensions and Weights	3-1
Table 3.1.2: Drive Dimensions and Weights	3-3
Table 3.2.1: Heat Dissipation and Required Air Flow	3-4
Table 3.2.2: Minimum Cabinet opening for Cooling	3-4
Table 3.4.2.1: Recommended Cables	3-8
Table 3.4.2.2: Encoders Settings Via S11...S23 Switches	3-9
Table 3.4.2.3: Encoders Connections	3-9
Table 3.4.2.4: Assignment of the XE Connector for Sinusoidal or Digital Encoders	3-10
4. Wiring Procedure	4-1
Table 4.2.2.1: Power Section Terminals	4-6
Table 4.2.2.2: Maximum Cable Cross Section	4-6
Table 4.3.1.1: LEDs on the Regulator Card	4-7
Table 4.3.1.2: Test Points on Regulator Card	4-7
Table 4.3.1.3: Jumpers on RV33 Regulator Card	4-8
Table 4.3.1.4: RV33 Regulator Card Switch S3 Settings	4-8
Table 4.3.2.1: Plug-in Terminal Strip Assignments	4-9
Table 4.3.2.2: Cable Cross-Section on the Plug-in Terminals of the Regulator Card	4-10
Table 4.3.2.3: Maximum Control Cable Lengths	4-10
Table 4.4.2.1: Assignment of the XS Connector for the RS 485 Serial Interface	4-13
Table 4.6.1.1: External Fuse Types for AC Input	4-17
Table 4.6.2.1: K1M - AC Input Contactors	4-18
Table 4.6.3.1: External Fuses for DC Input	4-19
Table 4.6.4.1: Internal Power Card Fuses	4-19
Table 4.7.1.1: 3-Phase AC Input Chokes	4-20
Table 4.7.2.1: Output Chokes	4-21
Table 4.8.2.1: Lists and of External Standard Resistors	4-23
Table 4.8.2.2: Braking Thresholds for Different Line Voltages	4-26
Table 4.8.2.3: Internal Braking Units	4-26
Table 4.9.1: DC Link Buffer Time	4-28
Table 4.10.1: Drive Trip Times, 230-V Threshold	4-31

Table 4.10.2: Drive Trip Time, 400-V Threshold	4-31
Table 4.10.3: Drive Trip Time, 460-V Threshold	4-32
Table 4.11.1: DC Link Discharge Times	4-32
5. Drive Operation	5-1
Table 5.1.1.1: Keypad LED Designation	5-2
Table 5.3.1.2.1 : Terminal Description	5-32
Table 5.3.1.2.2 :Amps/Volts Ratio	5-32
6. Function Description	6-1
Table 6.15.3.1: Multispeed Selection	6-113
Table 6.15.4.1: Ramp Selection	6-117
Table 6.15.7.1 Motor Setup Parameter List	6-126
7. Maintenance	7-1
8. Troubleshooting	8-1
9. Block Diagram	9-1
10. Parameters Lists	10-1

Section 0: Safety Precautions - Precautions de sécurité

ATTENTION!

According to the EEC standards the AV-300i should be used only after checking that the mechanical equipment uses those safety devices required by the 89/392/EEC set of rules.

Drive systems cause mechanical motion. It is the responsibility of the user to insure that any such motion does not result in an unsafe condition. Factory provided interlocks and operating limits should not be bypassed or modified.

Selon les normes EEC, les drives AV-300i et leurs accessoires doivent être employés seulement après avoir vérifié que la machine ait été produite avec les mêmes dispositifs de sécurité demandés par la réglementation 89/392/EEC concernant le secteur de l'industrie.

Les systèmes provoquent des mouvements mécaniques. L'utilisateur est responsable de la sécurité concernant les mouvements mécaniques. Les dispositifs de sécurité prévues par l'usine et les limitations opérationnelles ne doivent être dépassés ou modifiés.

WARNING - ELECTRICAL SHOCK AND BURN HAZARD / ATTENTION – DÉCHARGE ÉLECTRIQUE ET RISQUE DE BRÛLURE :

When using instruments such as oscilloscopes to work on live equipment, the oscilloscope's chassis should be grounded and a differential input amplifier should be used. Care should be used in the selection of probes and leads so that accurate readings may be made. See the instrument manufacturer's instruction book for proper operation and adjustments of the oscilloscope.

Lors de l'utilisation d'instruments (par exemple oscilloscope) sur des systèmes en marche, le châssis de l'oscilloscope doit être relié à la terre et un amplificateur différentiel devrait être utilisé en entrée.

Les sondes et conducteurs doivent être choisis avec soin pour effectuer les meilleures mesures à l'aide d'un oscilloscope.

Voir le manuel d'instruction pour une utilisation correcte des instruments.

WARNING - FIRE AND EXPLOSION HAZARD / ATTENTION – RISQUE D'INCENDIES ET D'EXPLOSIONS:

Fires or explosions might result from mounting drives in hazardous areas such as locations where flammable or combustible vapors are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

L'utilisation des drives dans des zones à risques (présence de vapeurs ou de poussières inflammables), peut provoquer des incendies ou des explosions. Les drives doivent être installés loin des zones dangereuses, et équipés de moteurs appropriés.

WARNING - STRAIN HAZARD / ATTENTION À L'ÉLÉVATION:

Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and trained personnel.

Une élévation inappropriée peut causer des dommages sérieux ou fatals. Il doit être élevé seulement avec des moyens appropriés et par du personnel qualifié.

WARNING - ELECTRICAL SHOCK / ATTENTION – CAS DE DÉCHARGE ÉLECTRIQUE:

Drives and motors must be grounded according to NEC.

Tous les moteurs et les drives doivent être mis à la terre selon le Code Electrique National ou équivalent.

WARNING / ATTENTION:

Replace all covers before applying power to the drive. Failure to do so may result in death or serious injury.

Remettre tous les capots avant de mettre sous tension le drive. Des erreurs peuvent provoquer de sérieux accidents ou même la mort.

WARNING / ATTENTION:

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the drive are energized during operation. The electrical installation, tune up and troubleshooting should therefore only be carried out by qualified personnel. Improper installation of motors or drives may therefore cause the failure of the drive as well as serious injury to persons or equipment.

The drive is not equipped with motor overspeed protection logic. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Les drives à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des drives sont sous tension pendant l'opération. L'installation électrique et l'ouverture des drives devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages matériels ou blesser des personnes.

Le convertisseur n'est pas pourvu de protection contre vitesse de fuite du moteur. On doit suivre les instructions données dans ce manuel et observer les règles nationales de sécurité.

CAUTION / PRECAUTION:

Do not connect line voltages that exceed the specification. If excessive voltage is applied to the drive, damage to the internal components will result.

Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d'une alimentation en tension excessive, des composants internes peuvent être endommagés.

CAUTION / PRECAUTION:

Do not operate the drive without a ground wire being connected. The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.

The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector must be attached to the wire using the crimp tool specified by the terminal manufacturer.

Ne pas faire fonctionner le drive sans prise de terre. Le châssis du moteur doit être mis à la terre à l'aide d'un connecteur de terre séparé des autres pour éviter le couplage des perturbations. Le connecteur de terre devrait être dimensionné selon la norme NEC ou le Canadian Electrical code. Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermé par les normes CSA et UL et dimensionné pour l'épaisseur du câble correspondant. Le connecteur doit être fixé à l'aide d'un instrument de serrage spécifié par le producteur du connecteur.

CAUTION / PRECAUTION:

Do not perform a megger test between the drive terminals or the control circuit terminals.

Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.

CAUTION / PRECAUTION:

Because the ambient temperature greatly effects drive life and reliability, do not install the drive in any location that exceeds the allowable temperature. Leave the ventilation cover attached for temperatures of 104° F (40° C) or below.

Étant donné que la température ambiante influe sur la vie et la fiabilité du drive, on ne devrait pas installer le drive dans des places où la température permise est dépassée. Laisser le capot de ventilation en place pour températures de 104°F (40°C) ou inférieures.

CAUTION / PRECAUTION:

If the drive's Fault Alarm is activated, consult the TROUBLESHOOTING section of this instruction book. Correct the problem before resuming operation, automatic reset of faults is not recommended.

Si la Fault Alarm du drive est activée, consulter la section du manuel concernant les défauts et après avoir corrigé l'erreur, reprendre l'opération. Ne pas réinitialiser l'alarme automatiquement par une séquence externe, etc....

CAUTION / PRECAUTION:

Be sure to remove the desiccant dryer packet(s) when unpacking the drive. (If not removed these packets may become lodged in the fan or air passages and cause the drive to overheat).

Lors du déballage du drive, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du drive).

CAUTION / PRECAUTION:

The drive must be mounted on a wall that is constructed of heat resistant material. While the drive is operating, the temperature of the drive's cooling fins can rise to a temperature of 194° F (90°C).

Le drive doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du drive, la température des ailettes du dissipateur thermique peut arriver à 194°F (90°).

Note:

The terms "Inverter", "Controller" and "Drive" are sometimes used interchangeably throughout the industry. We will use the term "drive" in this document

Les mots "Inverter", "Controller" et "Drive" sont interchangeables dans le domaine industriel. Nous utiliserons dans ce manuel seulement le mot "Drive".

1. Never open the drive or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the drive is listed in section 4.11.

Ne jamais ouvrir l'appareil lorsqu'il est sous tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien à l'intérieur de l'appareil est indiqué dans la section 4.11.

2. Be careful not to damage components when handling the drive. Changing the isolation gaps or removing the isolation covers is not permissible. If the front cover has to be removed because of a room temperature, higher than 40 degrees C, the user has to ensure that no accidental contact with live parts occur.

Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots. Si la plaque frontale doit être enlevée pour un fonctionnement avec la température de l'environnement plus haute que 40°C, l'utilisateur doit s'assurer, par des moyens opportuns, qu'aucun contact occasionnel ne puisse arriver avec les parties sous tension.

3. Protect the drive from extreme environmental conditions (temperature, humidity, shock etc.)

Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

4. No voltage should be connected to the output of the frequency inverter (terminals U2, V2 W2). The parallel connection of several inverter outputs or the direct connection of the inputs and outputs (bypass) is not permissible.

Aucune tension ne doit être appliquée sur la sortie du convertisseur (bornes U2, V2 et W2). Il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directe de l'entrée avec la sortie du convertisseur (Bypass).

5. When engaging a running motor, the Auto capture function (Auto capture in the ADD SPEED FUNCT menu) must be activated (not applicable to **Regulation mode**=sensorless vect).

Pour reprendre des moteurs en rotation, la fonction suivante doit être activée : "Auto capture" dans le menu ADD SPEED FUNCT.

6. A capacitive load (e.g. power factor capacitors) should not be connected to the output of the inverter (terminals U2, V2, W2).

Aucune charge capacitive ne doit être connectée à la sortie du convertisseur (bornes U2, V2 et W2) (par exemple des condensateurs de mise en phase).

7. Always connect the drive to the protective ground (PE) via the marked connection terminals (PE2) and the housing (PE1). Adjustable Frequency Drives and AC Input filters have ground discharge currents greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be a fixed type and be redundant.

Effectuer toujours des connexions de terre (PE) par le biais des bornes (PE2) et du châssis (PE1). Le courant de dispersion vers la terre est supérieur à 3,5 mA. Selon EN 50178 il faut prévoir dans ces cas une double connexion à terre.

8. The electrical commissioning should only be carried out by qualified personnel, who will be responsible for a suitable ground connection. The power supply feeder must be in accordance with the local and national codes. The motor must be protected against overloads.

La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable de l'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge

9. No dielectric tests should be carried out on parts of the inverter. A suitable measuring instrument (internal resistance of at least 10 kΩ/V) should be used for measuring the signal voltages.

Il ne faut pas exécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10 kΩ/V).

10. If the drives have been stored for longer than three years, the operation of the DC link capacitors may be impaired. Before commissioning connect them to a power supply for two hours with no load. This will regenerate the capacitors (the input voltage has to be applied without enabling the inverter).

*En cas de stockage des convertisseurs pendant plus de trois ans, il faut tenir compte du fait que les condensateurs du circuit intermédiaire gardent leurs caractéristiques d'origine seulement s'ils sont alimentés avant trois ans, à partir de leur date de fabrication. Avant la mise en service des appareils, qui sont restés stockés aussi longtemps, il est conseillé d'alimenter les convertisseurs pendant au moins deux heures, pour récupérer les caractéristiques d'origine des condensateurs : appliquer une tension d'entrée sans activer le convertisseur **(Disable)**.*

11. The drive may start accidentally because of a failure, even if disabled, unless it has been disconnected from the AC input feeder.

L'appareil peut redémarrer de façon accidentel en cas d'anomalie, sauf s'il a été déconnecté du réseau.

Section 1: Functions and Features

The AV-300i is a field-oriented vector drive with excellent speed control and high torque capabilities.

- Available control modes are:
 - Field oriented with speed sensor
 - Field oriented without speed sensor (Sensorless vector mode)
 - V/f control
- Space vector modulation keeps the noise level to a minimum.
 - Output voltage up to 98% of input voltage
 - Self tuning procedure for current, flux and speed regulators
- The Drives are fitted with IGBT (insulated gate bipolar) transistors.
- The output is protected against ground fault and phase to phase shorts.
- Regulator power supply is powered from the DC Bus circuit. The power supply is then backedup in the event of short-term voltage dips.
- Isolation between control the section and command terminals.
- Analog inputs are designed as differential inputs.
- Operation of the drive can be via:
 - The terminal strip
 - The keypad
 - A fieldbus connection (optional): INTERBUS-S with the DRIVECOM profile, PROFIBUS-DP or GENIUS.
 - The Toolbox configuration tool
- Fault register storing of the last ten fault alarms with timestamp.
- Overload control
- Engaging a running motor (Catch on the fly)
- Three configurable analog inputs on the standard drive
- Expansion of the analog outputs and inputs via option cards
- Reference value entry and actual value displayed as a percentage of user-defined dimensions
- Speed or current regulation
- Adaptive speed regulation
- Speed-related alarms
- Motor potentiometer function (Increase/Decrease speed by pushbutton)
- Jog operation
- 8 internal speed references
- 4 internal accel/decel ramps
- PID control
- Controlled stop in case of AC line power loss.

Notes:

Section 2: Inspection Procedure, Component Identification and Standard Specification

2.1. Inspection Procedures

2.1.1. General

A high degree of care is taken in packing the AV-300i Drives and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging.

Upon delivery, check the following:

- Packaging - for any external damage.
- Delivery invoice - to see that it matches the order.

Open the packaging with suitable tools. Check whether:

- Parts were damaged during transport.
- The drive type corresponds to your order.

In the event of any damage, incomplete, or incorrect order please notify the responsible sales office immediately.

The drive should only be stored in a dry location within the specified temperature ranges .

Note!

A certain degree of moisture condensation is permissible if this arises from changes in temperature (see section 2.3.1, "Permissible Environmental Conditions"). This does not apply when the devices are in operation. Always ensure that there is no moisture condensation in drives that are connected to the power supply!

2.1.2. Inverter type designation

The technical capability of the AV-300i Drive is contained in the type code. For example:

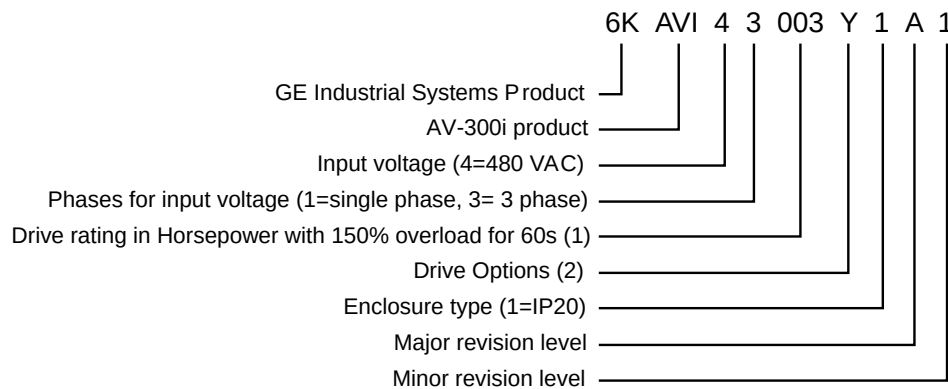


Figure 2.1.2.1: Inverter type designation

(1) Fractional horsepowers are denoted with the letter F (for example: 3/4 Hp=F75)

(2) X = keypad, without internal brake transistor

N = no keypad, uses Led module with internal brake transistor (DB)

Y = keypad, with internal brake transistor.

N = no keypad, uses LED module without internal brake (DB) transistor

*AV300i with Full function Keypad is the Standard configuration of the drive

1 Hp - 60 Hp, internal brake (DB) transistor is always supplied.

The AV-300i Drive selection depends on the rated current of the motor. The rated output current at the appropriate service conditions must be greater than or equal to the motor current.

The speed of the three-phase motor is determined by the number of pole pairs and the frequency of the motor used. Operation above the base frequency and speed of the motor must take into account unbalance, bearing loss etc. Care must also be taken for operation below 20 Hz as the shaft fan on the motor may not provide adequate cooling.

2.1.3. Nameplate

Check that all the data stated on the nameplate of the inverter corresponds to what has been ordered.

Figure 2.1.3.1: Identification nameplate

GENERAL  ELECTRIC					
Type	:	6K AVI43003Y1A1	S/N	9862330	
Main Power In	:	480 Vac	8.9 A	50/60Hz	3Phase
Main Power Out	:	0-480V ac	7.5A	0-400Hz	
		LISTED INDUSTRIAL CONTROL EQUIPMENT		 	

Type: Inverter model S/N: Serial number

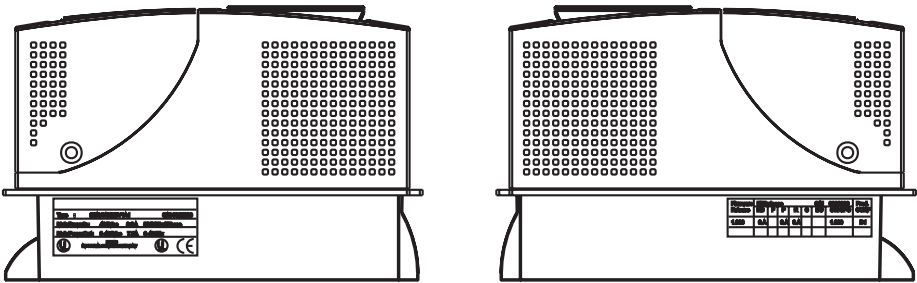
Main Power In: Power supply voltage - AC Input current - Frequency

Main Power Out: Output voltage - Output current - Output frequency

Figure 2.1.3.2: Firmware & Card revision level nameplate

Firmware Release	HW release					S/N 9862330		Prod. CONF
	D	F	P	R	S	BU	SW . CFG	
1.000	0.A		0.A	0.A			1.000	D1

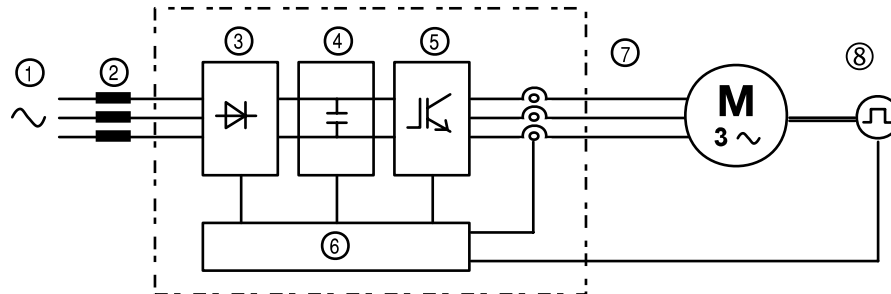
Figure 2.1.3.3: Nameplates position



2.2. Component identification

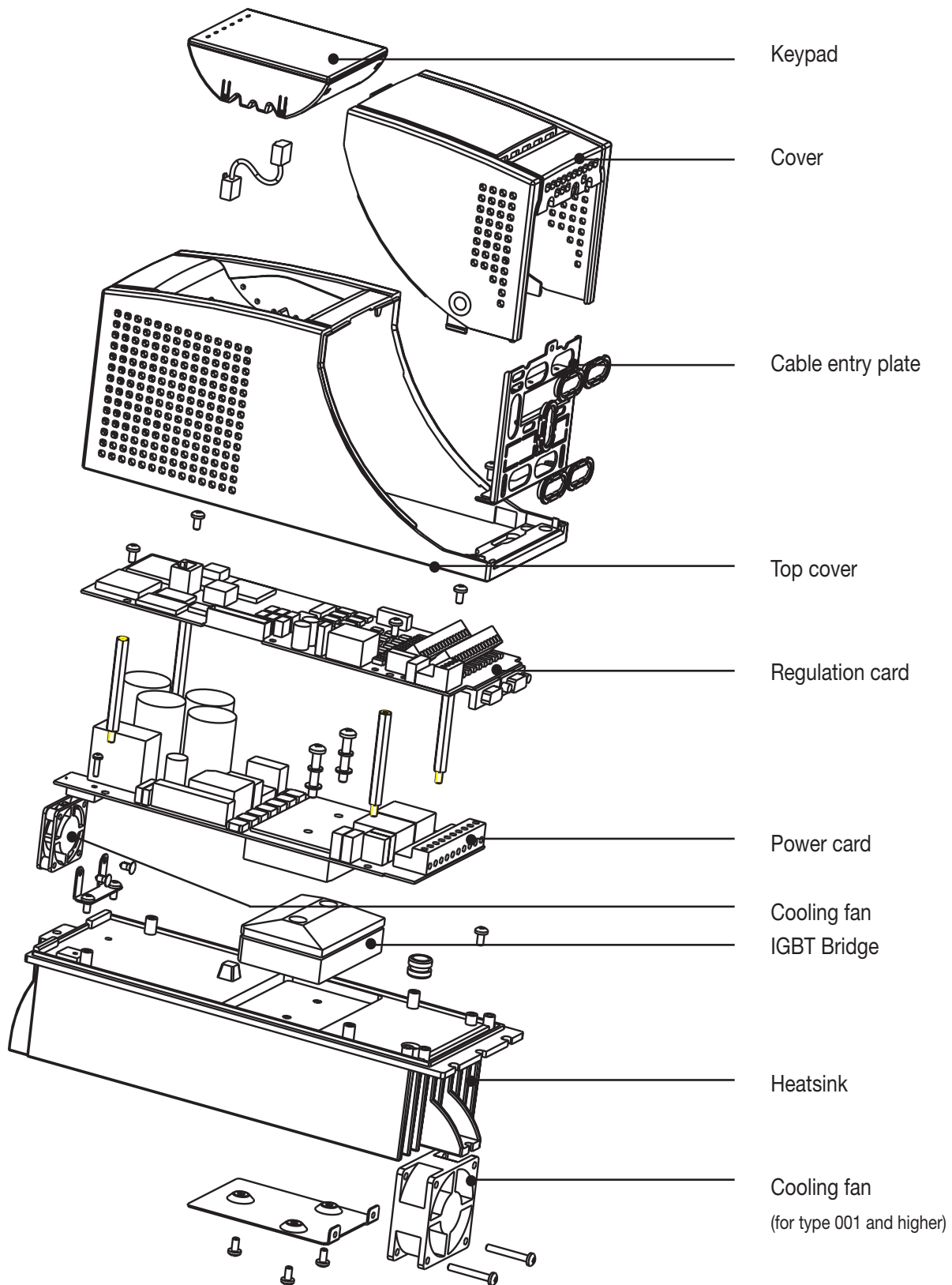
An AV-300i Drive converts constant voltage and frequency of a three-phase power bus into direct voltage. Then it converts this direct voltage into new three-phase power with adjustable voltage and frequency. This three-phase power supply can then be used for the adjustment of the speed of a three-phase motors.

Figure 2.2.1: Basic Setup of Frequency Inverter



1 AC Input supply voltage	
2 AC Mains choke	(see section 4.7.1)
3 Three-phase rectifier bridge	Converts the alternating current into direct current using a three phase full wave bridge.
4 DC Bus	With charging resistor and filter capacitor. Direct voltage (U_{DC}) = $\sqrt{2}$ x Mains voltage (U_{LN})
5 IGBT inverter	Converts direct voltage to a adjustable three-phase alternating voltage and frequency.
6 Configurable control section	Modules for open-loop and closed-loop control of the power section. This is used for processing control commands, reference values and actual values.
7 Output voltage:	Three-phase, adjustable alternating voltage.
8 Encoder	For speed feedback (see section 3.4.2)

Figure 2.2.2: Exploded view of the drive



2.3. Standard Specifications

2.3.1. Permissible environmental conditions

Table 2.3.1.1: Environmental specification

E N V I R O N M E N T	T _A Ambient temperature		[°C]	0...+40;+40...+50 with derating
			[°F]	32...+104;+104...+122with derating
	Installation location		Pollution degree: 2 or better (free from direct sunlight, vibration, dust, corrosive or in flammable gases, fog, vapor, oil, and dripping water, and saline environment)	
	Degree of protection		IP20	
			IP54 for the cabinet with externally mounted heatsink (size type .75 to 20 Hp)	
	Installation altitude		Up to 1000m above sea level; for higher altitudes a current reduction of 1.2% for every additional 100m of altitude.	
	Temperature:			
	operation		1)	0...40°C (32°...104°F)
			2)	0...50°C (32°...122°F)
	storage		-25...+55°C (-13...+131°F), class 1K4 per EN50178	
			-20...+55°C (-4...+131°F), for devices with keypad	
	transport		-25...+70°C (-13...+158°F), class 2K3 per EN50178	
			-20...+60°C (-4...+140°F), for devices with keypad	
	Air humidity:			
	operation		5% to 85%, relative humidity without moisture condensation or icing (Class 3K3 as per EN50178)	
			storage	
	storage		5% to 95%, relative humidity (Class 1K3 as per EN50178)	
			transport	
	transport		95% ³⁾ 60g/m ⁴⁾	
			Alight condensation of moisture may occur for a short time occasionally if the device is not in operation (class 2K3 as per EN50178)	
	Air pressure:			
operation		lb/in ²	125 to 154 (class 3K3 as per EN50178)	
		storage		
storage		lb/in ²	125 to 154 (class 1K4 as per EN50178)	
		transport		
transport		lb/in ²	125 to 154 (class 2K3 as per EN50178)	
S T A N D A R D	Climatic conditions		IEC68-2 Part 2 and 3	
	Clearance and creepage		EN50178, UL508C, UL840 degree of pollution 2	
	Vibration		IEC68-2 Part 6	
	EMC compatibility		EN61800-3 (see “EMCGuidelines” instruction book)	
	Approvals		CE, UL, cUL	

avy2000

- ¹⁾ Parameter **Ambient temp** = 40°C (104°)
 Ambient temp = 0 ... 40°C (32°...104°F)
 Over 40°C: - current reduction of 2% of rated output current per degree C
 - remove front cover (better than class 3K3 as per EN50178)
- ²⁾ Parameter **Ambient temp** = 50°C (122°F)
 Ambient temp = 0 ... 50°C (32°...122°F)
 Current derated to 0.8 rated output current
 Over 40°C (104°): removal of the top cover (better than class 3K3 as per EN50178)
- ³⁾ Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the drive is brought suddenly from -25° ...+30°C (-13°...+86°F).
- ⁴⁾ Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

Disposal of the Device

The AV-300i Drive can be disposed of as electronic scraps in accordance with the currently valid national regulations for the disposal of electronic parts.

The plastic cover of the drives (up to sizes 6KAVI43020) are recyclable: the material used is >ABS+PC< .

2.3.2. AC Input/Output Connection

The AV300i Drive must be connected to an AC line capable of delivering a symmetrical short circuit current (at 480V +10% Vmax) lower or equal to the values indicated on the table below. The addition of AC Line inductance should be taken into account (see chapter 4.7.1).

No external connection of the regulator power supply to the existing AC Input supply is required since the power supply is taken from the DC Link circuit. When commissioning, set the **Mains voltage** parameter to the value of the AC Input voltage. This automatically sets the threshold for the Undervoltage alarm at the appropriate level.

Note!

In some cases AC Input chokes, and possibly noise suppression filters should be installed on the AC Input side of the drive before operating the AV-300i Drive. See chapter "Chokes/Filters".

Adjustable Frequency Drives and AC Input filters have ground discharge currents greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be a permanent type.

Table 2.3.2.1: AC Input/Output specifications

Hp		3/4	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
Inverter Output (IEC 146 class1), Continuous service		[kVA]	1.6	2.7	3.8	5	6.5	8.5	12	16.8	22.4	32	42	55	64	79	98	128	145	173
Inverter Output (IEC 146 class2), 150% overload for 60s		[kVA]	1.4	2.4	3.4	4.5	5.9	7.7	10.9	15.3	20.3	29	38.2	50	58.3	72	89.2	116.5	132	157.5
P _m mot (recommended motor output):																				
@ ULN = 230 VAC; ISW = default; IEC 146 class 1		[kW]																		
@ ULN = 230 VAC; ISW = default; IEC 146 class 2		[kW]																		
@ ULN = 400 VAC; ISW = default; IEC 146 class 1		[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	75	90	110	132
@ ULN = 400 VAC; ISW = default; IEC 146 class 2		[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	75	90	110	132
@ ULN = 460 VAC; IEC 146 class 1		[Hp]	1	2	3	3	5	7.5	10	15	20	30	40	50	60	75	100	125	150	200
@ ULN = 460 VAC; IEC 146 class 2		[Hp]	0.75	1.5	2	3	5	7.5	10	15	20	30	40	50	60	75	100	125	150	200
U ₂ Max output voltage		[V]	0.98 x U _N (AC Input voltage)																	
f ₂ Max output frequency		[Hz]	400																	
f _m Rated output current:			200																	
@ ULN = 400 VAC; ISW = default; IEC 146 class 1		[A]	2.4	4	5.6	7.5	9.6	12.6	17.7	24.8	33	47	63	79	93	114	142	185	210	250
@ ULN = 400 VAC; ISW = default; IEC 146 class 2		[A]	2.2	3.6	5.1	6.8	8.7	11.5	16.1	22.5	30	43	58	72	85	104	129	169	191	227
@ ULN = 460 VAC; ISW = default; IEC 146 class 1		[A]	2.1	3.5	4.9	6.5	8.3	12	15.4	23.1	29.7	40	54	68	81	99	124	160	183	217
@ ULN = 460 VAC; ISW = default; IEC 146 class 2		[A]	1.9	3.2	4.4	5.9	7.6	11	14	21	27	36	50	62	74	90	112	146	166	198
f _{sw} switching frequency (Default)		[kHz]	8																	
f _{sw} switching frequency (Higher)		[kHz]	16																	
I _{ovld} (short term overload current, 200% of I _m for 0.5s on 60s)		[A]	4.4	7.2	10.2	13.6	17.4	23	32.2	45	60	86	116	144	170	208	258	338	382	454
Derating factor:			0.87																	
KV at 460/480 VAC			0.87																	
K _t for ambient temperature			0.8 @ 50°C (122°F)																	
K _f for switching frequency			0.7 for higher f _{sw}																	
U _{1N} AC Input voltage		[V]	400 V -15% ... 480 V +10%, 3Ph																	
AC Input frequency		[Hz]	50/60 Hz ±5%																	
I _N AC Input current for continuous service :			For these types an external inductance is recommended																	
- Connection with 3-phase reactor																				
@ 400 VAC; IEC 146 class 1		[A]	1.9	3.3	4.5	6.2	7.9	10.7	15.8	20.4	28.2	44	62	77	94	110	137	177	216	247
@ 460 VAC; IEC 146 class 1		[A]	1.7	2.9	3.9	5.4	6.9	9.3	13.8	17.8	24.5	37	53	66	82	96	120	153	188	214
- Connection without 3-phase reactor																				
@ 400 VAC; IEC 146 class 1		[A]	3.9	4.8	7.4	8.9	12	16.9	24.2	30.3	39.8									
@ 460 VAC; IEC 146 class 1		[A]	3.4	4.2	6.4	7.7	10.4	14.7	21	26.4	34.6									
Max short circuit power without line reactor (Z _{min} =1%)		[kVA]	160	270	380	500	650	850	1200	1700	2250	3200	4200	5500	6400	7900	9800	12800	14500	17300
Overvoltage threshold		[V]	820 V _{DC}																	
Undervoltage threshold		[V]	230 VDC (for 230 VAC mains), 400 VDC (for 400 VAC mains), 460 VDC (for 460 VAC mains)																	
Braking IGBT Unit (standard drive)																				
Standard internal (with external resistor); Braking torque 150%																				
Internal (with external resistor); Braking torque 150%																				
External braking unit (optional)																				
Hp			3/4	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150
Watts Loss			45	72	96	127	164	216	301	340	468	582	780	1000	1100	1390	1750	2200	2560	3050

2.3.3. AC Input current

Note!

The Input current of the drive depends on the operating state, the service conditions of the connected motor, and the use of input reactors. The table 2.3.3.1 shows the values corresponding to rated continuous service (IEC 146 class 1 and class 2), factoring in typical output power factor for each size.

2.3.4. AC Output

The output of the AV-300i Drive is protected against ground faults and phase to phase shorts. The switching frequency is constant in the speed range and depends on the drive size.

Note!

The connection of an external voltage to the output terminals of the drive is not allowed! Disconnect the motor from the drive output only after the drive has been disabled.

The value for the continuous output current rating (I_{CONT}) depends on AC Input voltage (K_V), Ambient temperature (K_T) and Switching frequency (K_F):

$$I_{CONT} = I_{2N} \times K_V \times K_T \times K_F \text{ (Values of derating factor are the listed on table 2.3.2.1)}$$

The overload capacity $I_{MAX} = 1.36 \times I_{CONT}$ for 60 seconds

The applicable deratings are automatically set when selecting the appropriate values of AC input voltage, ambient temperature and switching frequency.

Recommended motor outputs

The coordination of motor with the drive type, presented in the table below, refers to the use of standard 4 pole motors with a rated voltage equal to the input supply. As for motors with different voltages, the type of drive is determined by the rated current of the motor.

Motor nominal current cannot be lower than $0.3 \times I_{2N}$. Magnetizing motor current must not be higher than I_{CONT} .

Note!

For service conditions with overloads higher than 150%, the nominal current must be derated.

Table 2.3.3.1 shows nominal current values for typical service profiles (Ambient temperature = 40°C [104°F], standard switching frequency). For cycles with nominal current applied after the overload, the minimum duration is also specified.

For cycles shorter than the minimum duration specified, the current following the overload should be reduced to a level lower than the nominal, so that the RMS average over the cycle does not exceed the continuous current, I_{CONT} .

Similar criteria apply for operation with additional derating factors.

Table 2.3.3.1: Nominal Drive Current

Type		3F75	3001	3002	3003	3005	3007	3010	3015	3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200	
- I _{2N} Rated output current (@ U _{LN} =400Vac) :																					
	Continuous service, no overload (IEC 146 class 1)	[A]	2.4	4	5.6	7.5	9.6	12.6	17.7	24.8	33	47	63	79	93	114	142	185	210	250	324
	Overload service 150%x60s followed by I _N , min. cycle time 360s (IEC 146 class2)	[A]	2.2	3.6	5.1	6.8	8.7	11.5	16.1	22.5	29.9	42.6	57.1	71.6	84.3	103.4	128.7	167.7	190.4	227	293.8
	Overload service 200%x10s followed by I _N , min. cycle time 30s	[A]	1.6	2.7	3.8	5.1	6.5	8.6	12.0	16.9	22.4	32	42.8	53.7	63.2	77.5	96.6	125.8	142.8	170	220.3
	Overload service 200%x60s followed by I _N , min. cycle time 160s	[A]	1.6	2.7	3.8	5.1	6.5	8.6	12.0	16.9	22.4	32	42.8	53.7	63.2	77.5	96.6	125.8	142.8	170	220.3
	Overload service 250%x10s followed by I _N , min. cycle time 25s	[A]	1.3	2.2	3.0	4.1	5.2	6.8	9.6	13.5	18	25.6	34.3	43	50.6	62	77.2	100.6	114.2	136	176.3
	Overload service 300%x10s followed by I _N , min. cycle time 25s	[A]	1.1	1.8	2.5	3.4	4.3	5.7	8.0	11.2	15	16	21.4	27	31.6	38.8	48.3	63	71.4	85	110.2
	Overload service 300%x60s followed by I _N , min.cycle time 130s	[A]	1.1	1.8	2.5	3.4	4.3	5.7	8.0	11.2	15	16	21.4	27	31.6	38.8	48.3	63	71.4	85	110.2
- I _{2N} x K ₁ Rated output current (@ U _{LN} =460/480Vac) :																					
	Continuous service, no overload (IEC 146 class 1)	[A]	2.1	3.5	4.9	6.5	8.3	12	15.4	23.1	29.7	40	54	68	81	99	124	160	183	217	282
	Overload service 150%x60s followed by I _N , min. cycle time 360s (IEC 146 class2)	[A]	1.9	3.2	4.4	5.9	7.6	10	14	19.6	26	36.3	49	61.7	73.4	89.8	112.4	145.1	166	196.7	255.7
	Overload service 200%x10s followed by I _N , min. cycle time 30s	[A]	1.4	2.4	3.3	4.4	5.6	7.5	10.5	14.7	19.5	27.2	36.7	46.2	55.1	67.3	84.3	108.8	124.4	147.6	191.8
	Overload service 200%x60s followed by I _N , min. cycle time 160s	[A]	1.4	2.4	3.3	4.4	5.6	7.5	10.5	14.7	19.5	27.2	36.7	46.2	55.1	67.3	84.3	108.8	124.4	147.6	191.8
	Overload service 250%x10s followed by I _N , min. cycle time 25s	[A]	1.1	1.9	2.7	3.5	4.5	6.0	8.4	11.7	15.6	21.8	29.4	37	44	54	67.5	87	99.6	118	153.4
	Overload service 300%x10s followed by I _N , min. cycle time 25s	[A]	0.9	1.6	2.2	2.9	3.8	5.0	7.0	9.8	13	13.6	18.4	23.1	27.5	33.7	42.2	54.4	62.2	73.8	95.9
	Overload service 300%x60s followed by I _N , min. cycle time 130s	[A]	0.9	1.6	2.2	2.9	3.8	5.0	7.0	9.8	13	13.6	18.4	23.1	27.5	33.7	42.2	54.4	62.2	73.8	95.9

a12020

2.3.5. Open-Loop and Closed-Loop Control Section

Enable inputs		0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Analog inputs	Selectable	0... ± 10 V 0...20 mA 4...20 mA	0.25 mA max 10 V max 10 V max	
		Max common mode voltage: 0...± 10 V		
Analog outputs		0...± 10 V	5 mA max per output	
Digital inputs		0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Digital outputs	Supply	+ 15...35 V		
	Signals	+ 15...35 V	40 mA max per output	
Encoder inputs				
Sinusoidal	Voltage	1 V pp		
	Current	8.3 mA pp per channel (input resistance = 124 Ohms).		
	No. of pulses per revolution	min 600 max 9999		
	Max. frequency	80 kHz		
	Cable max.	500 feet (150 m), shielded, 4 twisted pairs as shown in the table 3.4.2.1		
Digital	Voltage	5 V		
	Current	10 mA		
	No. of pulses per revolution	min 600 max 9999		
	Type	standard and inverted signal		
	Max. frequency	150 kHz		
Int. voltage supply				
	Load capacity	+ 5 V	160 mA	Plug connector
	+ 10 V	10 mA	Terminal 7	
	- 10 V		10 mA	Terminal 8
	+ 24 V		120 mA	Terminal 19
	Tolerance	+ 10 V	± 3 % ¹⁾	
		- 10 V	± 3 % ¹⁾	
		+ 24 V	+ 20 ... 30 V, not stabilized	
		XE for digital encoder, PIN 7, 9		

¹⁾ The tolerance between positive and negative amplitudes is ± 0.5%

2.3.6. Accuracy

Output frequency:				
temperature dependent stability error		[°C]	≤ 50 ppm/°Ctypical	
resolution		[Hz]	0.001Hz at 50Hz 0.005Hz at 300Hz	
Internal reference value voltage:		[V]	±10V, terminals 7 and 8	
-temperature dependent stability error		[°C]	100 ppm/°Ctypical	
Reference values:				
resolution via keypad/Interface bus		16 bit or 15 bit + sign		
resolution via terminals (1/2,3/4,5/6)		11 bit + sign		
linearity via terminals (1/2,3/4,5/6)		± 0.1% of full scale		
S P E E D C O N T R O L	Speed limit / Absolute max speed		[rpm]	8000
	Digital reference resolution		[rpm]	0.25
	Field oriented (with sinusoidal Encoder):			
	speed feedback resolution		[rpm]	0.25 (for encoder pulses number ≥ 1900) >0.25(for encoder pulses number < 1900)
	accuracy		[%]	typical 0.01%
	control range		[rpm]	better than 1:10000
	max band width		[rad/s]	300 rad/s [47 Hz] ⁽¹⁾
	Field oriented (with digital Encoder):			
	speed feedback resolution		[rpm]	0.5
	accuracy		[%]	typical0.02%
	control range		[rpm]	better than 1:1000
	max band width		[rad/s]	300 rad/s [47 Hz] ⁽¹⁾
	Sensor less vector control:			
	speed feedback resolution		[rpm]	0.002x Nominal speed
	accuracy		[%]	0.3% @ Nominal speed 1.3% @2 % of Nominal speed
	control range		[rpm]	from 1:50 to 2.5x Nominal speed
	max band width		[rad/s]	100 rad/s [15,9 Hz] ⁽¹⁾
Constant V/f control:				
accuracy		[rpm]	0.3x nominal motor slip with automatic slip compensation	
control range		[%]	depending on motor nominal slip, typ. 1:50	
T O R Q U E C O N T R O L	Field oriented-Sensorless:			
	resolution		[rpm]	typical 1:1.000
	accuracy		[%]	typical 5% ⁽²⁾
	control range		[rpm]	1÷20
	min. response time (at load step)		[ms]	0.8
	max band width		2.4 krad/s [380 Hz]	

avy2030

(1) The response time and bandwidth are effected by the load and inertia. These represent limit values.

(2) This value does not include iron losses, mechanical losses and cogging torque (with Rr adaptation enabled).

Notes

Section 3: Installation Guidelines

3.1. Mechanical Specification

Figure 3.1.1: Drive dimensions (sizes 3F75 up to 3020)

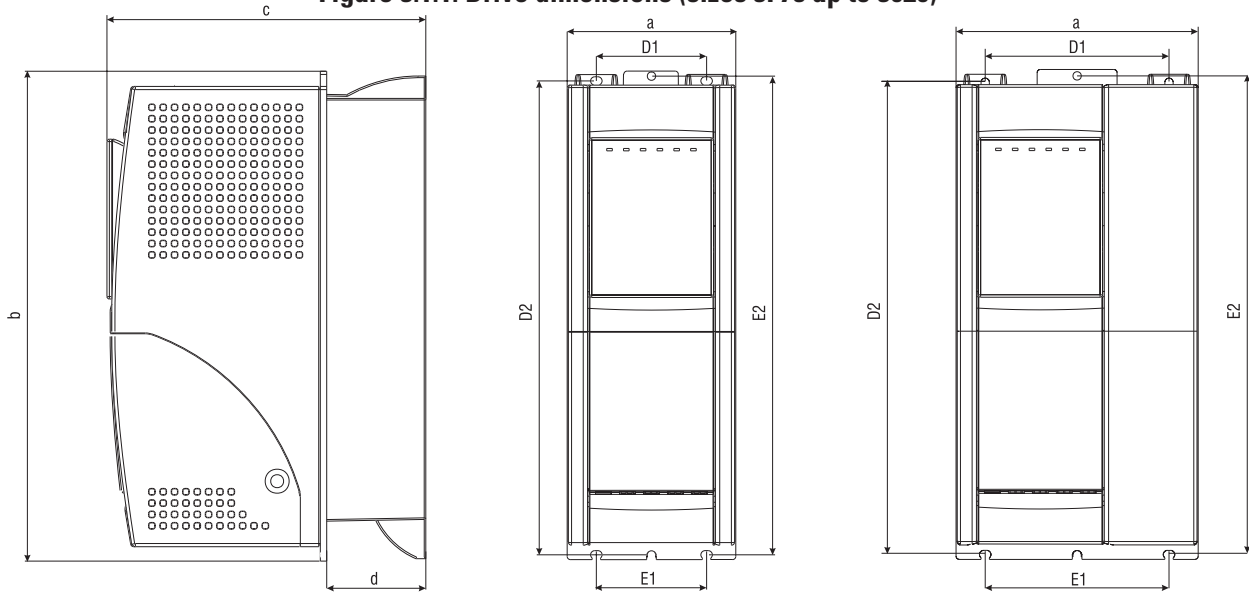


Figure 3.1.2: Mounting methods (sizes 3F75 up to 3020)

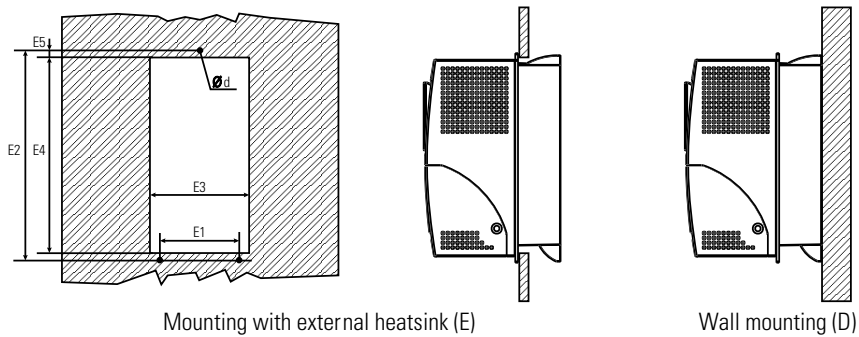


Table 3.1.1: Drive dimensions and Weights (sizes 3F75 up to 3020)

Hp		3/4	1	2	3	5	7.5	10	15	20	
Drive dimensions:											
a	inch (mm)	4.1 (105.5)				5.9 (151.5)			8.2 (208)		
b	inch (mm)	12.0 (306.5)								12.7 (323)	
c	inch (mm)	7.8 (199.5)								9.5 (240)	
d	inch (mm)	2.4 (62)								3.3 (84)	
D1	inch (mm)	2.7 (69)				4.5 (115)			6.6 (168)		
D2	inch (mm)	11.6 (296.5)								12.2 (310.5)	
E1	inch (mm)	2.7 (69)				4.5 (115)			6.5 (164)		
E2	inch (mm)	299.5 (11.7)								12.4 (315)	
E3	inch (mm)	3.9 (99.5)				5.7 (145.5)			7.8 (199)		
E4	inch (mm)	11.2 (284)								11.8 (299.5)	
E5	inch (mm)	0.35 (9)									
Ø d		M5									
Weight	lbs(kg)	7.7 (3.5)	7.9 (3.6)	8.1 (3.7)		10.9 (4.95)			19 (8.6)		

ai3100

Figure 3.1.3: Drive dimensions (sizes 3025 up to 3200)

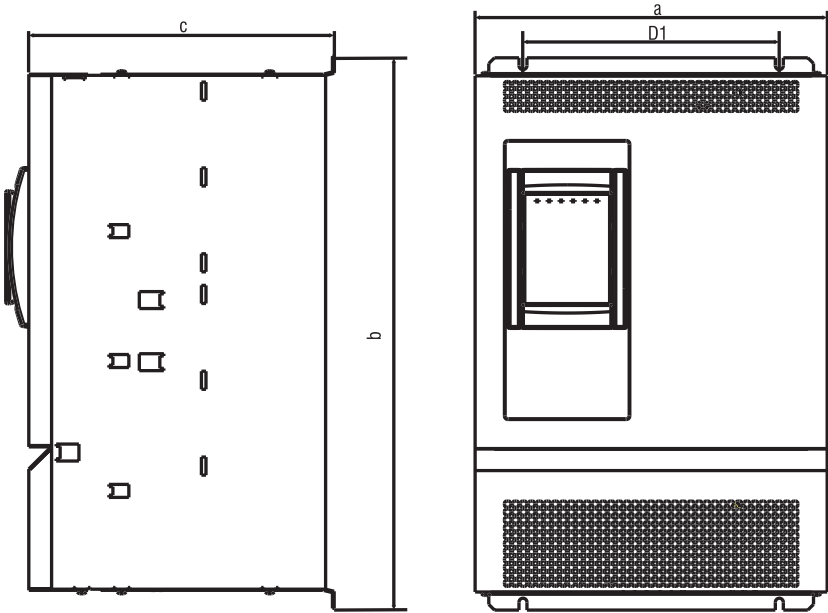


Figure 3.1.4: Mounting methods (sizes 3025 up to 3200)

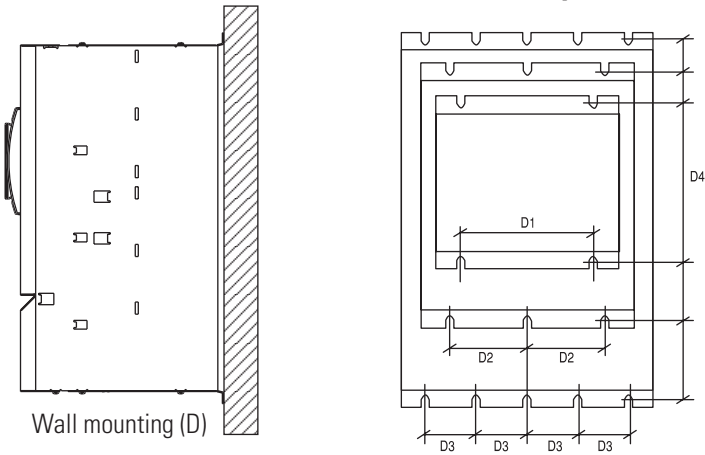
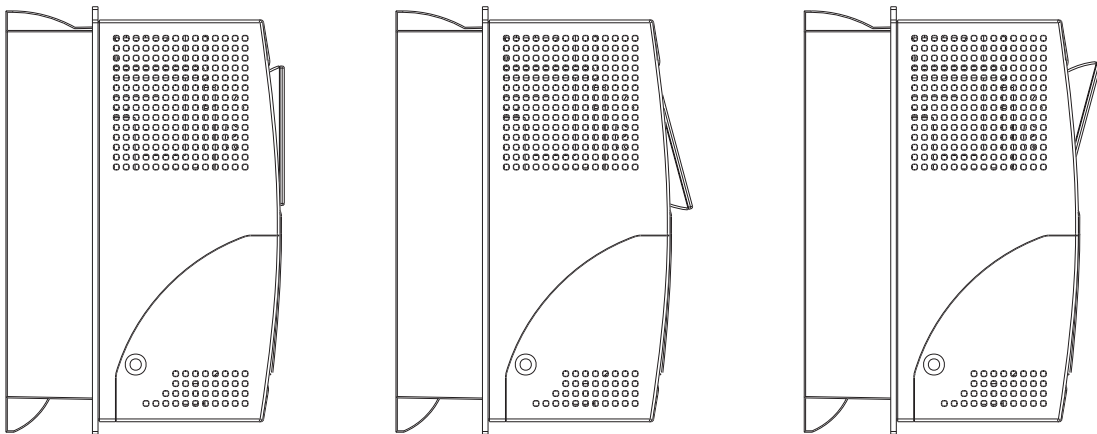


Table 3.1.2: Drive dimensions and Weights (sizes 3025 up to 3200)

Hp		25	30	40	50	60	75	100	125	150	200
Drive dimensions:											
a	inch (mm)	12.1 (309)			14.7 (376)		20 (509)				
b	inch (mm)	18.2 (489)			22.2 (564)		29.2 (741)	35.8 (909)			43.1 (1095)
c	inch (mm)	10.5 (268)	12.1 (308)				11.7 (297.5)				17.4 (442)
D1	inch (mm)	8.8 (225)									
D2	inch (mm)				5.9 (150)						
D3	inch (mm)						3.9 (100)				
D4	inch (mm)	18.7 (475)			21.6 (550)		28.5 (725)	35 (891)			42.4 (077)
Ø		M6									
Weight	lbs	39.6	48.5	48.9	74.9	74.9	130	166.1	176.7	190.6	231.4
	kg	18	22	22.2	34	34	59	75.4	80.2	86.5	105

ai3105

Figure 3.1.5: Keypad positioning

To allow a comfortable viewing angle, the keypad can be oriented in three different positions.

3.2. Watts Loss, Heat Dissipation, Internal Fans and Minimum Cabinet Openings

The heat dissipation of the drive depends on the operating state of the connected motor. The table below shows values that assume operation at default switching frequency (see table 2.3.2.1), Temp. $\leq 40^{\circ}\text{C}$, typical motor power factor and nominal continuous current.

Table 3.2.1: Heat dissipation and Required Air Flow

Type	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
	F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	
	7	0	0	0	0	0	1	1	2	2	3	4	5	6	7	0	2	5	0	
	5	1	2	3	5	7	0	5	0	5	0	0	0	0	0	5	0	5	0	
P _V Heat dissipation:																				
@U _{LN} =400Vac ¹⁾	[W]	48.2	77.5	104.0	138.3	179.5	233.6	327.4	373	512	658	864	1100	1250	1580	1950	2440	2850	3400	4400
@U _{LN} =460Vac ¹⁾	[W]	45.0	72.0	96.3	126.7	164.1	215.6	300.8	340	468	582	780	1000	1100	1390	1750	2200	2560	3050	3950
¹⁾ f _{SW} =default; I ₂ =I _{2N}																				
Airflow of fan:																				
Internal fan	[CFM]	7	7	7	7	7	7	18	18											
Heatsink fans	[CFM]	-	18	18	18	2x18	2x18	2x18	2x48	2x48	48	102	205	390	585			1095		

ai3110

Note!

All the drives from .75 KW through 60 KW have internal fans. The power (+24VAC) for these fans is provided from the internal power supply unit.

Note!

Heat dissipation losses refer to default switching frequency

Table 3.2.2: Minimum cabinet opening suggested for cooling

Type	3 F 7 5	3 0 0 1	3 0 0 2	3 0 0 3	3 0 0 5	3 0 0 7	3 0 1 0	3 0 1 5	3 0 2 0	3 0 2 5	3 0 3 0	3 0 4 0	3 0 5 0	3 0 6 0	3 0 7 5	3 1 0 0	3 1 2 5	3 1 5 0	3 2 0 0
Minimum cooling opening:																			
Control section cm ² (sq.inch)	31 (4.8)						36 (5.6)		2x150 (2x 23.5)	2x200 (2x31)	2x370 (2x57.35)	2x620 (2x96.1)				2 x 1600 (2 x 248)			
Heatsink cm ² (sq.inch)	36 (5.6)			72 (11.1)			128 (19.8)												

ai3120

3.2.1 Cooling fans power supply

Sizes 3F75 to 3060

Power supply (+ 24 VAC) for these fans are provided from the internal drive power supply unit.

Sizes 3075 to 3200

Power for these fans are internally provided from the AC Input voltage. Fusing is as follows:

- 6KAVI43075: 0.8A@115 V / 60Hz, 0.45A@230V / 50Hz
- 6KAVI43100 ... 6KAVI43150: 1.2A@115V / 60Hz, 0.65A@230V / 50Hz
- 6KAVI43200: 1.65A@115V / 60Hz, 0.70A@230V / 50Hz

Figure 3.2.1: UL type fan connections on 6KAVI43100, 6KAVI43125 and 6KAVI43150 sizes

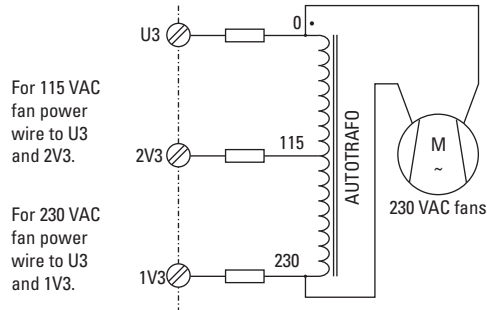


Figure 3.2.2: UL type fan connections for 6KAVI43075 and 6KAVI43200 sizes only

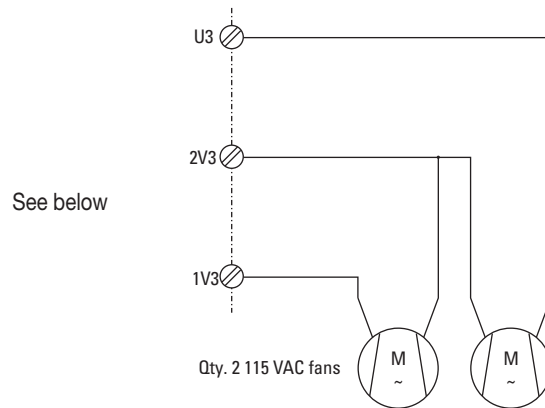
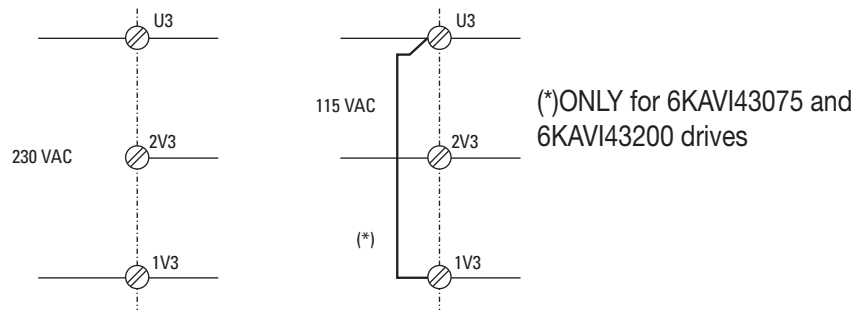


Figure 3.2.3: Example of external connection for 6KAVI43075 and 6KAVI43200 only.



An internal fuse (2.5A 250 VAC slo-blow) for 6KAVI143100, 6KAVI43125 and 6KAVI43150 sizes is provided.

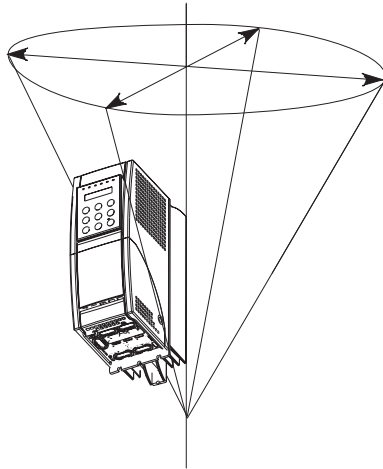
On 3075 and 3200 sizes the fuse must be mounted externally.

3.3. Installation Mounting Clearance

Note!

The dimensions and weights specified in this manual should be taken into consideration when the device is mounted. Improper handling and the use of unsuitable tools may cause damage.

Figure 3.3.1: Max. Angle of Inclination

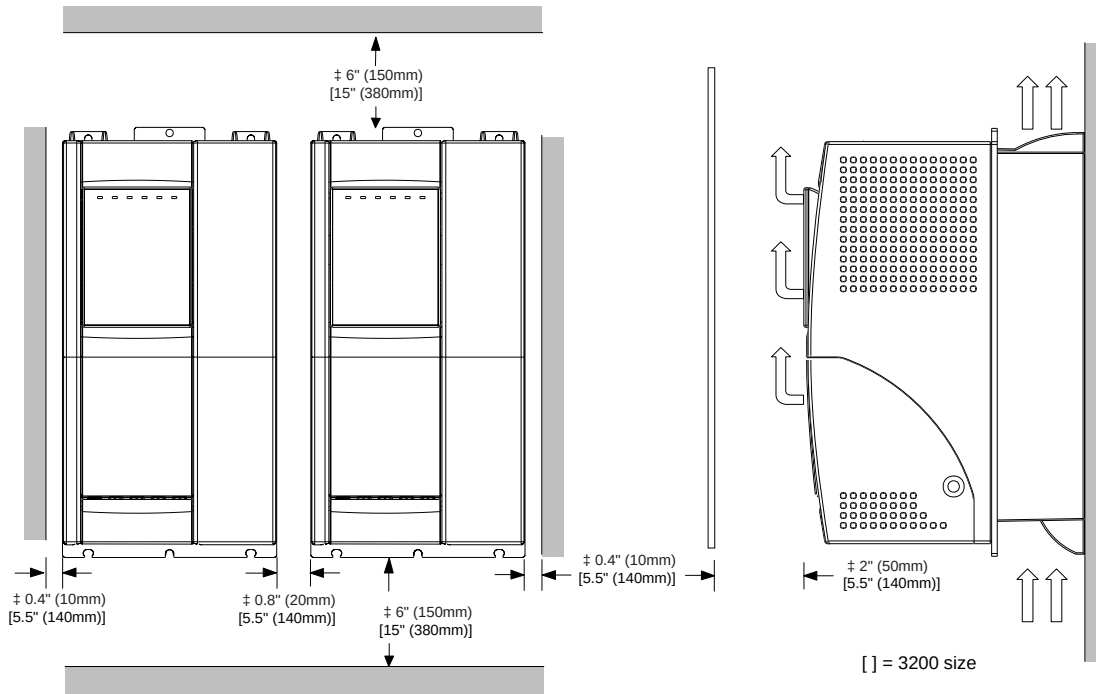


The maximum angle of inclination is 30°.

Note!

The drives must be mounted in such a way that the free flow of air is insured. Top and bottom clearance to the drive must be at least 150 mm (6 inches). A space of at least 50 mm (2 inches) must be maintained at the front. On size 3200, the top and bottom clearance must be at least 380 mm (15 inches), on front and sides a space of at least 140 mm (5.5 inches) must be maintained. Devices that generate a large amount of heat must not be mounted in the direct vicinity of the inverter.

Figure 3.3.2: Mounting Clearance



Note!

Mounting screws should be re-tightened after a few days of operation.

3.4. Motors and Encoders

The AV-300i Drives are designed for field oriented regulation of standard three-phase induction AC motors. A sinusoidal encoder or digital encoder may be used for speed feedback.

3.4.1. Motors

The electrical and mechanical data of standard three-phase motors refer to a particular operating range. The following points should be noted when these motors are connected to an AC Drive:

Is it possible to use standard induction motors?

With the AV-300i Drives it is possible to use standard induction motors. Characteristics of the motor have a great influence on the obtained performances.

Note!

See Section 2.3.4, "AC Output", about the voltages and motor power.

Which type of the induction motors have unfavorable results in operating on frequency inverters?

Motors with double squirrel-cage rotors or deep rotor bars should not be used.

Star or delta connection?

Motors can be connected in either wye or delta connections. Experience has shown that wye connected motors have better control properties, so wye connections are preferred.

Cooling

The cooling of three-phase motors is normally accomplished by means of a fan that is mounted on the motor shaft. Remember that the output of the fan is reduced when the motor is running at lower speeds, which in certain circumstances may mean that the cooling is insufficient for the motor. Check with the motor manufacturer whether an external blower is required and whether the motor can operate in the speed range required.

Operation above the rated speed?

Due to the mechanical factors (bearings, rotor unbalance) and increased iron losses, the motor may not be capable of the operation above rated speed.

What motor data is required for inverter operation?

Nameplate specifications

- Motor rated voltage
- Motor rated current
- Motor rated frequency
- Motor rated speed
- Power factor

The other data required for vector control is calculated by the inverter. In order to optimize the drive operation it is also useful to know the following :

- Magnetizing current
- Rotor resistance
- Stator resistance (Sensorless mode only)
- Leakage inductance (Field oriented mode with Rotor resistance adaptation enabled or Sensorless mode.).

Motor protection

Thermistors

PTC thermistors PER DIN 44081 or 44082 mounted in the motor can be connected directly to the inverter via terminals 78 and 79. The resistor (1Kohm) mounted between the terminals 78 and 79 must be removed.

Temperature dependent contacts in the motor winding

Temperature dependent contacts, “Klixon” type devices, can fault the drive via external logic or can be connected as an external fault through inverter terminal 15. They can also be connected to terminals 78 and 79 to have a specific error signal. In this case connect the existing 1 Kohm resistor in series with the Klixon contact, note that one side of it must be connected directly to terminal 79.

Note!

The motor PTC interface circuit (or klixon) has to be treated as a signal circuit. The connecting cable to the motor PTC must be made of twisted pairs with a shield. The cable route should not be parallel to the motor cables and remain at least 20 cm away.

Current limitation of the inverter

The current limit can protect the motor from overloads. For this protection the current limit and the motor overload control function in the drive (“Ovld mot ctrl”) must be set so that the current is kept within the permissible range of the motor.

Note!

Remember that current limit can control overheating of the motor due to overload, not due to insufficient ventilation. When the drive is operated at low speeds the use of PTC resistors or temperature-dependent contacts in the motor windings is recommended.

Output chokes

When using general purpose standard motors, output chokes are recommended to protect winding insulation. See section 4.7.2, “Output chokes”.

3.4.2. Encoders

One of four types of encoder may be connected to the XE connector (15-pin socket), see the table 3.4.2.2 for the jumper settings

- **DE:** 5V digital incremental encoder with $A / \bar{A}$, $B / \bar{B}$, $C / \bar{C}$
- **SE:** 5V sinusoidal incremental encoder with $A / \bar{A}$, $B / \bar{B}$, $C / \bar{C}$
- **DEHS:** 5V digital incremental encoder with $A / \bar{A}$, $B / \bar{B}$, $C / \bar{C}$ and three Hall sensor digital position signals (for AC Brushless motors)
- **SESC:** 5V sinusoidal incremental encoder with $A / \bar{A}$, $B / \bar{B}$, $C / \bar{C}$ and two sin/cos traces for absolute position (for AC Brushless motors or positioning)

Encoders are used to feed back a speed signal to the regulator. They should be coupled to the motor shaft with a backlash free connection.

The best regulation results are obtained when using sinusoidal encoders, however digital (rotary) encoders usually provide satisfactory results. See section 2.3.6, “Accuracy”.

The encoder cable should be made of twisted pairs with one shield. The shield should be connected to ground at the drive. In special cases where the cable length is more than 328 feet, 100 meters, it may helpful to use a cable with a shield on each conductor pair, which can be connected to the common point (0V). Some types of sinusoidal encoders may require installation with complete isolation from the motor frame and shaft.

Table 3.4.2.1: Recommended cable section and length for the connection of encoders

Cable Section [mm ²]	0.22	0.5	0.75	1	1.5
Max Length feet [m]	88 [27]	203 [62]	305 [93]	410 [25]	492 [150]

newai3130

Table 3.4.2.2: Encoders setting via S11...S23 Jumpers

Encoder / Jumpers setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	-	-	-	-	-	-
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-	B	B
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	B	B	B	B	B	B

ai3150

The jumper S17 selects the enabling of the channel C pulses reading. This jumper has to be correctly selected for the encoder loss alarm to function correctly.

*S17 ON : channel C (index) reading=ON

*S17 OFF: channel C (index) reading=OFF

Table 3.4.2.3: Encoders connections

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1 B-	2	3 C+	4 C-	5 A+	6 A-	7 0V	8 B+	9 +5V	10 E+	11 E-	12 F+	13 F-	14 G+	15 G-
DE	8 pole	•		•	•	•	•	•	•	•						
SE	8 pole	•		•	•	•	•	•	•	•						
SESC	12 pole	•		•	•	•	•	•	•	•	•	•	•			
DEHS	14 pole	•		•	•	•	•	•	•	•	•	•	•	•	•	•

ai3160

Requirements:

Sinusoidal encoders (XE connector on the Regulation card)

max. frequency	80 KHz (select the appropriate number of pulses depending on max. speed)
Number of pulses per revolution	min 600, max 9999
Channels	two-channel, differential
Power supply	+ 5 V (Internal supply) *
Load capacity	> 8.3 mA pp per channel

Digital encoders (XE connector on Regulation card)

max. frequency	150 KHz (select the appropriate number of pulses depending on required max. speed)
Number of pulses per revolution	min 600, max 9999
Channels	- two-channel, differential (A / $\bar{A}$, B / $\bar{B}$, C / $\bar{C}$). An encoder loss detection is possible via firmware setting. - two channel, (A,B). Encoder loss detection is not possible.
Power supply	+ 5 V (Internal supply) *
Load capacity	> 4.5 mA / 6.8 ... 10.9 mA per channel

- * Via the keypad ("CONFIGURATION/Motor spd fbk/ Enc 1 supply vlt" menu) it is possible to select 4 different values of internal encoder supply voltage to compensate for the voltage reduction due to encoder cable length. Selections available are: 0=5.41V, 1=5.68V, 2=5.91V, 3=6.18V via **Enc 1 supply vlt** parameter.

Encoder power supply test (if the internal supply +5V is used)

During the start up of the drive:

- verify the encoder power supply is connected to the encoder terminals.
- via **Enc 1 supply vlt** parameter set the appropriate voltage for the encoder supply.

Connector for external encoder connection:

Male terminal type: 15 pin high density (VGA type)

Connector cover: Standard 9 pin low profile

Table 3.4.2.4: Assignment of the XE connector for a sinusoidal or a digital encoder

Designation	Function	I/O	max. voltage	max. current
PIN 1	Channel B- For B- digital or B- COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 2	-			
PIN 3	Channel C+ For C+ digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 4	Channel C- For C- digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 5	Channel A+ For A+ digital or A+ SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 6	Channel A- For A- digital or A- SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 7	Reference point for +5V encoder supply voltage	0	—	—
PIN 8	Channel B+ For B+ digital or B+ COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 9	+5V encoder supply voltage	0	+5 V	200 mA
PIN 10	Channel E+ For E+ digital commutation or SIN+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 11	Channel E- For E- digital commutation or SIN- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 12	Channel F+ For F+ digital commutation or COS+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 13	Channel F- For F- digital commutation or COS- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 14	Channel G+ For G+ digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital
PIN 15	Channel G- For G- digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital

ai3140

Section 4: Wiring Procedure

4.1. Accessing the Wire Termination Points

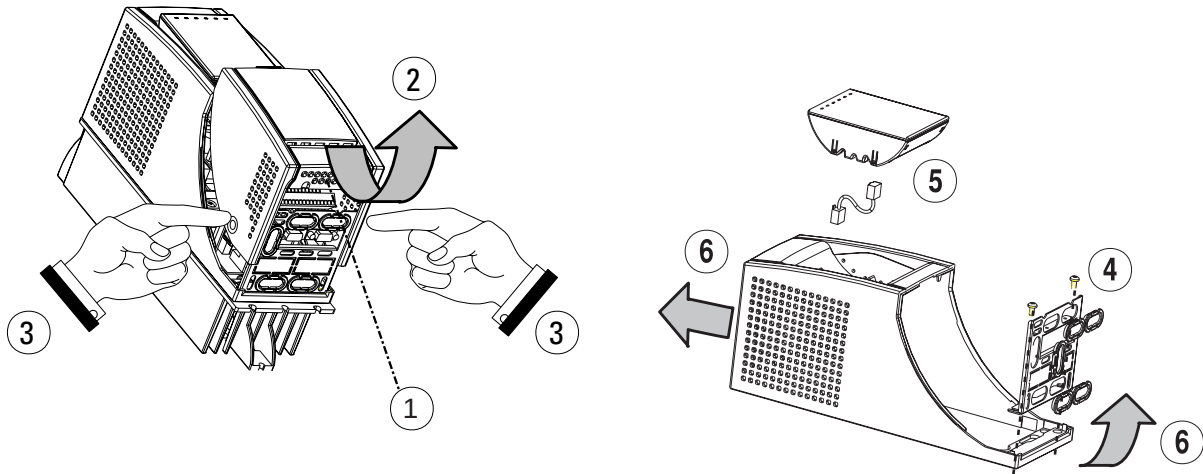
4.1.1 Removing the covers

Note!

Observe the safety instructions and warnings given in this manual. The drives can be opened without the use of force.

See figure 2.2.2 “Drive view & components” to identify single parts.

Figure 4.1.1: Removing the covers (sizes 3F75 to 3020)



Sizes 3F75 to 3010

The cover and cable entry plate of the drive must be removed in order to install the electrical connections:

- remove the screw (1), remove the drive cover (2), press on both sides as shown (3).
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover from the bottom (over the wire terminals) and then push it to the top (6).

Sizes 3015 to 3020

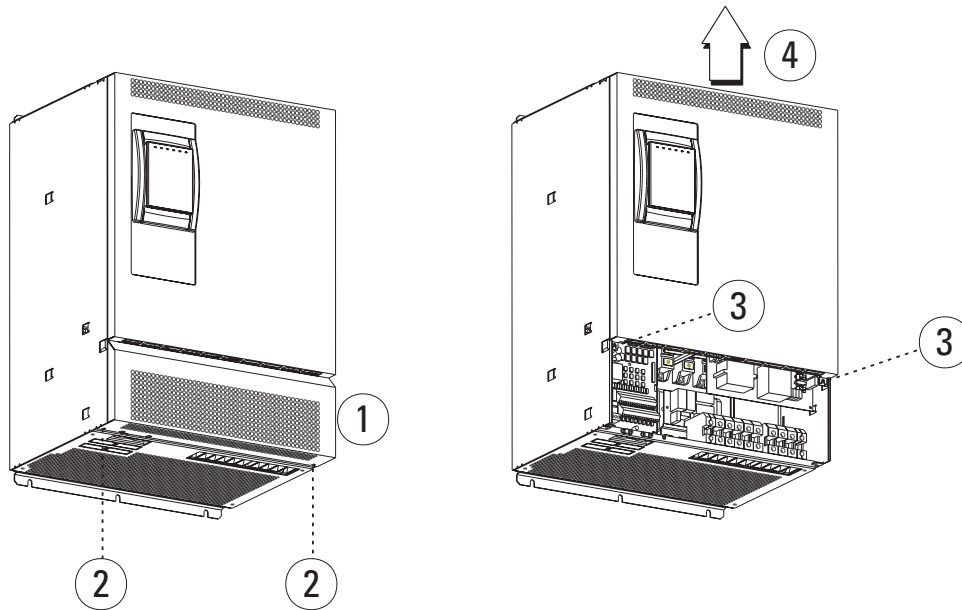
The cover and cable entry plate of the drive must be removed in order to install the electrical connections:

- remove the two screws (1) and remove the drive cover
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover from the bottom (over the wire terminals) and then push it to the top (6).

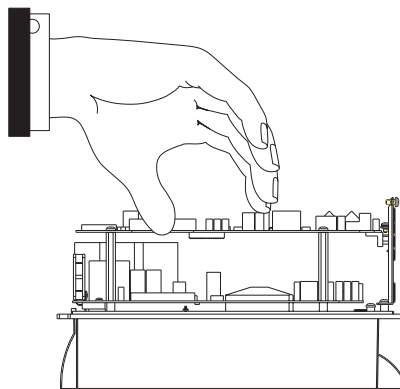
Figure 4.1.2: Removing the covers (sizes 3025 to 3200)



Sizes 3025to 3200

The cover of the drive must be removed in order to install the electrical connections: unscrew the two screw (2) and remove the cover (1)

The top cover must be removed in order to mount the option card and change the internal jumper settings: remove the two screw (3) and remove the top cover by moving it as indicated in figure (4)



Attention:

In order to avoid damage to the drive do not lift or carry it by using the PC cards as lifting devices.

4.2. Power section

4.2.1. PV33-.. Power Card

Figure 4.2.1.1: PV33-1-. power card (sizes 3F75 to 3003)

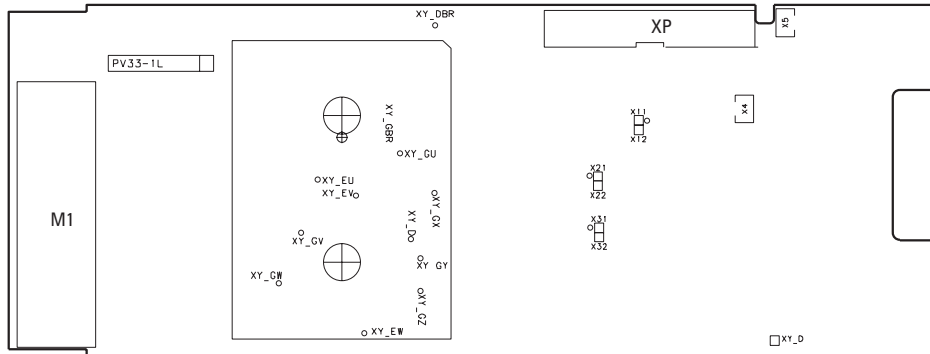


Figure 4.2.1.2: PV33-2-.. power card (sizes 3005 to 3010)

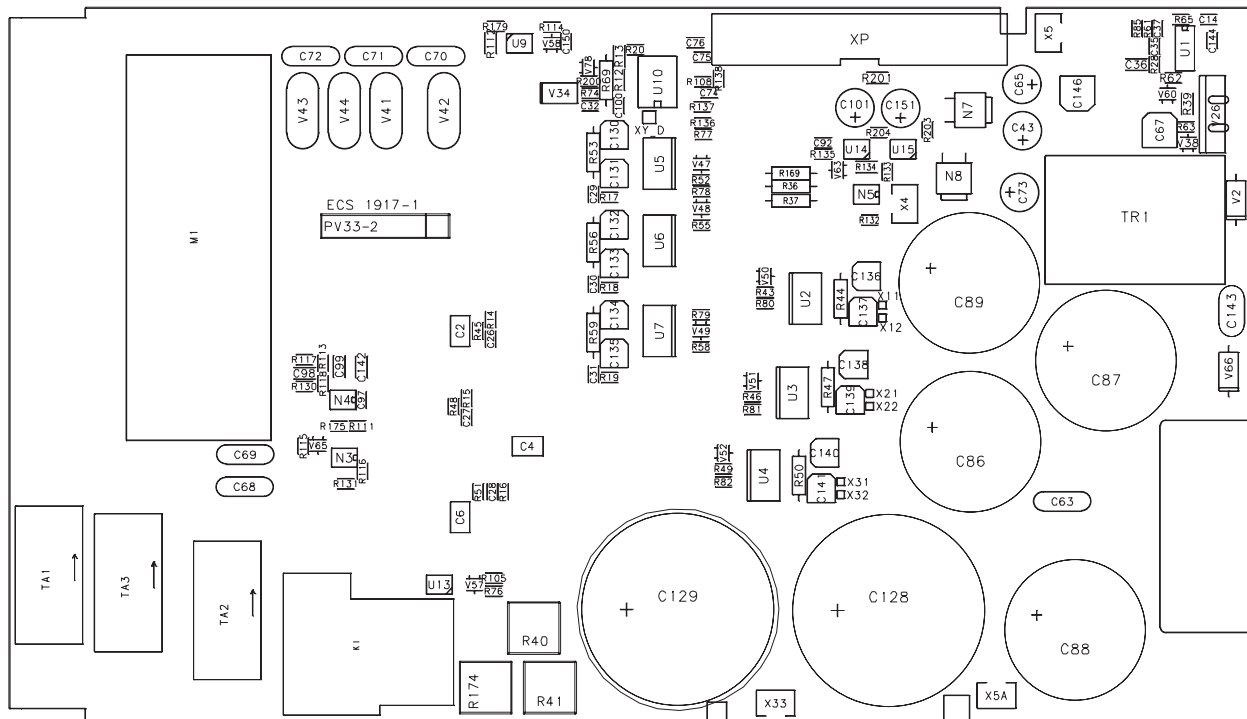


Figure 4.2.1.3: PV33-3-.. power card (sizes 3015 and 3020)

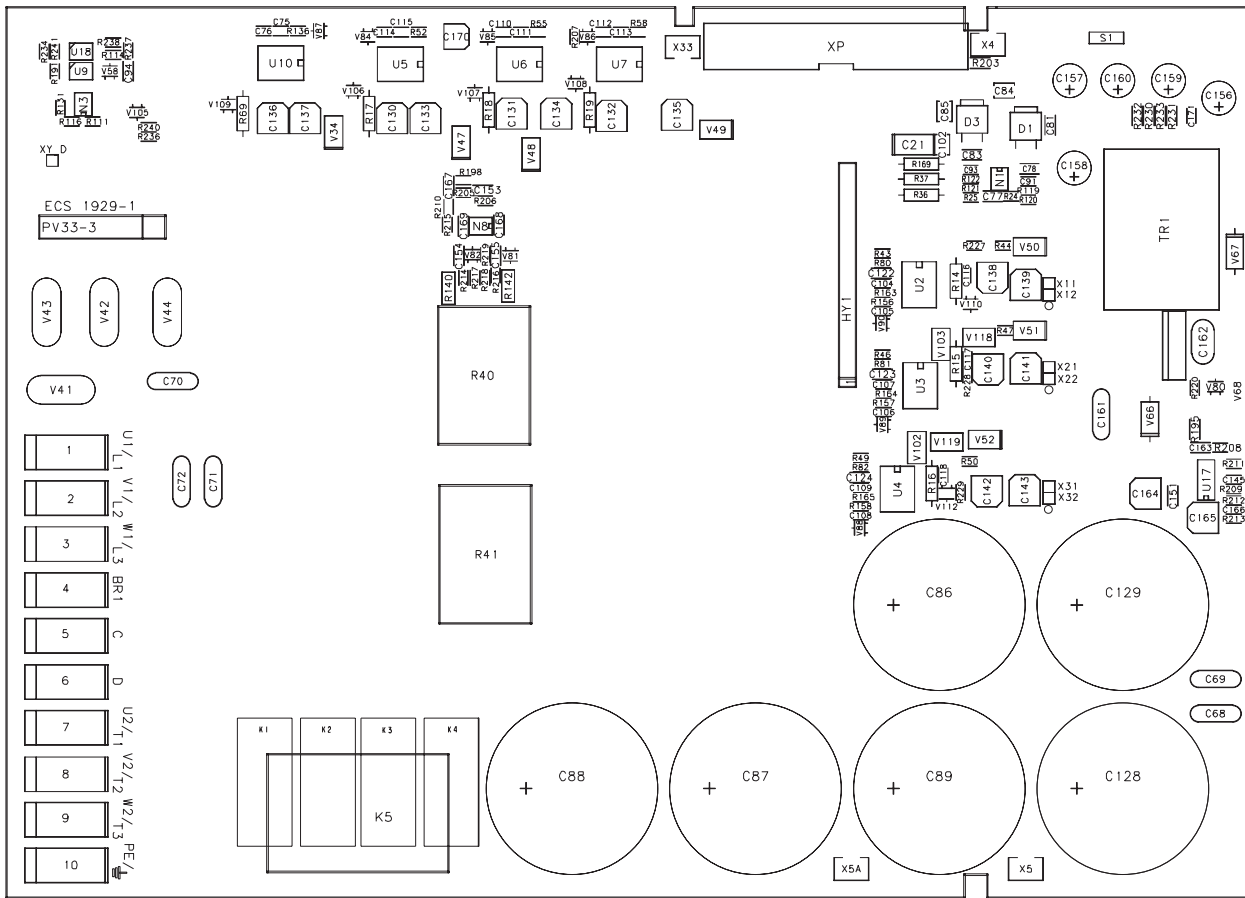


Figure 4.2.1.4: PV33-4-.. power card (sizes 3025 to 3060)

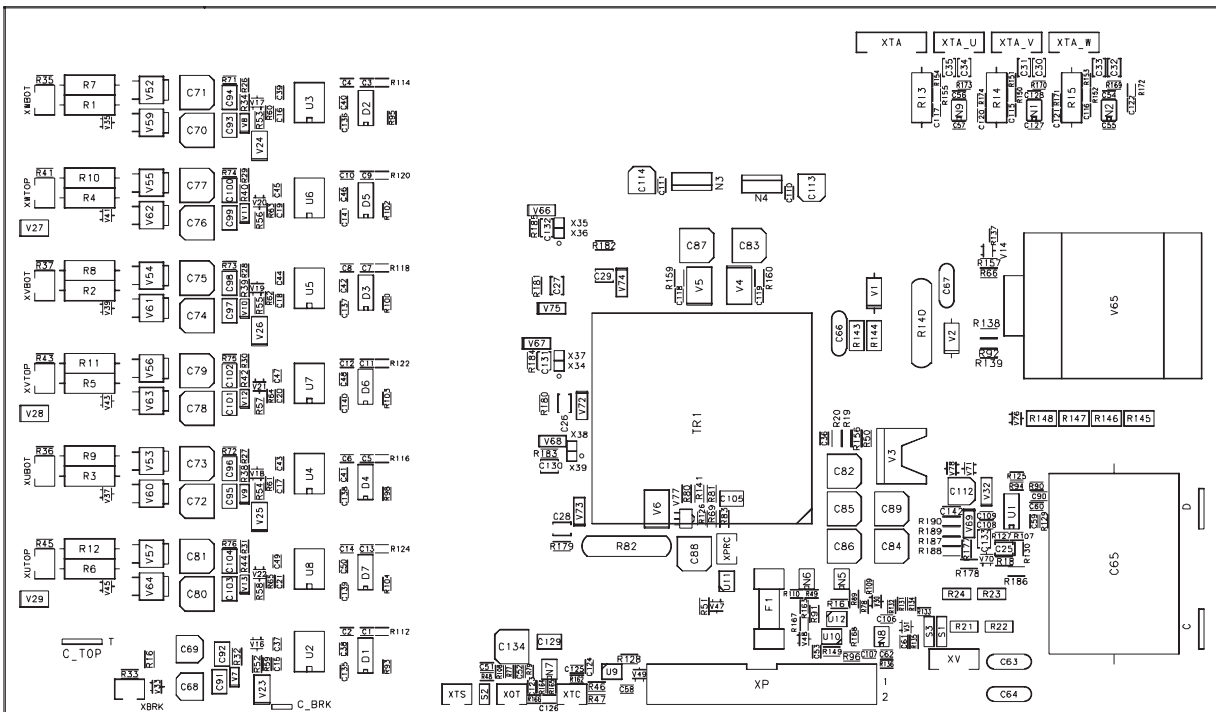
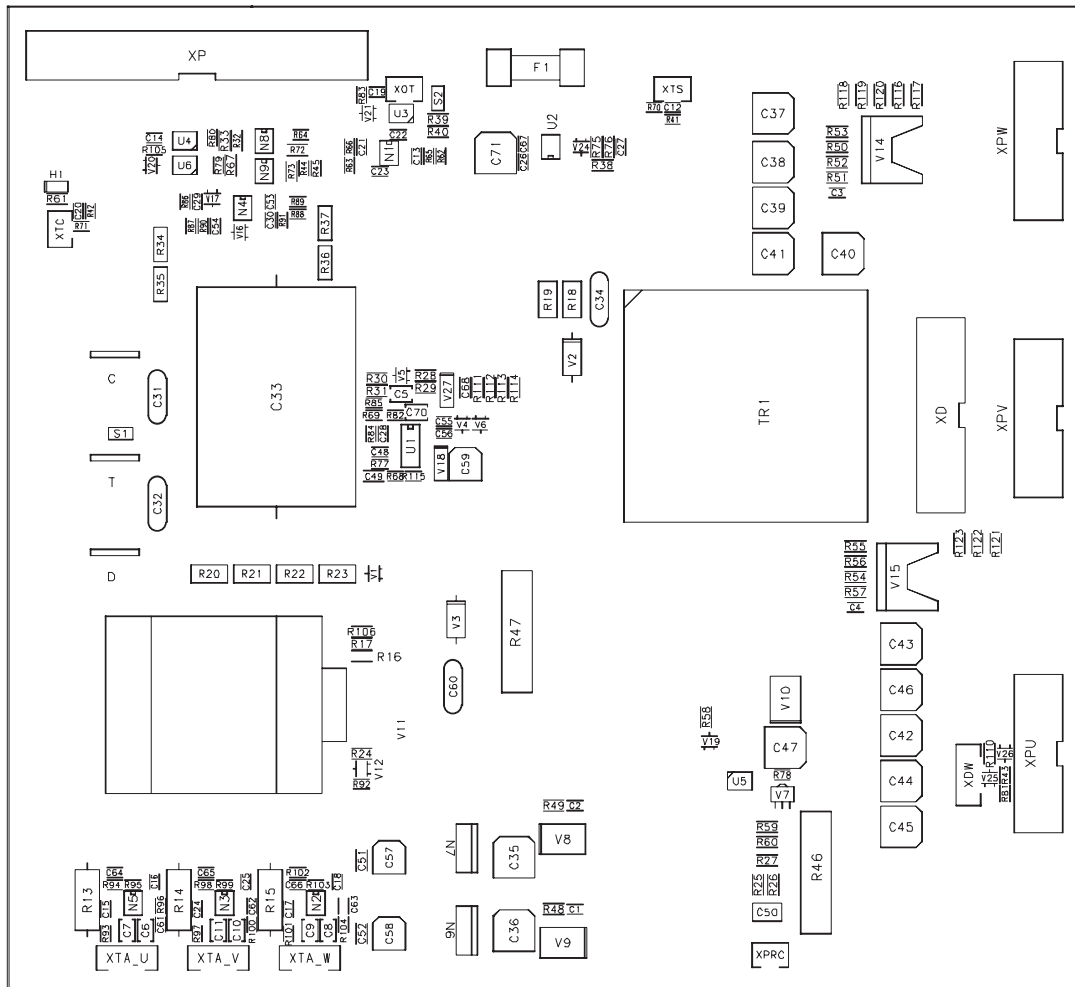
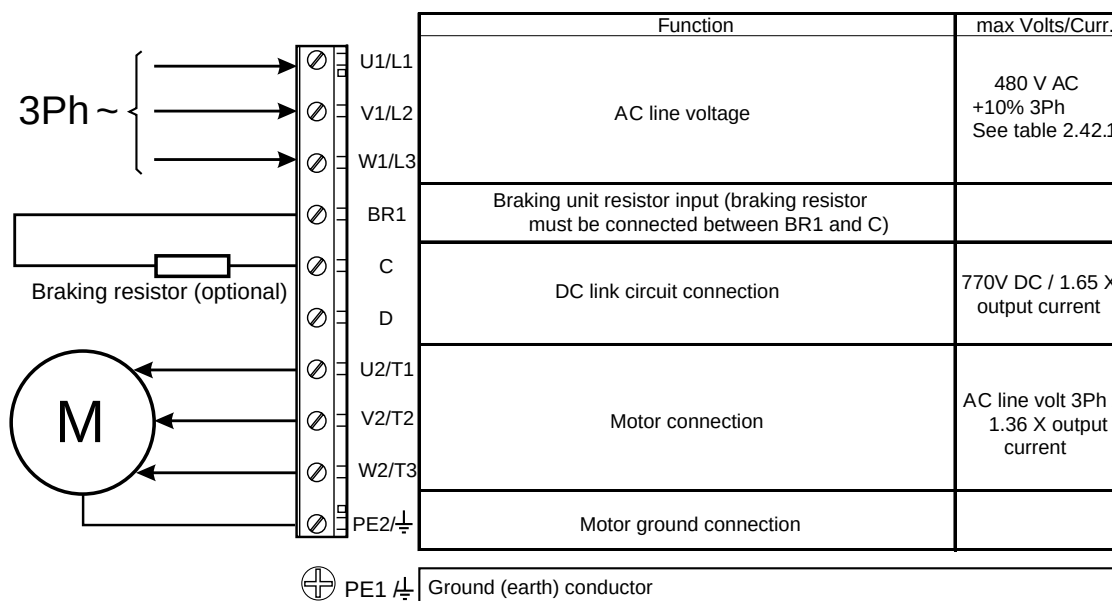


Figure 4.2.1.5: PV33-5-.. power card (sizes 3075 to 3200)



4.2.2. Terminal Assignment in the Power section / Cable Cross-Section

Table 4.2.2.1: Power Section Terminals**Power terminal layout**

Sizes 3F75 to 3020

The terminals of the drive are accessible by removing the cover and the cable entry plate (see section 4.1, "Accessing the connectors"). In some drive sizes it may be possible to remove the entire connector. All the power terminals are located on the power card PV33 shown in the previous chapter.

Sizes 3025 to 3200:

The terminals of the drive are accessible by removing the cover (see section 4.1, "Accessing to the connectors"). All the power terminals are located on the power card PV33 shown in the previous chapter.

Maximum Cable Sizes for power terminals U1, V1, W1, U2, V2, W2, C, D, PE**Table 4.2.2.2: Maximum cable cross section for power terminals**

Type		3F75	3001	3002	3003	3005	3007	3010	3015	3020	3025	3030
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	14				12	10		8	6		4
	[mm2]	2				4			8	10	16	25
Tightening torque		[in-lbs] 4.4 to 5.3							10.6 x 13.2		17.7	26.5
PE1, PE2 terminals	AWG	14				12	10		8	6		6
	[mm2]	2				4			8	10	16	16
Tightening torque		[in-lbs] 4.4 to 5.3							10.6 x 13.2		17.7	26.5
Type		3040	3050	3060	3075	3100	3125	3150	3200	* = kcmils		
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	2		1/0	2/0	4/0	300*	350*	4xAWG2			
	[mm2]	35		50	70	95	150	185	4x35			
Tightening torque		[in-lbs] 35			106		88 to 265					
PE1, PE2 terminals	AWG	6		2								
	[mm2]	16		50								
Tightening torque		[in-lbs] 26		35						a)40		

* = kcmils

ai4040

Caution!

The current conductor of the motor cable can conduct up to twice the value of the rated current if there is a ground fault at the output of the AV-300i Drive.

Note:

Use 75°C copper conductor only.

4.3 Regulation Section

4.3.1 RV33-1 Regulation Card

Figure 4.3.1.1: RV33 Regulation Card Switch & Jumpers

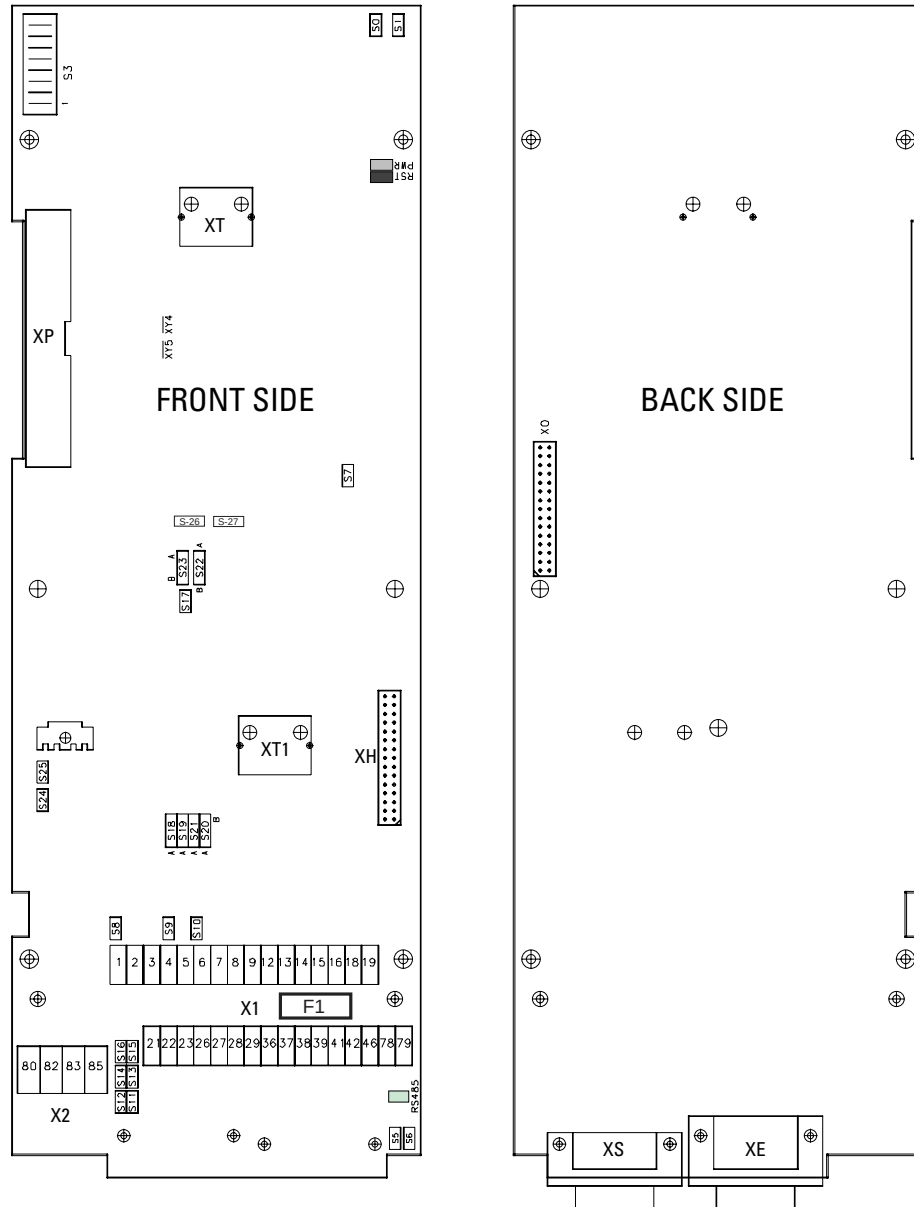


Table 4.3.1.1: LEDs on Regulation card

Designation	Color	Function
RST	red	LED lit during a Hardware Reset
PWR	green	LED lit when the voltage +5V is present and at correct level
RS485	green	LED is lit when the RS485 interface is supplied

ai4050g

Table 4.3.1.2: Test points on Regulation Card RV33

Designation	Function
XY4	Phase current signal (U) (see table 5.3.1.2.2)
XY5	Reference point (common)

ai4070g

Table 4.3.1.3: Jumpers on Regulation Card RV33

Designation	Function	Factory setting
S0	The setting must not be changed	OFF
S1	The setting must not be changed	OFF
S5 - S6	Terminating resistor for the serial interface RS485 ON= Termination resistor IN OFF= No termination resistor	ON*
S8	Calibration of the analog input 1 signal (terminals 1 and 2) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S9	Calibration of the analog input 2 signal (terminals 3 and 4) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S10	Calibration of the analog input 3 signal (terminals 5 and 6) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S11 - S12 - S13 S14 - S15 - S16	Encoder settings** ON=Sinusoidal SE or SESC encoder OFF=Digital DE or DEHS encoder	OFF
S17	Monitoring of the C-channel of the digital encoder ON=C-Channel monitored OFF=C-Channel not monitored (required for single-ended channels)	OFF
S18 - S19 S20 - S21	Encoder setting Pos. A=digital DEHS encoder Pos. B= sinusoidal SESC encoder	B
S22 - S23	Analog input 3 enabled (option with SESC encoder) Pos. A=If SESC encoder is used Pos. B=Analog input 3 enabled	B
S24	Jumper to disconnect 0V (of 24V) from ground ON=0V connected to ground OFF=0V disconnected from ground	ON
S25	Jumper to disconnect 0V (regulation section) from ground ON=0V connected to ground OFF=0V disconnected from ground	ON
S26-S27	Internal use	ON

*On multiramp systems this jumper is ON only for the last drop on the line.

ai4060

**These jumpers are supplied with the drive in a separate kit (EAM_1618)

Table: 4.3.1.4: RV33 Regulation Card Switch S3 Settings

Type	3F75	3001	3002	3003	3005	3007	3010	3015	3020	
S1	ON	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	
S2	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	
S3	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	
S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S5	ON	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	
S6	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S7	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
Type	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
S1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
S2	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON
S3	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON
S4	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
S5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S6	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S7	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

ai4080

The drives are factory set per the above table. When installing a regulation card, set dip-switch S3 per the above table.

4.3.2. Terminal Assignments for the Regulation Section

Table 4.3.2.1: Plug-in Terminal Strip Assignments

Strip X1	Function	max
1	Analog input 1	$\pm 10V$ @ 0.25mA (20 mA when current ref input)
2	Reference point: terminal 2. Default setting: Ramp ref 1	
3	Analog input 2	
4	Reference point: terminal 4. Default setting: none	
5	Analog input 3	
6	Reference point: terminal 6. Default setting: none. (1)	
7	+10V	+10V/10 mA
8	-10V	-10V/10 mA
9	0V	-
12	Enable drive	+30V
13	Start	3.2 mA@15V
14	Fast stop	5 mA@24V
15	External fault	6.4 mA@30V
16	COMD I/O	-
18	0V24	-
19	+24V OUT	+22...28V 120 mA@24V
21	Analog output 1	$\pm 10V/5$ mA
22	0V	-
23	Analog output 2	$\pm 10V/5$ mA
26	BU comm. output	+28V/15 mA
27	0V24	-
28	RESERVED	-
29	RESERVED	-
36	Digital input1	+30V 3.2 mA@15V 5 mA@24V 6.4 mA@30V
37	Digital input2	
38	Digital input3	
39	Digital input4	
41	Digital output 1	+30V/40 mA Programmable digital output; default setting: none
42	Digital output 2	
46	Supply D0	+30V/80 mA
78	Motor PTC	1.5mA
79		
Strip X2	Function	max curr.
80	OK relay contact	250VAC 1A, AC11
82	Relay 2 contact	
83	Relay 2 contact	250VAC 1A, AC11
85	Relay 2 contact	

Maximum Cable Sizes for control terminals

Table 4.3.2.2: Maximum permissible cable cross-section on the plug-in terminals of the regulator section

Terminals	Maximum Permissible Cable Cross-Section			Tightening torque [in-lbs]
	[mm ²]		AWG	
	flexible	multi-core		
1 ... 79	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	3.5
80 ... 85	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	3.5

Ai4090

The use of a 75 x 2.5 x 0.4 mm (3 x 0.1 x 0.02 inch) flat screwdriver is recommended. Remove 6.5 mm (0.26 inch) of the insulation at the cable ends. Only one unprepared wire (without ferrule) should be connected to each terminal point.

Maximum Cable Length

Table 4.3.2.3: Maximum Control Cable Lengths

Cable section [mm ²]	0.22	0.5	0.75	1	1.5
Max Length feet [m]	88 [27]	203 [62]	305 [93]	410 [125]	492 [150]

ai3130

Potentials of the control section

The voltages of the regulator section (24V and $\pm 10V$) are isolated and can be disconnected from ground via jumpers. The connections between each potential are shown in Figure 4.3.1.2.

The digital inputs are designed as differential inputs.

The digital inputs are optocoupled to the control circuit. The digital inputs (terminals 12 to 15 and 36 to 39) have terminal 16 as a common reference point.

The analog outputs are not differential amplifiers and have a common reference point (terminal 22).

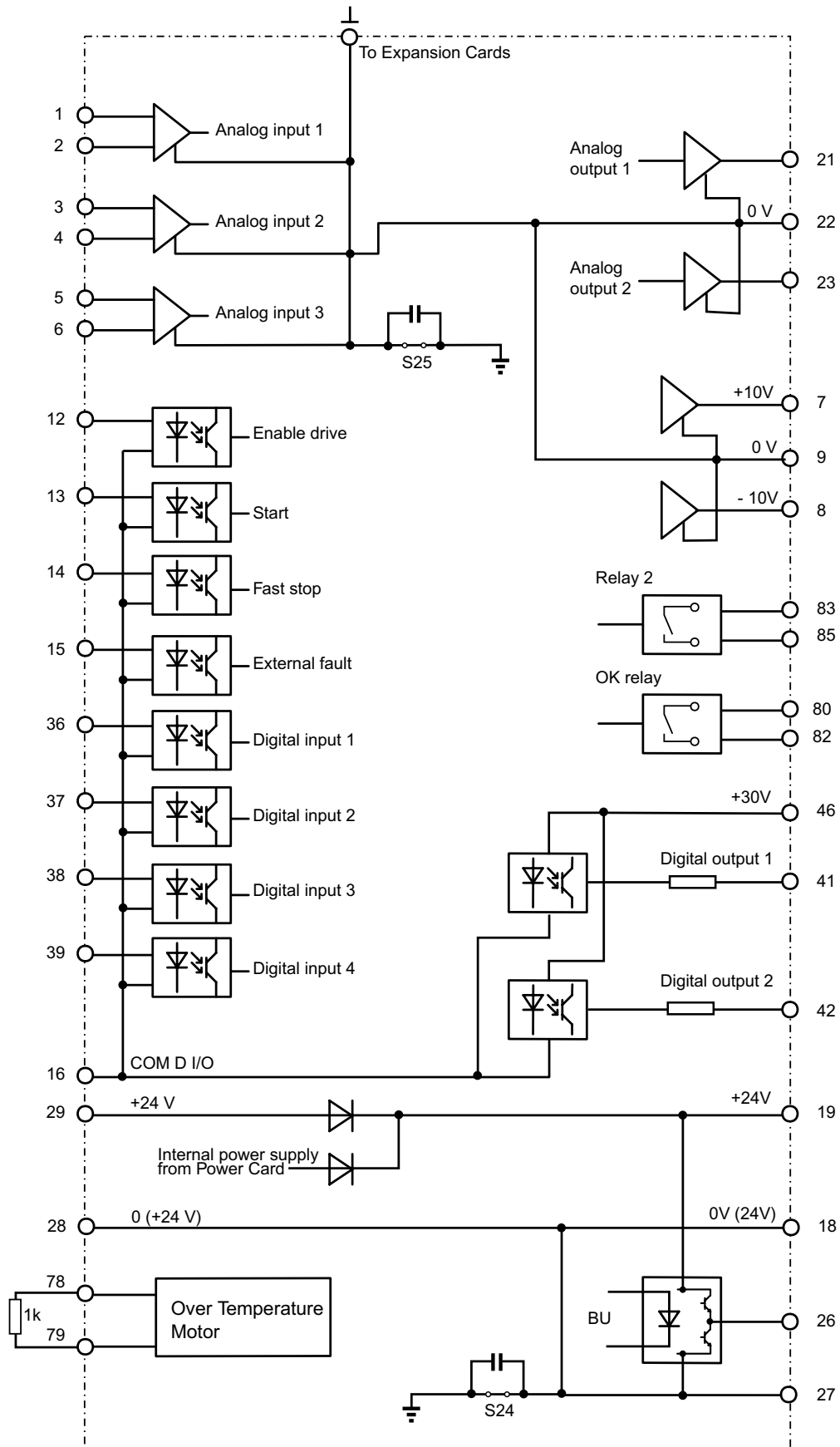
The analog output have a maximum voltage of ± 10 VDC with respect to common (terminal 22 or 9).

The digital outputs are optocoupled to the control circuit. The terminals 41 to 42 have terminal 16 as a common reference point and terminal 46 as the common supply.

In order to reduce the interferences on the input/output signals, leave in place the ground jumper connections S24 and S25.

The brake unit command has reference point (terminal 27) and is connected to the reference point +24V (terminal 18).

Figure 4.3.1.2: Potentials of the control section



4.4. Serial Interface

4.4.1. Serial Interface Description

The RS 485 serial interface enables data transfer via a loop made of two symmetrical, twisted conductors with a common shield. The maximum transmission distance is 1200 m (3936 feet) with a transfer rate of 9.6 KBaud. The transmission is carried out via a differential signal. RS 485 interfaces are bus-compatible in half-duplex mode, i.e. sending and receiving take place in sequence. Up to 31 AV-300i devices (up to 128 address selectable) can be networked together via the RS 485 interface. Address setting is carried out via the **Device address** parameter. Further information concerning the parameters to be transferred, their type and value range is given in the table contained in section 10, "Parameter lists".

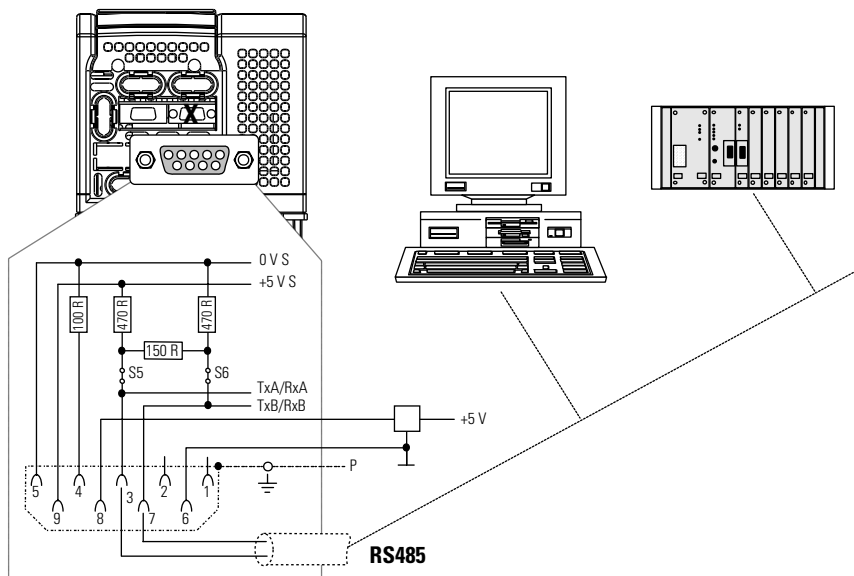


Figure 4.4.1.1: RS485 Serial Interface

The RS 485 on the AV-300i series drives is located on the Regulation card in the form of a 9-pin SUB-D socket connector (XS). The communication may be with or without isolation. If total isolation is needed an external power supply is necessary (+5V). Communication without isolation is suggested when there will be a temporary connection with only one drive. The differential signals are transferred via PIN 3 (TxA/RxA) and PIN 7 (TxB/RxB). Bus terminating resistors must be connected at the beginning and end of an RS 485 bus in order to prevent signal reflexion. The bus terminating resistors on AV-300i drives are connected via jumpers S5 and S6. This enables a direct point-to-point connection with a PLC or PC.

Note!

Insure that only the first and last drop of an RS 485 bus have the bus terminating resistor (S5 and S6 mounted). In all other drives (within the network) jumpers S5 and S6 must not be mounted.

A point to point connection can be done using a "CTI" option interface , this device does not require additional jumper settings.

Multidrop connections (two or more drives) having an external power supply (pin 5 / 0V and pin 9 / +5V). Pins 6 and 8 are reserved for use with the "PCI-485" interface card.

When connecting the serial interface insure that:

- only shielded cables are used
- power cables and control cables for contactors/relays are routed separately

Note!

See the manual "SLINK3 Communication protocol" for more detail.

4.4.2. RS 485 Serial Interface Connector Description

Table 4.4.2.1: Assignment of the plug XS connector for the RS 485 serial interface

Designation	Function	I/O	Elec. Interface
PIN 1	Internal use	–	–
PIN 2	Internal use	–	–
PIN 3	RxA/TxA	I/O	RS485
PIN 4	Internal use	–	–
PIN 5	0V (Ground for 5 V)	–	Power supply
PIN 6	Internal use	–	–
PIN 7	RxB/TxB	I/O	RS 485
PIN 8	Internal use	–	–
PIN 9	+5 V	–	Power supply

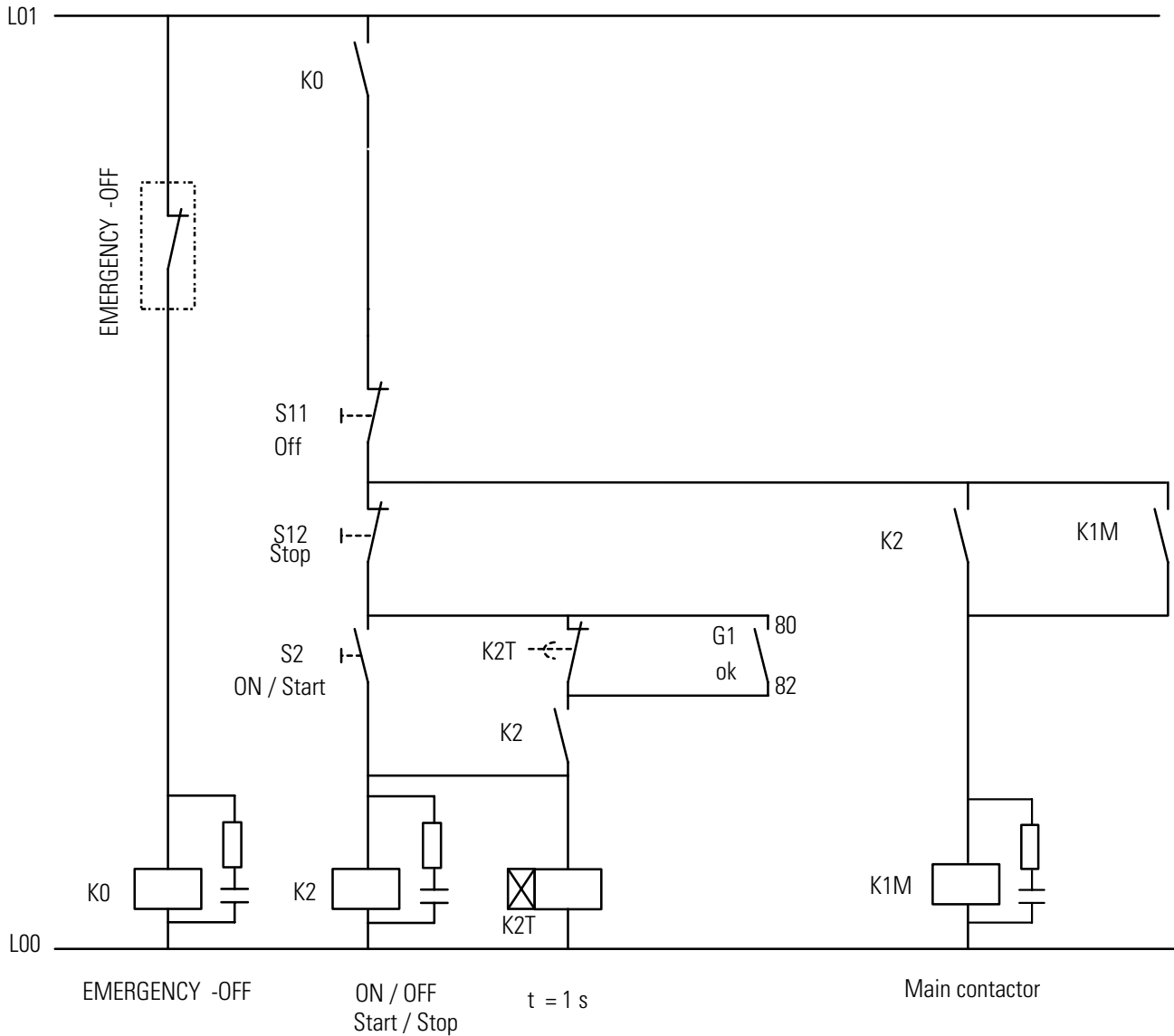
ai4110

I = Input O = Output

4.5. Standard connection diagram

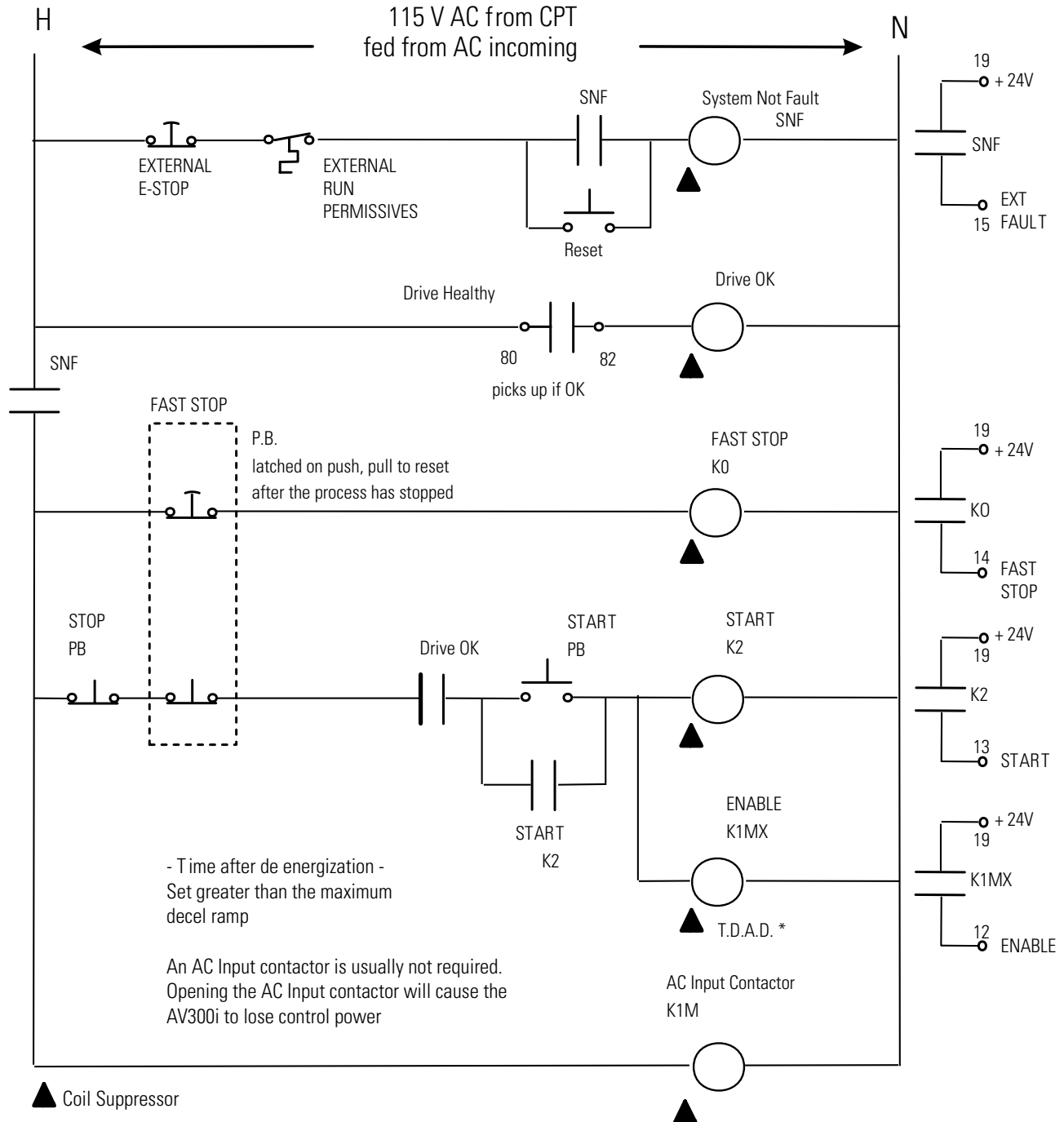
4.5.1. AV-300 Connections

Figure 4.5.1.1: Control sequencing



Note:

OK relay must be configured as "Drive healthy" for this circuit (Factory configuration)

Figure 4.5.1.2: Example for relay interface

Note!

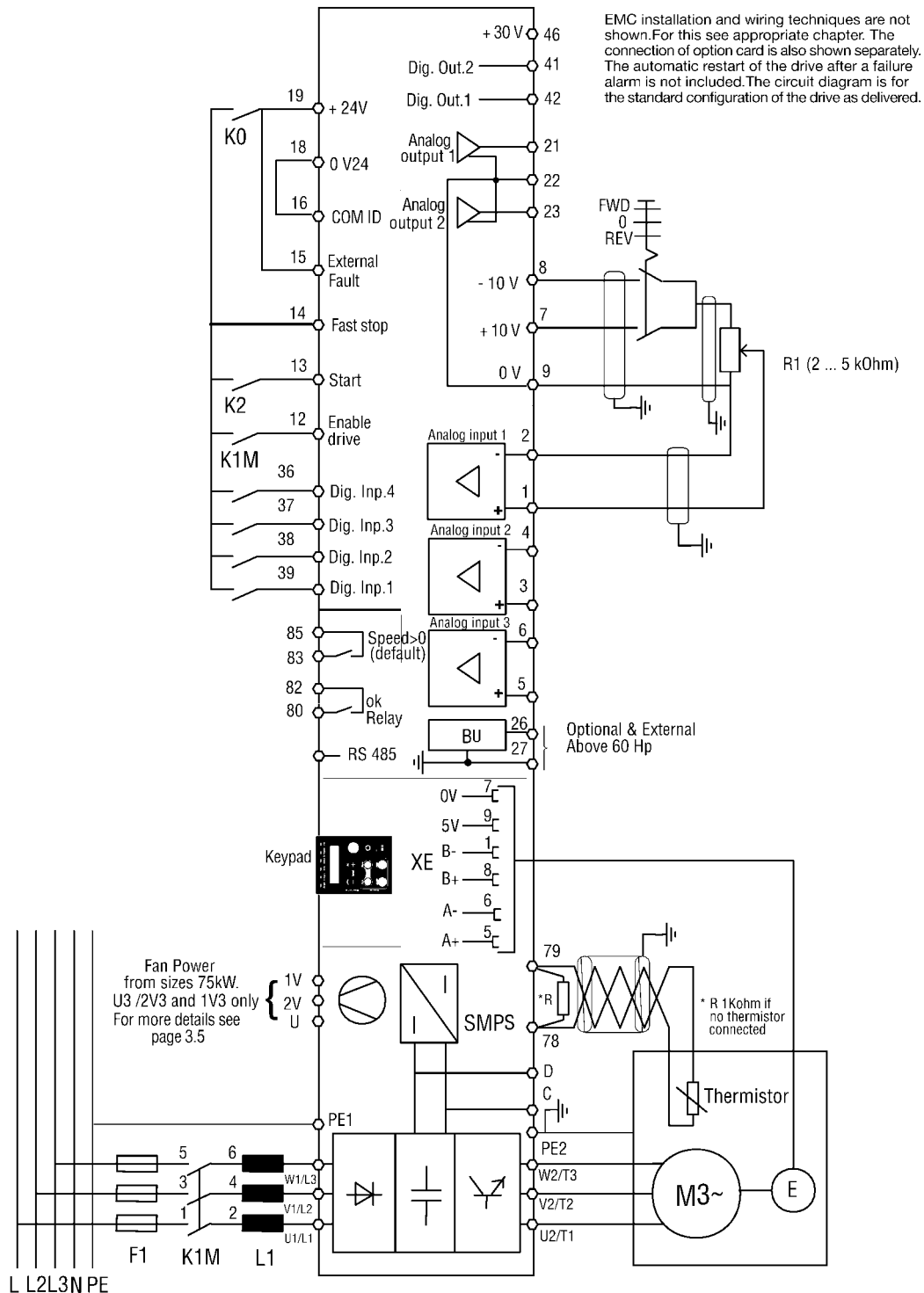
- 1 - ENABLE must remained energized during a normal STOP or FAST STOP for the AV-300i to decel on a ramp. ENABLE may be de energized after zero speed is achieved.
- 2 - ENABLE must be de energized to power up and to reset a fault or alarm.
- 3 - If the external fault input, or fast stop input, is unused, the unused input must be tied to +24V (terminal 19).
- 4 - EXTERNAL FAULT input, FAST STOP input, START input and ENABLE input need to be picked up during LAN operation.

Opening the input will cause labeled drive reaction.

- * - T.D.A.D. = Time Delay After De energization

Note:

The connection diagram shown in the figure 4.5.1.1 (Control sequencing) is valid only when the configuration of the alarm **Enable seq err** is set as **Ignore**.

Figure 4.5.1.3: Typical connection

4.6. Circuit Protection

4.6.1. AC Input Fusing

The inverter must be fused on the AC Input side. Fuses, circuit breakers and protective switches can be used. Semiconductor fuses provide a greater degree of protection.

Note!

If the terminals of the DC Link circuit (C and D) are connected to external devices, semiconductor fuses must always be used on the input side. This, for example, is the case with:

- connected external braking units (BU...)
- coupled DC Link circuits of several inverters
- connected external capacitors

Three-phase inductance on AC input will improve the DC link capacitors life.

Table 4.6.1.1: External Fuse Types for AC input side

Drive type	F1 - Fuses type							
	Connections without three-phase reactor on AC input				Connections with three-phase reactor on AC input			
	DC link capacitors life time [h]	Europe	USA		DC link capacitors life time [h]	Europe	USA	
3F75	25000	GRD2/10 or Z14GR10	A70P10	FWP10	50000	GRD2/10 or Z14GR10	A70P10	FWP10
3001					50000			
3002	25000	GRD2/16 or Z14GR16	A70P20	FWP20	50000	GRD2/10 or Z14GR10	A70P10	FWP10
3003	10000				50000			
3005	25000	GRD2/20 or Z14GR20	A70P20	FWP20	50000	GRD2/16 or Z14GR16	A70P20	FWP20
3007	25000	GRD2/25 or Z14GR25	A70P25	FWP25	50000			
3010	10000	GRD3/35 or Z22GR40	A70P35	FWP35	50000	GRD2/25 or Z14GR25	A70P25	FWP25
3015	25000	GRD3/50 or Z22GR40	A70P40	FWP40	50000	GRD3/35 or Z22GR40	A70P35	FWP35
3020	10000	GRD3/50 or Z22GR50	A70P40	FWP50	50000	GRD3/50 or Z22GR50	A70P40	FWP40
3025	10000	For these types an external reactor is mandatory if the AC input impedance is equal or less than 1%			25000	GRD3/50 or Z22GR50	A70P50	FWP50
3030	10000				25000	S00üf1/80/80A/660V or Z22gR80	A70P80	FWP80
3040	10000				25000	S00üf1/80/100A/660V or M00üf01/100A/660V	A70P100	FWP100
3050	10000				25000	S00üf1/80/160A/660V or M00üf01/160A/660V	A70P175	FWP175
3060	10000				25000			
3075	10000				25000	S00üf1/80/160A/660V or M00üf01/160A/660V	A70P300	FWP300
3100	10000				25000			
3125	10000				25000	S2üf1/110/400A/660V or M2üf1/400A/660V	A70P400	FWP400
3150	10000				25000			
3200	10000				25000			

ai4120

Fuse manufacturers: Type GRD2... (E27), GRD3... (E33),
 Z14... 14 x 51 mm, Z22... 22 x 58 mm = Jean Müller, Eltville
 A70P... = Gould Shawmut
 FWP... = Bussmann

Note!

The technical data for the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are in the corresponding data sheets.

4.6.2. AC Input contactors

Table 4.6.2.1: K1M - AC Input Contactors

AV-300i P/N	HP	Class 1 output I (without choke)		Class 2 output I		AC contactor type*
		400 VAC input current (A)	460 VAC input current (A)	400 VAC input current (A)	460 VAC input current (A) Class 1 Curr	
3F75	0.75	3.9	3.4	1.9	1.7	MC0A310AT3
3001	1	4.8	4.2	3.3	2.9	
3002	2	-	-	4.5	3.9	
3002	2	7.4	6.4	-	-	
3003	3	-	-	-	5.4	
3003	3	8.9	7.7	6.2	-	
3005	5	-	10.4	7.9	6.9	MC1A310AT3
3005	5	12	-	-	-	CL02A310TJ
3007	6	16.9	14.7	10.7	9.3	
3010	10	24.2	21	15.9	14	
3015	15	30.3	18	20.4	21	
3020	20	-	25	28.2	27	
3020	20	39.8	-	-	-	CL07A311MJ
3025	30	39	33	39	36	CL25A310TJ
3030	40	57	49	57	50	CL45A310TJ
3040	50	74	64	74	62	CL05A311MJ
3050	60	-	19	-	74	
3050	60	91	-	91	-	CL25A310TJ
3060	75	106	93	106	90	CL08A311MJ
3075	100	137	119	137	112	CL09A311MJ
3100	125	172	150	172	146	CK08BE311J
3125	150	218	188	218	166	
3150	150	247	214	247	198	
3200	200	296	257	296	256	MN

Dai462

* P/Ns are listed for GE ED&C C2000 series mini contactors and IEC contactors with the following options: 3 N.O. main poles, FVNR, 110/115 VAC 50/60 Hz coil, screw type terminals, and 1 N.O. auxiliary contact.

NOTE! Coil suppression is recommended.

For alternate coil voltages, detailed ordering information, and other contactor options refer to GEP 1260, mini contactors: GEH 5475, GEH 5931, and GEH 5932 IEC contactors: GEH 6223.

Contactors were picked using AC-1 ratings & 1 minute short time rating (10 minute for recovery).

Note!

The technical data of the contactors, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are given in their appropriate data sheets.

4.6.3. External fuses of the power section DC input side

Use the following fuses when a RS-300 Line Regen converter is used (see RS-300 instruction book for other details).

Table 4.6.3.1: External fuses type for DC input side

Drive type	Fuses type		
	Europe	USA	
3F75	Z14GR6	A70P10	FWP10A14F
3001	Z14GR10	A70P10	FWP10A14F
3002			
3003	Z14GR16	A70P20-1	FWP20A14F
3005			
3007	Z14GR20	A70P20-1	FWP20A14F
3010	Z14GR32	A70P30-1	FWP30A14F
3015	Z14GR40	A70P40-4	FWP40B
3020	Z22GR63	A70P60-4	FWP60B
3025	S00üF1/80/80A/660V	A70P80	FWP80
3030	S00üF1/80/100A/660V	A70P100	FWP100
3040	S00üF1/80/125A/660V	A70P150	FWP150
3050	S00üF1/80/160A/660V	A70P175	FWP175
3060	S00üF1/80/200A/660V	A70P200	FWP200
3075	S1üF1/110/250A/660V	A70P250	FWP250
3100	S1üF1/110/315A/660V	A70P350	FWP350
3125	S1üF1/110/400A/660V	A70P400	FWP400
3150	S1üF1/110/500A/660V	A70P500	FWP500
3200	S1üF1/110/500A/660V	A70P500	FWP500

ai4140

Fuse manufacturers: Type Z14..., Z22, S00 ..., S1... = Jean Müller, Eltville
 A70P... = Gould Shawmut
 FWP... = Bussmann

Note!

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are shown in their corresponding data sheets.

* Typical fuse would be Bussman 550 or Littlefuse 217002.

4.6.4 Internal fuse

Table 4.6.4.1: Internal fuse on power cards

Drive type	Designation	Protection of	Fuse (source)	Fitted on:
3025 to 3200	F1	+24V	2A fast 5 x 20 mm (Bussmann: SF523220 or Schurter: FSF0034.1519 or Littlefuse: 217002)	Power card PV33-4-"D" and higher
				Power card PV33-5-"B" and higher
3F75 to 3200	F1	+24V	Resettable fuse	Regulation card RV33-1C and higher
3075 to 3150	F3	Fans transformer	2.5A 6.3x32 (Bussmann: MDL 2.5, Gould Shawmut: GDL1-1/2, Siba: 70 059 76.2,5, Schurter: 0034.5233)	Bottom cover (power terminals side)

ai4145

Note!

Power supply protection for models 3F75 through 3025 is done by an electronic circuit on the card.

4.7. Chokes / Filters

Note!

A three-phase inductance should be connected on the AC Input side in order to limit the input RMS current of AV-300i series Drives. The inductance can be provided by an AC Input choke or an AC Input transformer.

4.7.1. AC Input Chokes

Table 4.7.1.1: 3-Phase AC Input Chokes

Drive type	Three-phase Mains choke				
	Mains Inductance [mH]	Rated current [A]	Saturation current [A]	Frequency [Hz]	Model Number*
3F75	6.1	2.5	5	50/60	37G00201
3001	3.69	3.7	7.4	50/60	37G00201
3002	2.71	5.5	11	50/60	37G00402
3003	2.3	6.7	14	50/60	37G00402
3005	1.63	8.7	18	50/60	37G00802
3007	1.29	11.8	24.5	50/60	37G01202
3010	0.89	17.4	36.5	50/60	37G01802
3015	0.68	22.4	46.5	50/60	37G02502
3020	0.51	30	61	50/60	37G03502
3025	0.35	41	83	50/60	37G03502
3030	0.24	58	120	50/60	37G04502
3040	0.18	71	145	50/60	37G05502
3050	0.13	102	212	50/60	37G08002
3060	0.13	102	212	50/60	37G08002
3075	0.148	173	350	50/60	37G10002
3100	0.148	173	350	50/60	37G13002
3125	0.085	297	600	50/60	37G16002
3150	0.085	297	600	50/60	37G20002
3200	0.085	297	600	50/60	37G25002

* GE Industrial Systems Power Equipment Model Numbers.

ai4150

An input choke is strongly recommended in order to:

- prolong the life time of the DC link capacitors and increase the life of the input rectifier.
- reduce the AC line harmonic distortion
- reduce problems due to a low impedance of the AC line ($\leq 1\%$).

Note!

The current rating of these inductances (reactors) is based on nominal current of standard motors, listed in table 2.3.3.1 in section 2.3.4, "AC Output". Model numbers are from TransCoil, Inc (TCI)

4.7.2. Output Chokes

The AV-300i Drive can be used with general purpose standard motors or with motors specially designed for drive use. The latter usually have a higher insulation rating to better withstand PWM voltages.

Following are typical motor parameters:

Low voltage general purpose standard motors

VDE 0530:	max. peak voltage	1kV
	max. dV/dt	500 V/us
NEMA MG1 part 30:	max. peak voltage	1 kV
	min. rise time	2 us

Low voltage motors for use on inverters

NEMA MG1 part 31:	max. peak voltage	1.6 kV
	min. rise time	0.1 us.

Motors designed for use with adjustable frequency drives do not require any specific filtering of the voltage waveform from the drive.

For general purpose motors with long cable runs (typically over 100 feet [30 m]) an output choke is recommended to maintain the voltage waveform within the specified limits. Suggested choke ratings and part numbers are listed in table 4.7.2.1.

The rated current of the filters should be approx. 20% above the rated current of the inverter in order to take into account additional losses due to the PWM waveform.

Table 4.7.2.1: Recommended values for output chokes

Drive type	Three-phase choke			Model Number* Load Reactors 5% Z
	Rated Inductance [mH]	Rated Current [A]	Saturation Current [A]	
3F75	1.4	9.5	20	37G00202
3001				37G00202
3002				37G00403
3003				37G00403
3005	0.87	16	34	37G00803
3007				37G01203
3010	0.51	27	57	37G01803
3015	0.51	27	57	37G02503
3020	0.43	32	68	37G03503
3025	0.33	42	72	37G03503
3030	0.24	58	100	37G04503
3040	0.18	76	130	37G05503
3050	0.12	110	192	37G08003
3060	0.12	110	192	37G08003
3075	0.07	180	310	37G10003
3100	0.07	180	310	37G13003
3125	0.041	310	540	37G16003
3150	0.041	310	540	37G20003
3200	0.041	310	540	37G25003

*Chokes are capable of 200% for 3 minutes. GE Industrial Systems Power Equipment Model Number.

Note!

When the drive is operated at rated current and at 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage.

4.7.3. Interference Suppression Filters

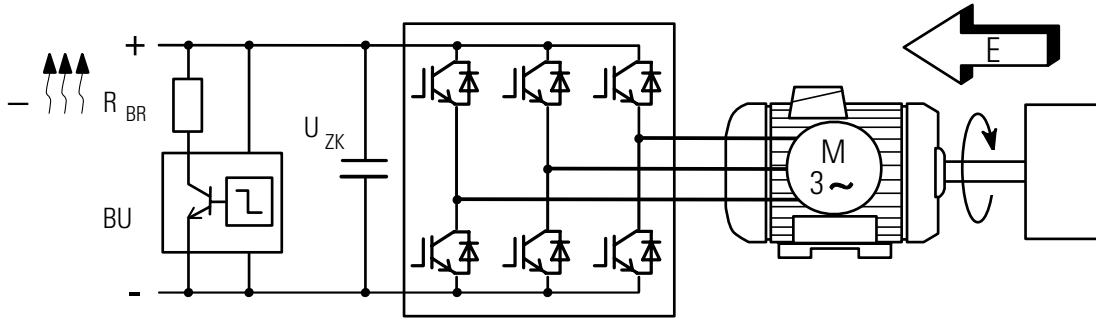
The AV-300i series inverters must be equipped with an external EMI filter in order to reduce the radiofrequency emissions on the AC line. The filter selection is dependent on the drive size and the installation environment. The "EMC Guidelines" instruction book can be used as a reference.

This guide also describes how to arrange a cabinet (connection of filter, line reactors, cable shield, grounding, etc.) in order to make it EMC compliant according the EMC Directive 89/336/EEC.

4.8. Braking Units

In regenerative operation, the frequency-controlled three-phase motor feeds energy back to the DC link circuit via the drive. This leads to an increase in the DC link voltage. Braking units (BU) are used to prevent the DC voltage from rising to an unacceptable value. Braking units activate a resistor that is connected in parallel to the capacitors of the DC link circuit. The feedback energy is converted to heat via the braking resistor (R_{BR}), thus providing very short deceleration times and restricted four-quadrant operation.

Figure 4.8.1: Operation with the Braking Unit



Drive sizes 3F75 to 3060 have an internal braking unit (see section 2.1.2 “Inverter type designation”) factory mounted. The standard AV-300i drives described here can have external braking units connected via terminals C and D.

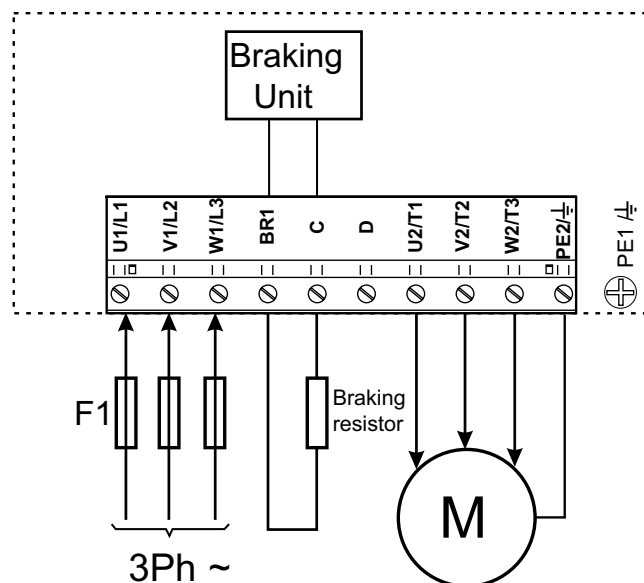
Note!

When the internal braking unit is present or when circuit terminals C and D are connected to external devices, the AC input must be protected with semiconductor fuses!

4.8.1. Internal braking unit

The Internal Braking Unit is included as standard (up to and including size 3060). The braking resistor is optional and has to be mounted externally. For parameter settings refer to section 6.15.8 **Braking unit**. The figure below shows the configuration for internal brake unit operation.

Figure 4.8.1.1: Connection with internal Braking Unit and external braking resistor



4.8.2 External braking resistor

Table 4.8.2.1: Lists and technical data of the external standard resistors for inverters 3F75 up to 3060

Inverter Type	Resistor Type	P_{NBR} [kW]	R_{BR} [Ohm]	E_{BR} [kJ]
3F75	MRI/T600 100R	0.6	100	22
3001				
3002				
3003				
3005				
3007	MRI/T900 68R	0.9	68	33
3010				
3015	MRI/T1300 49R	1.3	49	48
3020	MRI/T2200 28R	2.2	28	82
3025	MRI/T4000 15R4	4	15.4	150
3030	MRI/T4000 11R6	4	11.6	150
3040	MRI/T4000 11R6	4	11.6	150
3050	MRI/T8000 7R7	8	7.7	220
3060	MRI/T8000 7R7	8	7.7	220

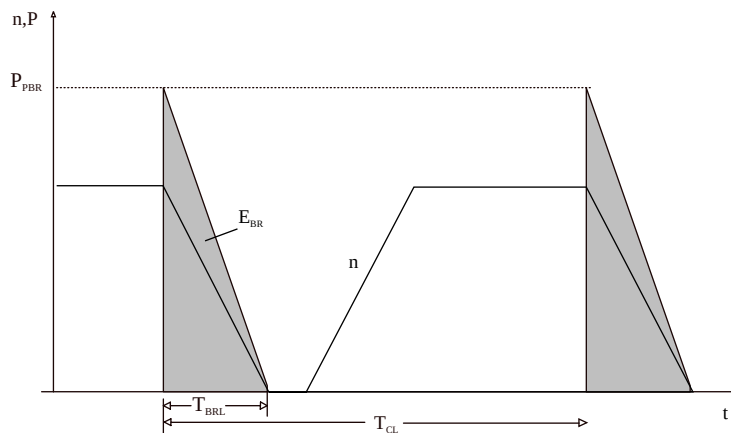
ai4190

Parameters description:

P_{NBR}	Nominal power of the braking resistor
R_{BR}	Braking resistor value
E_{BR}	Max surge energy which can be dissipated by the resistor
P_{PBR}	Peak power applied to the braking resistor
T_{BRL}	Maximum braking time in the limit cycle where braking power = P_{PBR} with typical triangular profile.

$$T_{BRL} = 2 \frac{E_{BR}}{P_{PBR}} + [s]$$

Figure 4.8.2.1: Limit operating braking cycle with typical triangular power profile



T_{CL}	Minimum cycle time in the limit operating cycle where braking power = P_{PBR} with typical triangular profile.

$$T_{CL} = \frac{1}{2} T_{BRL} \frac{P_{PBR}}{P_{NBR}} = [s]$$

The **BU overload** alarm occurs if the duty cycle exceeds the maximum allowed. This is done to prevent possible damages to the resistor.

Resistor model: Standard resistor data

Example code: MRI/T900 68R

MRI = resistor type

900 = nominal power (900 W)

T= with safety thermostat

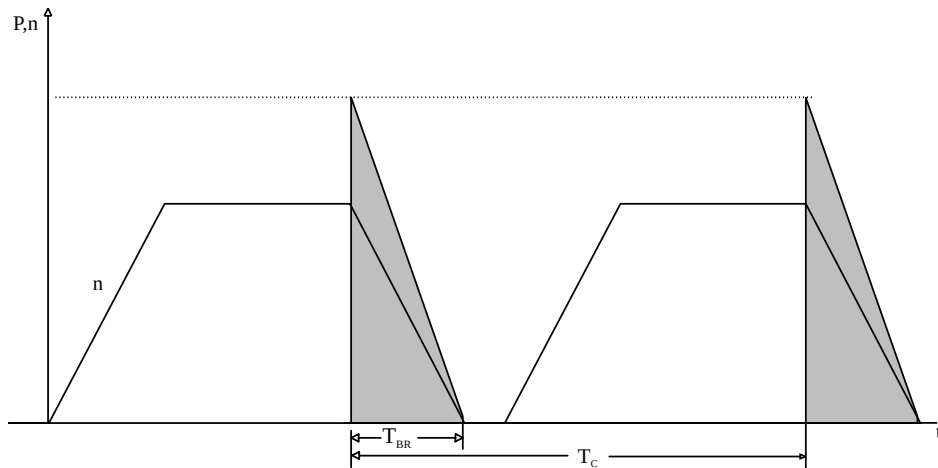
68R = resistor value (68 Ω)

Note!

The suggested match of resistor-model and inverter-size allows a stop at nominal torque with duty cycle $T_{BR} / T_C = 20\%$

Where: T_{BR} = Braking time
 T_C = Cycle time

Figure 4.8.2.2: Braking cycle with $T_{BR} / T_C = 20\%$



The standard resistor can be used for duty cycles, different from the ones above. These resistors, whose technical data are shown in the table 4.8.2.1, have been sized to tolerate an overload equal to 4 times their nominal power for 10 seconds.

They can tolerate an overload whose energy dissipation was the same as the maximum power level defined by:

$$P_{PBR} = \frac{V_{BR}^2 [V]}{R_{BR} [Ohm]} = W$$

Where: V_{BR} = braking unit threshold (see table 4.8.2.2)

Referring to the figure 4.8.2.1, where the power profile is a typical triangular one, the following example can be evaluated (see also table 4.8.2.1).

Resistor model: MRI/T600 100R

Nominal power $P_{NBR} = 600$ [W]

Maximum energy $E_{BR} = 4 \times 600[W] \times 10[s] = 24000[J]$

Inverter line supply = 460V

From table 5.8.2.2: $V_{BR} = 780V$

$$P_{PBR} = \frac{V_{BR}^2}{R_{BR}} = \frac{780^2}{100} = 6084 \text{ [W]} \quad T_{BRL} = 2 \frac{E_{BR}}{P_{PBR}} = 2 \frac{20000}{6084} = 6.6[s]$$

Consider the following relation:

A) If $T_{BR} \leq E_{BR} / P_{NBR}$ verify:

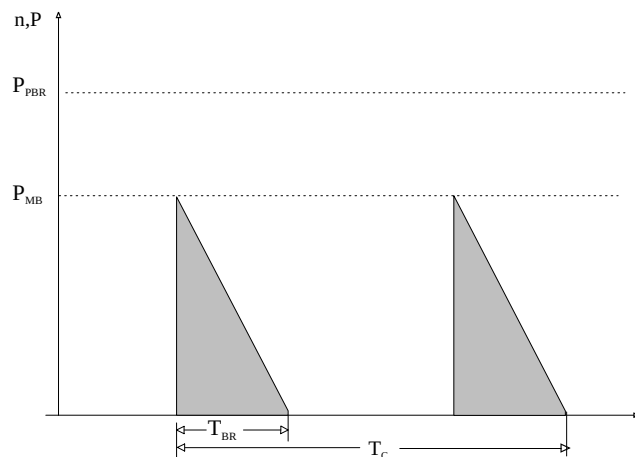
$$1) \quad P_{MB} \leq 2 \cdot E_{BR} / T_{BR} \quad \text{Where: } P_{MB} \text{ is the average power of the cycle (see.fig. 4.8.2.3)}$$

$$2) \quad P_{beff} = \frac{P_{MB} \times T_{BR}}{2 T_C} \leq P_{NBR}$$

The average power of the cycle must not be higher than of that of the nominal resistor.

B) If $T_{BR} > E_{BR} / P_{NBR}$ that is to say, a case of very long braking time, it must be sized such that $P_{MB} \leq P_{NBR}$

Figure 4.8.2.3: Generic braking cycle with triangular profile



If one of the above mentioned rules is not used, it will be necessary to increase the nominal power of the resistor, staying within the limit of the internal braking unit (shown in table 4.8.2.3),

In order to protect these resistors from overload, the parameters **BU ovd time** and **BU duty cycle** (menu FUNCTIONS\Brake unit) manage the maximum time and duty cycle at which the resistors can tolerate their peak power P_{PBR} .

The data must be calibrated to the AC line for which they are specified, defined by the parameter **BU DC vlt** (menu FUNCTIONS\Brake unit).

The default parameters are calculated for a braking threshold that correspond to a line voltage = 400 VAC.

Using different braking resistor from those shown in table 4.8.2.1, must take into account the following formulas:

BU ovoid time [s] = E_{BR} / P_{PBR} (time of braking at the limit condition for a cycle with a triangular profile)

BU duty cycle % = $(P_{NBR} / P_{PBR}) \times 100$

Table 4.8.2.2: Braking thresholds for different Mains

Line Voltage	Braking threshold V_{BR} [V]
230 VAC	400
400 VAC	680
460 VAC / 480VAC	780

avy4200

The result of these calculations must be assigned to the corresponding parameters in menu FUNCTIONS\Brake unit. When the duty cycle exceeds the data entered, the alarm **BU overload** automatically occurs in order to prevent possible damages to the resistor.

The following table can be used to choose an external resistor, different from the standard series.

Table 4.8.2.3: Technical data of the internal braking units

Inverter type	I _{RMS} [A]	I _{PK} [A]	T [s]	Minimum R _{BR} [ohm]
3F75	4.1	7.8	19	100
3001				
3002				
3003				
3005				
3007	6.6	12	16	67
3010				
3015	12	22	17	36
3020	17	31	16	26
3025	18	52	42	15
3030	37	78	23	10
3040	29		37	
3050	50	104	22	7.5
3060				
3075 up to 3200	External braking unit (optional)			

ai4210

I_{RMS} = Nominal current of the braking unit

I_{PK} = Peak current deliverable for 60 seconds max.

T = Minimum cycle time for I_{PK} equal to 10 seconds

The following condition must be satisfied
$$I_{RMS} \geq \sqrt{\frac{1}{2} \times \frac{P_{BR}}{R_{BR}} \times \frac{T_{BR}}{T_C}}$$

Each drive is provided with terminals 26 and 27 which allow control of one or more external braking units connected in parallel. The drive will act as Master and the external brake units 6KBU300 must be configured as Slaves. In this way it will be possible to utilize the internal I²t protection (see section 6.15.8 **Braking unit**).

Where more than one BU unit is used, each BU with a resistor of the same value refers to the parameters calculated for the single unit.

4.8.3. Calculation of a generic external braking resistance used in combination with an internal braking unit.

In order to calculate resistor values different from the ones shown in the table 4.8.2.1, the following points apply:

The peak power dissipated by the resistor is $P_{PBR} = V_{BR}^2 / R_{BR} [W]$, where “ V_{BR} ” is the turn on voltage of the braking unit (see table 4.8.2.2).

The requested maximum power must not be higher than P_{MB} . ($P_{MB} \leq P_{PBR}$).

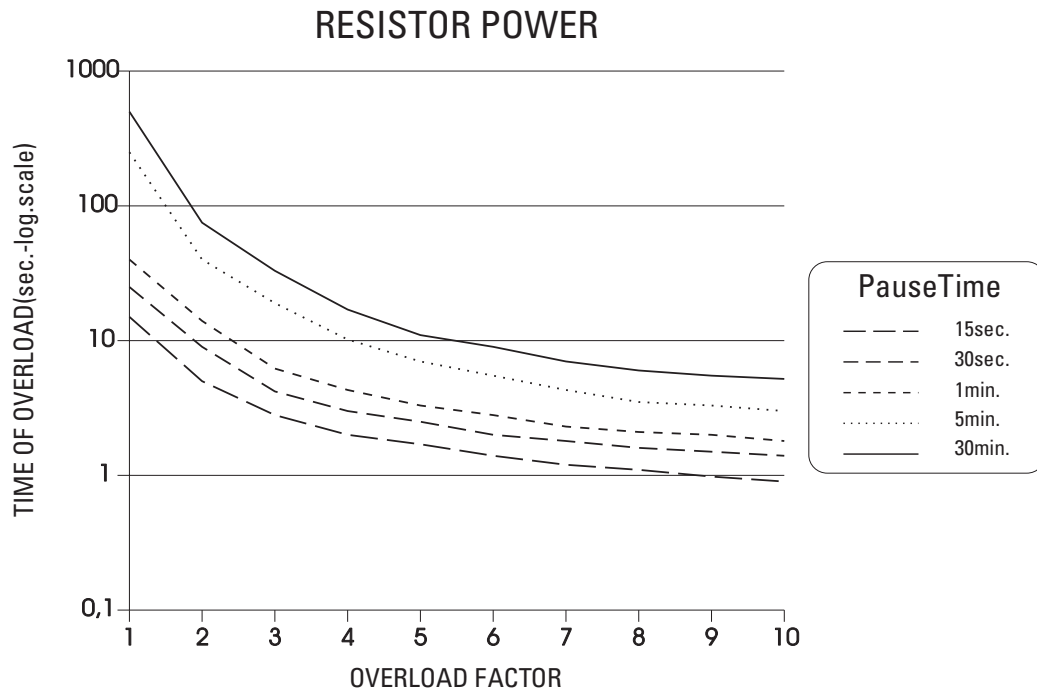
The braking resistor is normally used with an intermittent cycle. Therefore it is possible to use a resistor capable of continuous dissipated power lower than P_{MB} .

The following diagram is valid for the rectangular load profile, and can be used to determine the overload value. For a triangular load profile, this diagram provides a conservative sizing for the resistor (similar diagrams can be provided by the manufacturer of the resistor to be used).

In order to calculate the value of the continuous power (or rated power) of the braking resistor , the overload factor should be determined using the diagram, then the following formula:

$$\text{Nominal Power } P_{MBR} = \frac{P_{MB}}{\text{Overloadfactor}}$$

fA003



Example: I

In order to stop a 18.5 kW motor (38A at 400V) with a 150% overload, the max. regenerated power is 27.75 kW. Assuming a 5-second braking time (overload time for resistance) and 1-minute pause, the diagram gives a 3.9 overload factor.

Therefore, the resistor power will be:

$$P_{NBR} = \frac{27500}{3.9} \approx 7.11 \text{ kW}$$

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For drives larger than 3060, or for special braking cycles, it is recommended to use one or more BU-300 external braking units.

4.9. Buffering the Regulator Supply

The power supply for the control section is provided by a switched mode power supply unit (SMPS) from the DC Link circuit. The drive is disabled as soon as the voltage of the DC Link circuit is below the threshold value (U_{Buff}). The regulator supply is buffered by the energy of the DC Link circuit until the limit value (U_{min}) is reached. The buffer time is determined by the capacitance of the DC Link capacitors. The minimum values are shown in the table below. The buffer time (t_{Buff}) can be extended by connecting external capacitors in parallel (on terminals C and D).

Table 4.9.1: DC Link Buffer Time

Inverter type	Internal capacitance C_{std} [μF]	Buffer time t_{Buff} (minimum value) with the internal capacitance at :		Maximum permissible external capacitance C_{ext} [μF]	Maximum power required by switched mode power supply P_{SMPS} [W]
		AC Input voltage =400V [s]	AC Input voltage =460V [s]		
3F75	220	0.165	0.25	0	65
3001	220	0.165	0.25	0	65
3002	330	0.24	0.37	0	65
3003	330	0.24	0.37	0	65
3005	830	0.62	0.95	0	65
3007	830	0.62	0.95	0	65
3010	830	0.62	0.95	0	65
3015	1500	1.12	1.72	1500	65
3020	1500	1.12	1.72	1500	65
3025	1800	1.54	2.3	4500	70
3030	2200	1.88	2.8	4500	70
3040	3300	2.83	4.2	4500	70
3050	4950	4.24	6.3	4500	70
3060	4950	4.24	6.3	4500	70
3075	6600	5.6	8.1	0	70
3100	6600	5.6	8.1	0	70
3125	9900	8.4	12.1	0	70
3150	14100	12.8	17.2	0	70
3200	14100	12.8	17.2	0	70

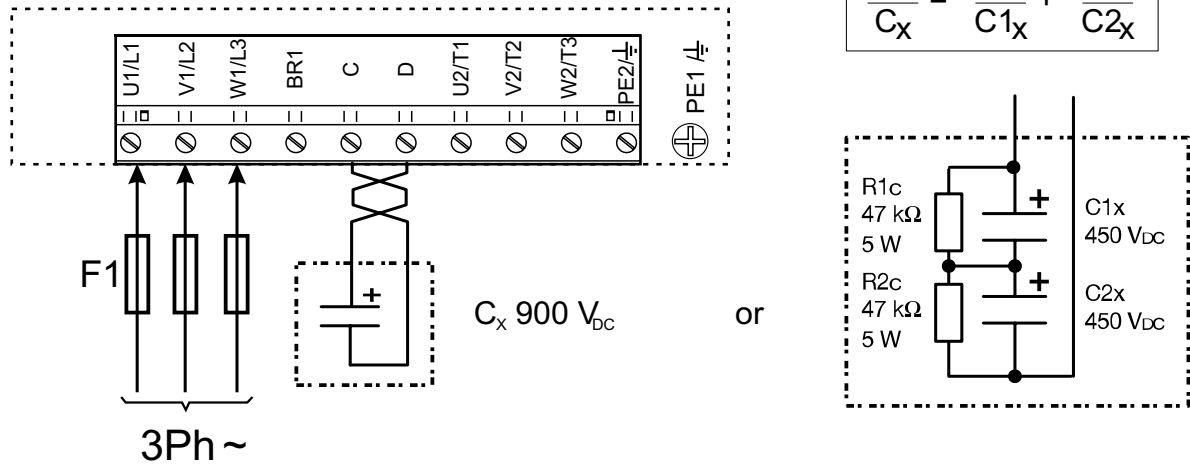
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SMPS = Switched Mode Power Supply

Note!

When connecting external components the DC link circuit, the AC Input **must** be protected with semiconductor fuses!

Figure 4.9.1: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors



Formula for calculating the size of external capacitors:

$$C_{ext} = \frac{2 \cdot P_{SMPS} \cdot t_{Buff} \cdot 10^6}{U_{Buff}^2 - U_{min}^2} - C_{std}$$

fA018

C_{ext}, C_{std}	[μF]	
P_{SMPS}	[W]	$U_{Buff} = 400 \text{ V at } U_{LN} = 400 \text{ V}$
t_{Buff}	[s]	$U_{Buff} = 460 \text{ V at } U_{LN} = 460 \text{ V}$
U_{Buff}, U_{min}	[V]	$U_{min} = 250 \text{ V}$

Calculation example

A 6KAVI43025 Drive is operated with an AC Input supply $U_{LN} = 400 \text{ V}$. A voltage failure buffer is required for max. 1.5 s. PSMPS 70W, t_{Buff} 1.5 s, U_{Buff} 400V, U_{min} 250V, C_{std} 1800μF.

$P_{SMPS} =$	70 W	$t_{Buff} =$	1.5 s
$U_{Buff} =$	400 V	$U_{min} =$	250 V
$C_{std} =$	1800 μF		

$$C_{ext} = \frac{2 \times 70 \text{ W} \times 1.5 \text{ s} \times 10^6 \mu\text{F/F}}{(400 \text{ V})^2 - (250 \text{ V})^2} - 1800 \mu\text{F} = 2154 \mu\text{F} - 1800 \mu\text{F} = 354 \mu\text{F}$$

$$C_{ext} = \frac{2 \times 65 \text{ W} \times 1.5 \text{ s} \times 10^6 \mu\text{F/F}}{(400 \text{ V})^2 - (250 \text{ V})^2} - 830 \mu\text{F} = 2000 \mu\text{F} - 830 \mu\text{F} = 1170 \mu\text{F}$$

4.10. AV-300i Power Dip Ride Through Data and Restart Setup

The AV-300i has a 3-phase full-wave rectifier feeding the DC link.

If the DC link reaches the Undervoltage threshold (see tables 4.10.1, 4.10.2 and 4.10.3), the AV-300i will disable the Drive, and generate an undervoltage alarm.

The undervoltage alarm can latch & trip the drive immediately, or be programmed to reset itself and restart. The undervoltage alarm settings define how many restarts are permitted. There is a 'restart time' parameter that sets how long the undervoltage condition can exist before the AV-300i attempts a reset.

The DC link feeds the AV-300i power supply. If the DC link goes below 250 VDC the electronics reset as if just powered up. The capacity of the DC link supplying the drive section, and the power draw of the AV-300i electronics & cooling fans determine how long the drive stays up under power dips or power loss.

The DC link can have extra capacitance added externally to add time to keep the DC link above 250 VDC as long as possible. The following tables calculate how long the drive can keep the power above 250 VDC for control power if the maximum amount of capacitance is added externally. Remember, adding capacitance holds in the power supply longer, but also takes longer to recharge.

The ride through of a power dip depends on the relative load (energy) that the DC bus has to output, and the magnitude and duration of the power dip. A power dip needs to be below the DC undervoltage threshold before the drive would even see any trip condition.

Without external capacitors a power dip of 1 cycle (16.6ms @ 60 Hz) with the motor at full load will cause an undervoltage trip.

The undervoltage trip time can be calculated by the following formula:

$$t = \frac{(U_{dc}^2 - U_{buff}^2) \cdot (C_{SL} + C_{ext})}{2P_{am} \cdot 10^2} \quad fA027$$

where:

t:	=	undervoltage trip time [ms]
U_{dc} :	=	DC link voltage [V]
U_{thr} :	=	trip threshold voltage [V]
C_{Std} :	=	DC link capacitance [μ F]
C_{ext} :	=	external capacitance [μ F]
P_{am} :	=	motor power consumption [W]

P_{am} depends on the motor load conditions:

- At full load, it can be calculated as follows: $P_{am} = \frac{P_m}{\eta_m} \quad fA028$

where:

P_m :	=	motor rated power
η_m :	=	motor rated efficiency

- At no load, it depends on the iron losses, mechanical losses, and stator joule losses. The sum of these terms is about 50% of the full load losses.

Full load losses P_{fl} are:

$$P_{\text{fl}} = P_m \frac{1 - \eta_m}{\eta_m} \quad \text{fA029}$$

Maximum power supply drop out time (Buffer time/voltage failure buffer) of AV-300i is achieved by adding the maximum recommended capacitance to the DC bus.

The following table shows the maximum power supply drop out time for different Undervoltage thresholds and inverter sizes. The meaning of the symbols in the columns is as follows:

C_{std} = internal capacitance in uF,

C_{ext} = max external total capacitance in uF,

T_{buff} = max drop out time in sec.,

P_{SMPS} = power supply watts,

V_{buff} = volts threshold to disable drive operation,

V_{min} = min DC volts that will support the power supply

$$T_{\text{buff}} = \frac{(C_{\text{std}} + C_{\text{ext max}}) \cdot (U_{\text{buff}}^2 + U_{\text{min}}^2)}{2 P_{\text{smps}} \cdot 10^6} \quad \text{fA030}$$

Where T_{buff} is defined by the formula:

Table 4.10.1: Drive Trip Times, 230-V Threshold

Size	P_{SMPS}	C_{std}	$C_{\text{ext max}}$	U_{buff}	U_{min}	T_{buff}
3025	70	1800	4500	230	200	0.58
3030	70	2200	4500	230	200	0.62
3040	70	3300	4500	230	200	0.72
3050	70	4950	4500	230	200	0.87
3060	70	4950	4500	230	200	0.87
3075	70	6600	0	230	200	0.61
3100	70	6600	0	230	200	0.61
3125	70	9900	0	230	200	0.91
3150	70	14100	0	230	200	1.3
3200	70	14100	0	230	200	1.3

ai4225

Table 4.10.2: Drive Trip Times, 400-V Threshold

Size	P_{smps}	C_{std}	$C_{\text{ext max}}$	U_{buff}	U_{min}	T_{buff}
3F75	65	220	0	400	250	0.165
3001	65	220	0	400	250	0.25
3002	65	330	0	400	250	0.24
3003	65	330	0	400	250	0.24
3005	65	830	0	400	250	0.62
3007	65	830	0	400	250	0.62
3010	65	830	0	400	250	0.62
3015	65	1500	1500	400	250	2:25
3020	65	1500	1500	400	250	2:25
3025	70	1800	4500	400	200	5.4
3030	70	2200	4500	400	200	5.74
3040	70	3300	4500	400	200	6.68
3050	70	4950	4500	400	200	8.1
3060	70	4950	4500	400	200	8.1
3075	70	6600	0	400	200	5.65
3100	70	6600	0	400	200	5.65
3125	70	9900	0	400	200	8.48
3150	70	14100	0	400	200	12.08
3200	70	14100	0	400	200	12.08

ai4230

Table 4.10.3: Drive Trip Time, 460-V Threshold

Size	P _{smps}	C _{std}	C _{ext max}	U _{buff}	U _{min}	T _{buff}
3F75	65	220	0	460	250	0.25
3001	65	220	0	460	250	0.25
3002	65	330	0	460	250	0.37
3003	65	330	0	460	250	0.37
3005	65	830	0	460	250	0.95
3007	65	830	0	460	250	0.95
3010	65	830	0	460	250	0.95
3015	65	1500	1500	460	250	3.45
3020	65	1500	1500	460	250	3.45
3025	70	1800	4500	460	200	7.72
3030	70	2200	4500	460	200	8.21
3040	70	3300	4500	460	200	9.56
3050	70	4950	4500	460	200	11.58
3060	70	4950	4500	460	200	11.58
3075	70	6600	0	460	200	8.04
3100	70	6600	0	460	200	8.09
3125	70	9900	0	460	200	12.13
3150	70	14100	0	460	200	17.28
3200	70	14100	0	460	200	17.28

ai4240

4.11. Discharge Time of the DC-Link

Table 4.11.1: DC Link Discharge Times

Type	I _{2N}	Time (seconds)	Type	I _{2N}	Time (seconds)
3F75	2.1	90	3030	58	60
3001	3.5		3040	76	90
3002	4.9	150	3050	90	120
3003	6.5		3060	110	
3005	8.3	205	3075	142	
3007	11		3100	180	
3010	15.4		3125	210	
3015	21.6	220	3150	250	
3020	28.7		3200	310	
3025	42	60			

ai4250

To avoid electric shock hazard, these are the minimum elapsed times that the AV-300i Drive must be disconnected from the AC Input before an operator may service parts inside the drive.

Condition

These values assume a drive supplied at 480 VAC +10%, without any options, and represents the worst case condition.

Section 5: Drive Operation

The figure 5.1. shows parameter management in the drive. The set of parameters which is used by the inverter during the operation, is called the “Current set”.

At each power up, the parameters contained in the non-volatile memory, “Permanent set”, are copied in the “Current set”.

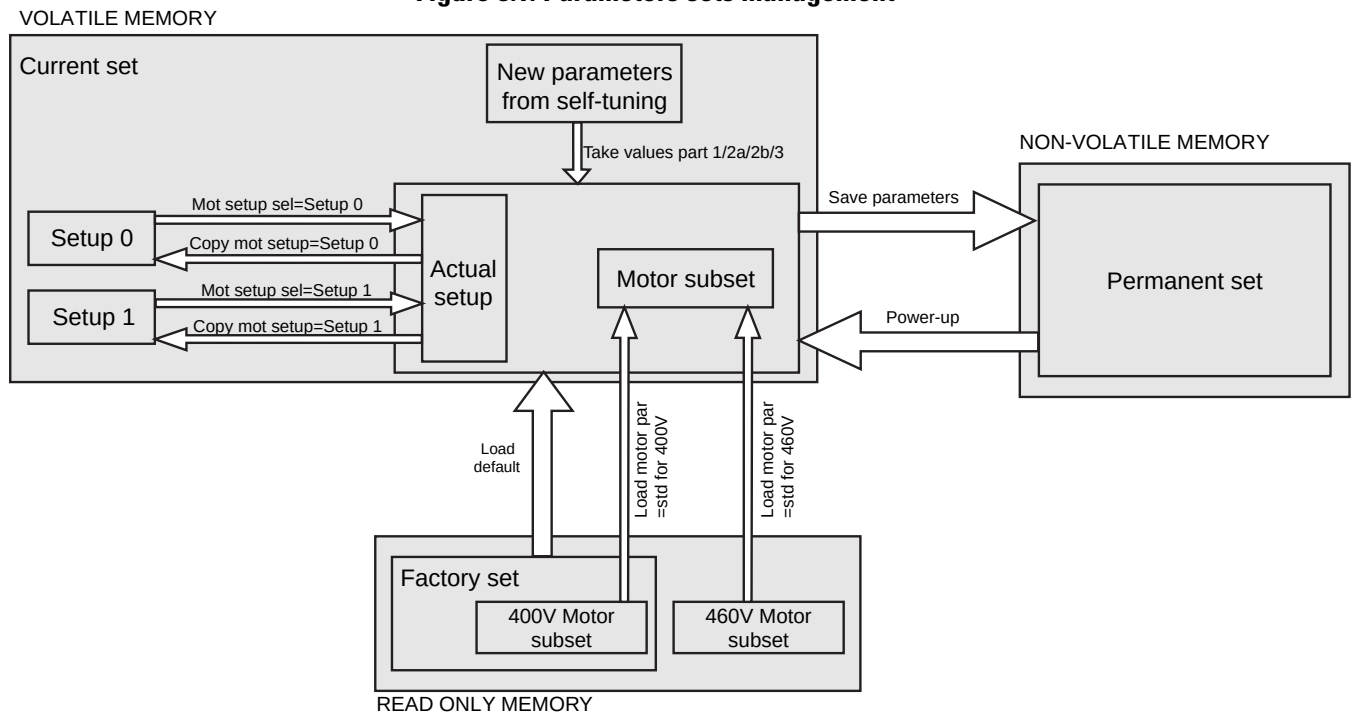
The drive comes from the factory with the “Permanent set” parameters preloaded with a set called “Factory set”, whose values are indicated in the tables of section 10.1, column “Factory”.

The user can change the parameter values of the “Current set” and subsequently store it in the “Permanent set” through the **Save parameters** command.

It is always possible to recall (into the “Current set”) the factory parameters “Factory set” by means of the **Load default** command.

In addition, the diagram shows some operations on subsets of parameters which are made possible by individual commands.

Figure 5.1: Parameters sets management



5.1. Keypad

The keypad is made of a LCD display with two 16-digit lines, seven LEDs and nine function keys. It is used

- to control the drive, when this kind of use has been programmed (Main commands=DIGITAL)
- to display the speed, voltage, diagnostics etc. during the operation
- to set the parameters

Figure 5.1.1: Keypad on the left, Led module on the right.



Note!

Keypad cables longer than 20 cm must be shielded.

5.1.1. LEDs & buttons

The LEDs present on the keypads are used to quickly diagnose the operating state of the drive.

Table 5.1.1.1: Keypad leds designation

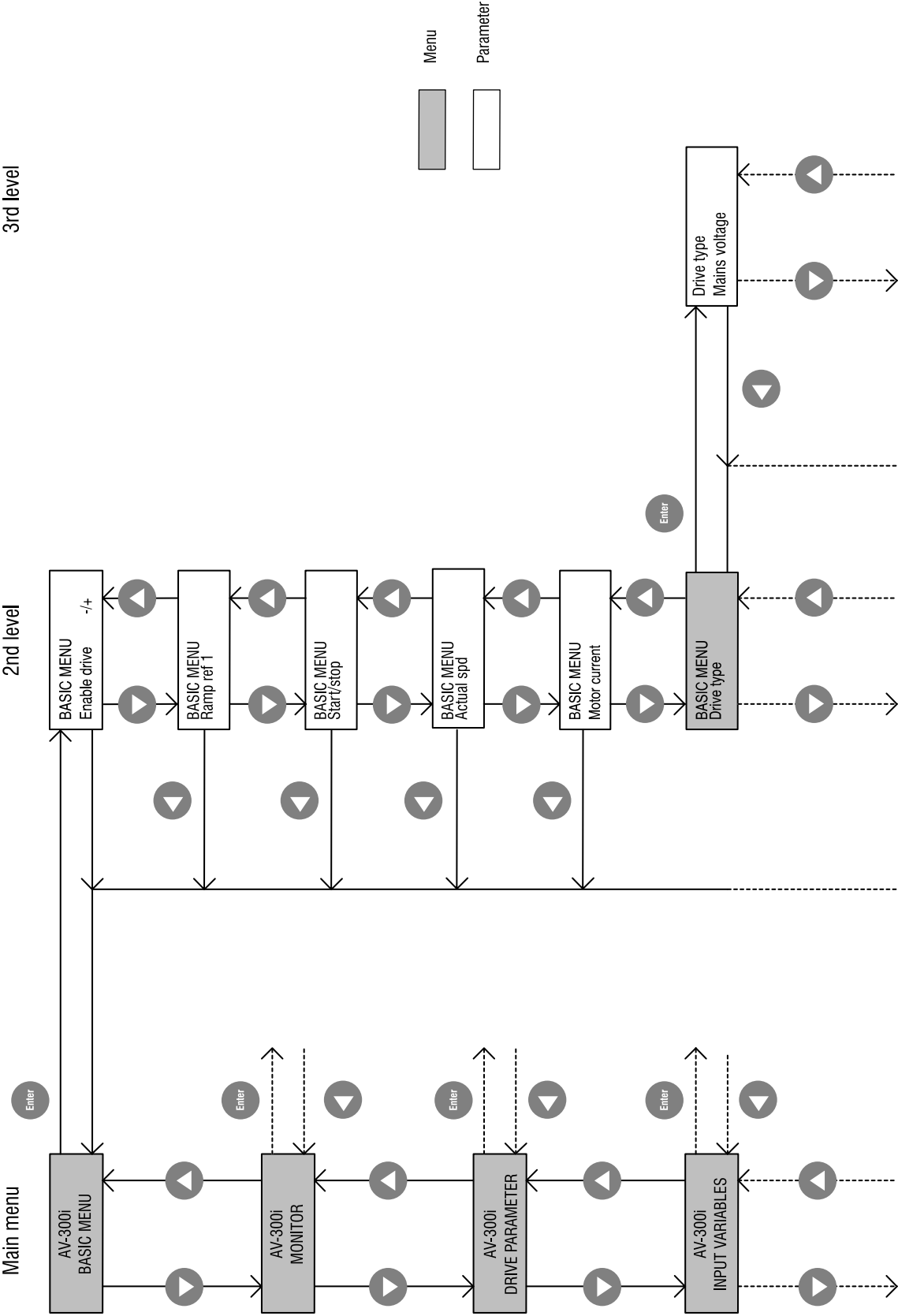
Designation	Color	Function
-Torque	yellow	the LED is lit when the drive operates with a negative torque
+Torque	yellow	the LED is lit when the drive operates with a positive torque
ALARM	red	the LED is lit when a trip occurs
ENABLE	green	the LED is lit when the drive is enabled
Zero speed	yellow	the LED is lit when zero speed is reached
Limit	yellow	the LED is lit when the drive operates at a current limit
Shift	yellow	the LED is lit when the second keypad functions are enabled

ai5010

Control buttons	Text reference	Function
	[START]	START button puts the drive into the Enable (Stop control function ON) and Run state (Main commands = DIGITAL). When Main commands is set as TERMINALS this button is not active.
	[STOP]	STOP button stops the drive from the Run state when Main commands is set as DIGITAL. (Holding this button for 2 sec. will cause the drive to be disabled). When Main commands is set as TERMINALS this button is not active.
	[Increase] / [Jog]	“Plus” button increases the speed reference when using the Motor pot function. This button is the JOG command when the shift button is pressed.
	[Decrease] / [Rotation control]	“Minus” button decreases the speed reference for the Motor pot function. “Rotation control” changes the rotation direction in Jog mode and Motor pot function when shift button is selected.
	[Down arrow] / [Help]	“Down arrow” is used to change menu or parameter selection. In parameter and reference setting modes, it changes the value of the parameter or the reference. Help – Function Not available (“Help not found” is displayed when pressed and when shift button is selected)
	[Up arrow] / [Alarm]	“Up arrow” is used to change menu or parameter selection. In parameter and reference setting modes, it changes the value of the parameter or the reference. “Alarm” - Failure register is displayed (shift selected). Use the UP/DOWN Arrows to scroll through the last 10 alarms.
	[Left arrow] / [Escape]	“Left arrow”, when editing numeric parameters it selects the digit to modify. In other cases it is used to exit from the setting mode. “Escape” is used to exit from setting mode and Alarm display mode (when shift button is selected).
	[Enter] / [Home]	“Enter” is used to enter a new value for a parameter in the parameter setting mode. “Home” is used to go directly to the BASIC MENU (when shift button is selected)
	[Shift]	“Shift” button enables the second keypad functions (Rotation control, Jog, Help, Alarm, Escape, Home)

5.1.2. Moving Inside a Menu

Figure 5.1.2.1: Moving Inside the Navigation Menu



The BASIC MENU always appears when the inverter is switched on.

Use the ▲ and ▼ keys to select the individual points within the same menu level.

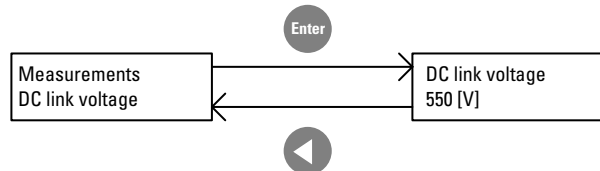
Press the **Enter** key to enter the next menu level.

Use the ◀ key to return to the next higher menu level, irrespective of which menu point was selected. The appropriate menu of the next higher level will appear once the return has been made.

Press **Home (Shift and Enter)** to go directly to BASIC MENU.

5.1.3. Displaying Parameters

(MONITOR \ Measurement)



Select the parameters within the menu.

Press **Enter**. The parameter will appear with the corresponding value.

Press < key to return to the menu.

5.1.4. Changing / Saving Parameters / Password

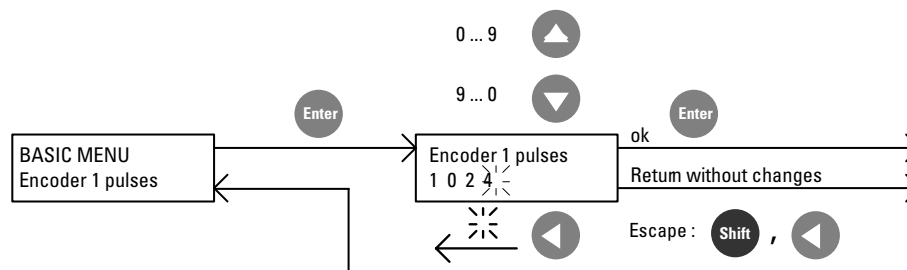
The parameters with changeable values are divided into three groups:

- Parameters whose content is either selected as a number or as text within a defined range, e.g. ramp times and reference values
- Parameters whose contents are fixed values that can be selected, e.g. **Mains voltage** with the options 400V and 460 V
- Parameters that are automatically scaled by the keypad, e.g. **Auto tune inp XX**

Note!

Only those parameters that are not assigned to a digital or analog input/output can be changed with the keypad. The changed parameters must be saved otherwise the previous values will be loaded the next time the drive is switched on.

Changing numerical values and text (i.e.: BASIC MENU \ Encoder 1 pulses):



Select the parameter to be changed in the menu.

Press **Enter**. The value of the parameter will appear and the last digit will flash. The value of the flashing digit is always the one that can be changed.

Increase the value with ▲. Reduce the value with ▼.

Select the next digit with ◀.

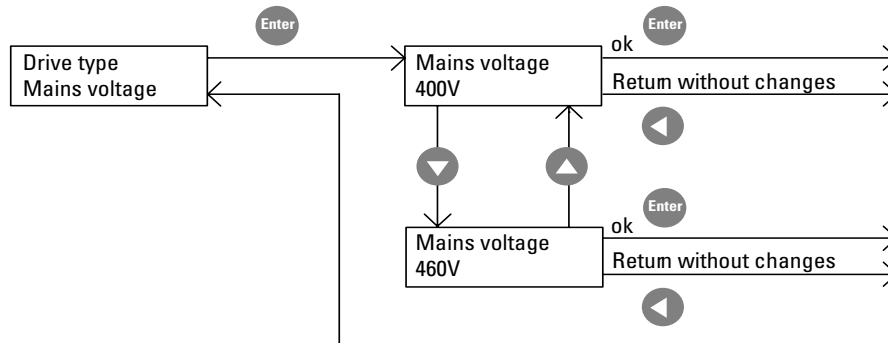
Confirm the new value and return to the previous display by pressing **Enter**.

Press **Escape (Shift and ◀)** to return without changes.

Note!

When setting the **Dim factor text** parameter, the following characters are also available in addition to the numbers: / % & + , - . : < = > ? A...Z [] a...z

Selection from predefined values (i.e.: BASIC MENU \ Drive type \ Mains voltage):

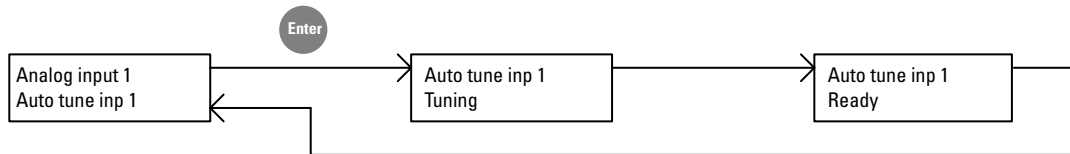


To change a value press **Enter**. The current value is shown in the display. This can be changed with the ▲ and ▼ keys.

Confirm the new value and return to the previous display by pressing **Enter**.

Press < key to return without changes.

Automatic Scaling (i.e.: I/O CONFIG \ Analog Inputs \ Analog input 1 \ Auto tune inp 1)



Select the appropriate **Auto tune input XX** parameter. Press **Enter**.

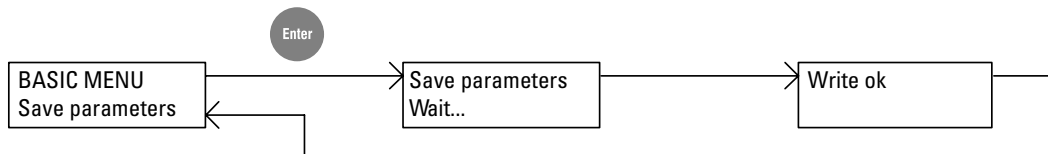
The scaling procedure will run automatically. The messages “Tuning” and “Ready” will appear in sequence as the procedure is executed.

Note!

The maximum signal possible must be present on the analog input concerned during the scaling procedure.

Saving (BASIC MENU \ Save parameters):

The parameters must be saved otherwise previous values will be loaded the next time the drive is switched on.

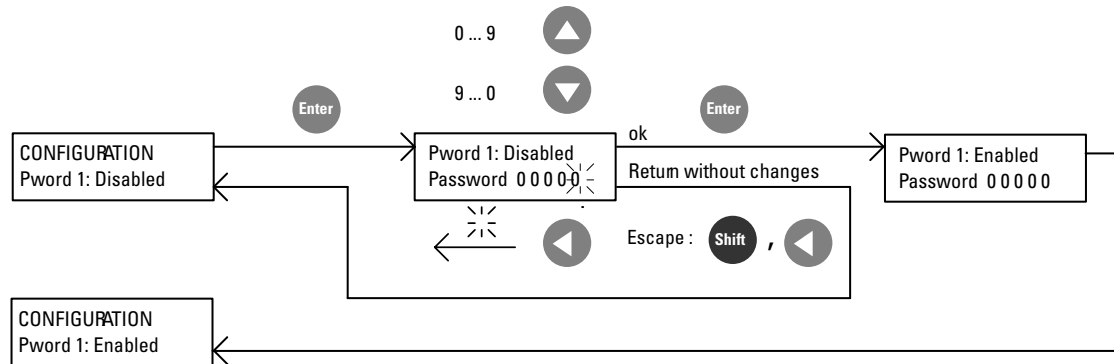


Select **Save parameters** in the BASIC MENU or in the SPEC FUNCTIONS menu. Press **Enter**.

The save operation is automatic. The messages “Wait ...” and “Write ok” will appear in sequence as the procedure is executed.

Setting a password (CONFIGURATION \ Pword 1):

The operator can define a password consisting of a five-digit number combination. This protects the keypad from unauthorized access and is carried out via the **Pword 1** parameter.



Select the **Pword1** (= Password 1) in the CONFIGURATION menu.

Press **Enter**. The value 00000 will appear with the last digit flashing. The value of the flashing digit is changed.

Increase the value with ▲. Reduce the value with ▼.

Select the next digit left with ◀.

Confirm the password by pressing **Enter**. The message: “Pword1: Enabled” will then appear with the new password displayed.

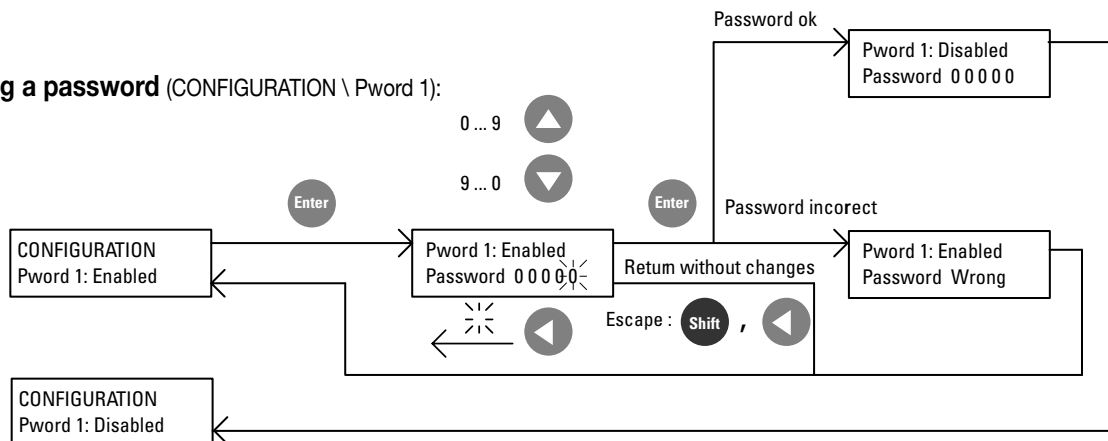
The existence of a password setting is indicated in the CONFIGURATION menu via the “Pword 1: Enabled” message.

Press **Escape** (Shift and ◀) to return without changes.

Note!

The password must be saved with **Save parameters** so that it is also active the next time the drive is switched on.

Entering a password (CONFIGURATION \ Pword 1):



Select the **Pword1** (= Password 1) parameter in the CONFIGURATION menu.

Press **Enter** to call up the value 00000 with the last digit flashing. The flashing digit is the one changed. The valid password must be re-entered in order to unlock the keypad (and Toolbox).

Increase the value with ▲. Reduce the value with ▼.

Select the next digit left with ◀.

Confirm by pressing **Enter**. The message: “Pword1: Disabled” will then appear for a short time.

The existing password is indicated in the CONFIGURATION menu via the “Pword 1: Disabled”.

Press **Escape** (**Shift** and **<**) key to abort the entry of the password.

If the incorrect password is entered and then Enter pressed, the message “Password wrong” will appear and the keypad will return to the CONFIGURATION menu with the display “Pword1: Enabled”

Note!

The **Save parameters** function must be used to save the password.

5.1.5. Operating the Drive via the Keypad

In order to operate the drive via the keypad, the following settings must be made in the CONFIGURATION menu:

- **Main commands** = Digital
- **Control mode** = local

The hardware enable input on terminals 12 thru 15 are also active when the drive is operated via the keypad. This means, for example, that the signal at terminal 13 must also be present to start the drive via the keypad.

If the drive is stopped via the keypad, it can be restarted simply by pressing the start key.

If the stop was caused by removing the voltage signal on terminal 13, both the signal at terminal 13 and the start command via the keypad are necessary to restart the drive. The signal on the terminal board must be present before giving the keypad command.

The same applies to the enable command of the drive via the **Enable drive** parameter.

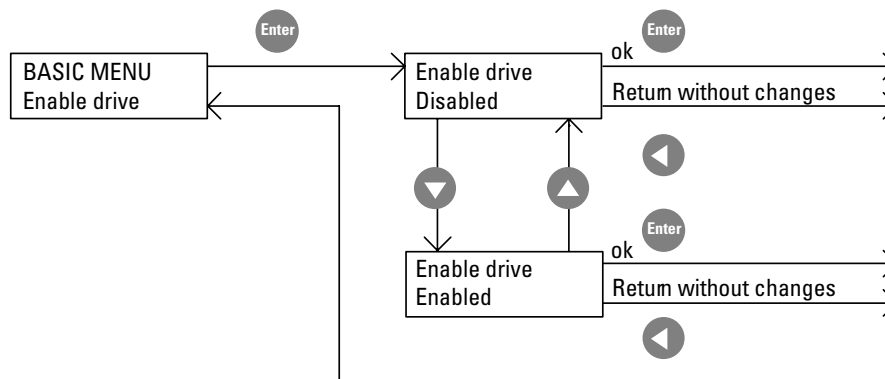
5.1.5.1. Starting and Stopping the Drive with Keypad

Note!

The keypad must be enabled (see section 6.12.1) before performing these actions.

(**MAIN COMMANDS** parameter = **DIGITAL**)

Enabling / Disabling the Drive (BASIC MENU \ Enable drive):



Select the **Enable drive** parameter in the BASIC MENU or MONITOR Menu.

Press **Enter**.

Use the **▲** and **▼** keys to move from “Disabled” to “Enabled”.

Press **Enter** to confirm your entry. (Note: the **Enable drive** parameter will not become enabled until the start command is given.)

Press **◀** key to return without changes.

Start / Stop

Start: Press the  (start) key. The + and – keys can be used to adjust the motor speed.

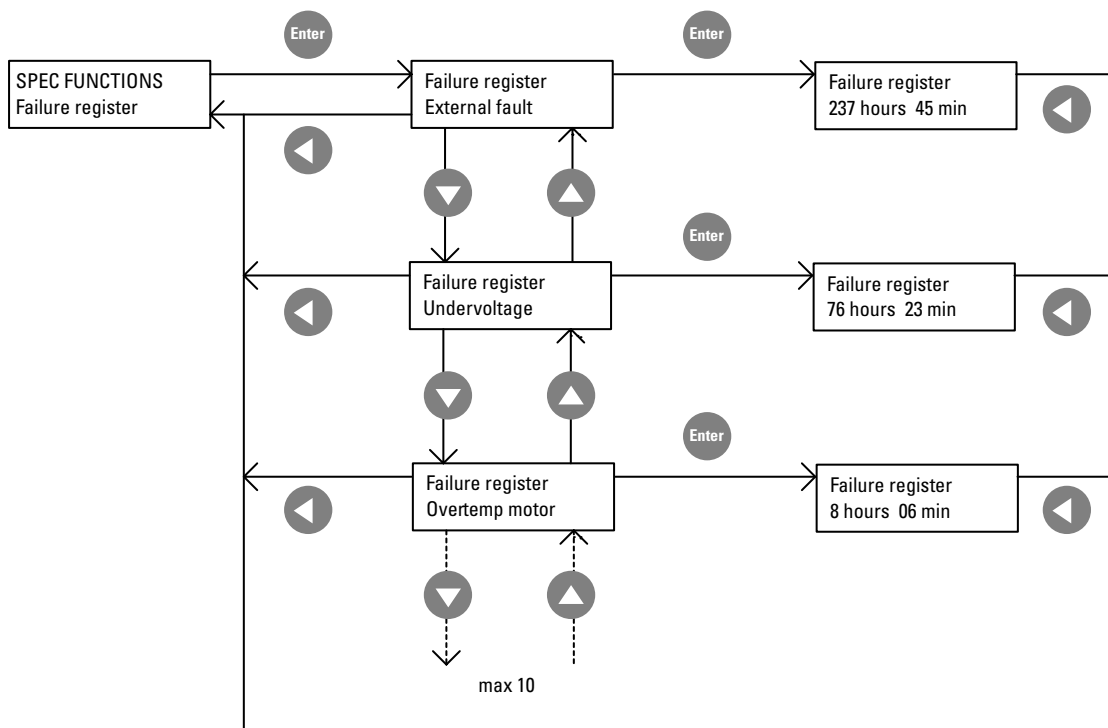
Stop: Press the  (stop) key.

Warning:

The Keypad STOP key can be used only when MAIN COMMANDS parameter is set to digital.

5.1.5.2. Failure register / acknowledge alarms

Displaying the failure register



Press **Alarm** (**Shift** and **▲**) key to select the **Failure register** parameter (or select it in the SPEC FUNCTIONS menu).

Press **Enter**: the last error that has occurred will be displayed.

Use **▲** key to display the previous error.

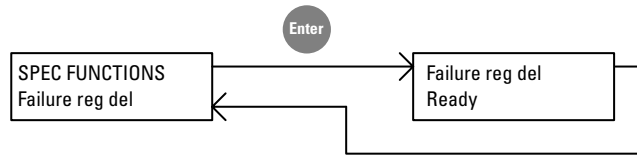
The failure register can retain up to 10 values. If a new failure is reported, the oldest entry in the failure register is overwritten.

The entries in the failure register are retained until the register is cleared.

Press **Enter** to display the time at which the failure occurred. The time statement refers to the operating hours of the inverter (unit connected to AC supply).

Press **▲** or **▼** to returns to the **Failure register** menu point.

If the **◀** key is pressed when the failure is displayed, the display returns to the Failure register menu without showing the time.

Clearing the failure register:

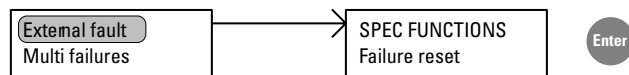
Select the **Failure reg del** parameter in the SPEC FUNCTIONS menu.

Press **Enter**. The failure register is deleted.

Acknowledging a failure alarm:

If a failure occurs, the appropriate failure alarm will appear in the display. The display will alternately flash the failure message and the existing text.

Acknowledge or reset the failure by pressing the < key. The drive must be disabled and the Start command must not be present.

Acknowledging several failure alarms:

If several alarms occur at the same time, the blinking message “Multi failures” will be shown in the display.

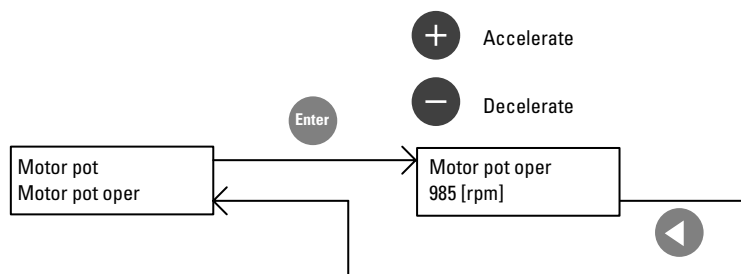
Select the **Failure reset** parameter in the SPEC FUNCTIONS menu.

Press the **Enter** key to acknowledge or reset the failure alarm. The drive must be disabled and there should be no Start command present.

5.1.5.3. Motor Potentiometer function**Note!**

To use the motor potentiometer function, it must be enabled with the **Enable motor pot** parameter!

This function is located in the FUNCTION/motor pot menu.



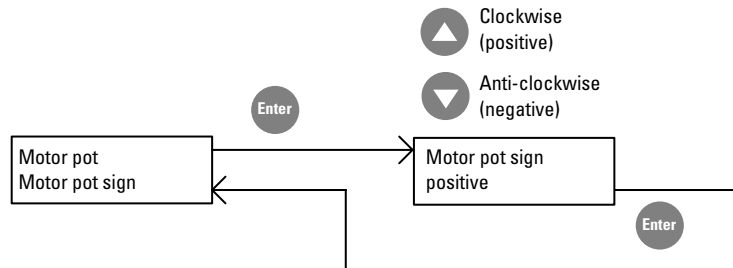
Select the **Motor pot oper** parameter in the “Motor pot” menu.

Press the “**Start**” button.

Press **Enter** to display the current reference value.

Press the **+** key to increase the reference value and accelerate the drive. Press the **-** key to decrease the reference value and decelerate the drive. This applies to both directions.

Press **Escape (Shift , ◀)** to return to the “Motor pot” submenu.



Changing rotation direction:

Select the **Motor pot sign** parameter in the “Motor pot” menu.

Press **Enter** to display the current direction.

Press the **▲** key to select positive rotation and the **▼** key for negative rotation.

Confirm by pressing **Enter**.

Changing the **Motor pot sign** parameter during operation causes the drive to reverse rotation following the ramp times that have been set.

Resetting the speed reference value:



Select the **Motor pot reset** parameter in the “Motor pot” submenu.

Press **Enter**. The speed reference value will be reset to zero.

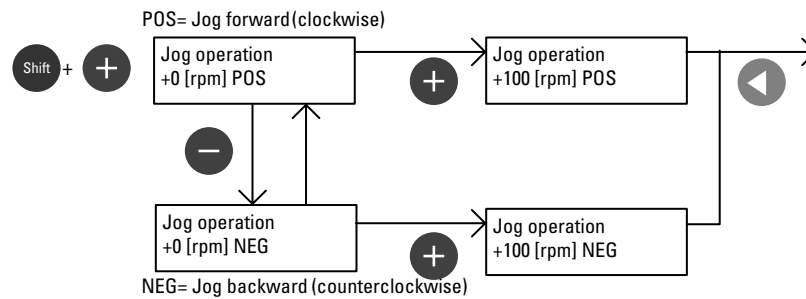
Note!

The speed reference value can only be reset when the drive is switched off.

5.1.5.4. Jog function

Note!

The **Enable jog** parameter is a default setting with a speed reference value = 100 rpm.



Verify that the drive is stopped

Press **Shift** and **+** keys to select the **Jog operation** function.

Press Jog to run the motor (the selected jog speed will be displayed).

Press **◀** key to exit from jog operation.

5.2. Menu Structure

The aim of this introductory guide is to introduce the user to the basic menu structure of the AV-300i Drive, operation of the drive and commissioning of the drive via the BASIC MENU.

It is assumed that the drive has the factory set default configuration and that the installation has been carried out according to the diagrams in section 4.6, "Standard connection diagrams".

Possible parameter values and information about write/read authorization by the operator are described in the "List of all parameters" provided in the manual.

5.2.1 Main menu and Submenu

BASIC MENU	Drive type		
MONITOR	Measurements	Speed	Speed in DRC [] Speed in rpm Speed in %
	I/O		
DRIVE PARAMETER	Mot plate data Motor Parameter	Self-tuning	Self-tune 1 Self-tune 2a Self-tune 2b Self-tune 3
	Sensorless V/f control	Voltage boost Slip compens V/f spd search Energy save	
INPUT VARIABLES	Ramp ref	Ramp ref 1 Ramp ref 2	
	Speed ref	Speed ref 1 Speed ref 2	
	T current ref		
LIMITS	Speed limits	Speed amount Speed min/max	
	Current limits Flux limits Voltage limits		
RAMP	Acceleration Deceleration Quick stop		
SPEED REGULAT	Spd zero logic Speed up Droop function Inertia/loss cp		
CURRENT REGULAT			
FLUX REGULATION			
REG PARAMETERS	Percent values	Speed regulator Current reg	Dead time comp
		Flux regulator Voltage reg	
	Base values	Speed regulator Current reg Flux regulator Voltage reg	
	In use values		
CONFIGURATION	Motor spd fbk Drive type Dimension fact Face value fact Prog alarms	Undervoltage Overvoltage Heatsink sensor Heatsink ot Intake air ot Regulation ot Module overtemp Overtemp motor External fault Overcurrent Output stages Opt2 failure Bus loss Hw opt1 failure Enable seq err BU overload	
I/O CONFIG	Analog outputs	Analog output 1 Analog output 2 Analog output 3 Analog output 4	
	Analog inputs	Analog input 1 Analog input 2 Analog input 3	
	Digital outputs Digital inputs Encoder inputs		
ADD SPEED FUNCT	Adap spd reg Speed control Speed zero		
FUNCTIONS	Motor pot Jog function Multi speed fct Multi ramp fct	Ramp 0 Acceleration 0 Deceleration 0 Ramp 1 Acceleration 1 Deceleration 1 Ramp 2 Acceleration 2 Deceleration 2 Ramp 3 Acceleration 3 Deceleration 3	
	Stop control Speed draw Motor setup Overload contr	Ovid mot contr Ovid drv contr	
	Brake unit Pwr loss stop f		
SPEC FUNCTIONS	Test generator DC braking Links	Link 1 Link 2	
	Pad Parameters		
OPTIONS	Option 1	PDC config	Pdc inputs Pdc outputs Virt dgt in Virt dgt out
	Option 2		
	PID	PID source PID references PI controls PD controls PID target Diameter calc	
DRIVECOM	Speed amount Speed min/max Acceleration Deceleration Quick stop Face value fact Dimension fact		
SERVICE			

5.2.2 Main menus, submenus, page numbers and parameters

Basic Menu		
	6-7	Enable drive
	6-7	Ramp ref 1
	6-7	Start/stop
	6-7	Actual spd [rpm]
	6-7	Motor current
	Drive type	
	6-7	Mains voltage
	6-7	Ambient temp
	6-7	Continuous curr
	6-7	Software version
	6-7	Regulation mode
	6-7	Acc delta speed
	6-7	Acc delta time
	6-7	Dec delta speed
	6-7	Dec delta time
	6-7	T current lim +
	6-7	T current lim -
	6-7	Encoder 1 type
	6-7	Encoder 1 pulses
	6-7	Speed base value
	6-7	Save parameters
MONITOR		
	6-11	Enable drive
	6-11	Start/stop
	Measurements	
	Speed	
	Speed in DRC []	
	6-11	Ramp ref (d)
	6-11	Ramp output (d)
	6-11	Speed ref (d)
	6-11	Actual spd (d)
	6-11	F act spd (d)
	6-11	Act spd filter
	Speed in rpm	
	6-11	Ramp ref (rpm)
	6-11	Ramp outp (rpm)
	6-11	Speed ref (rpm)
	6-11	Actual spd (rpm)
	6-11	Enc 1 speed (rpm)
	6-11	Enc 2 speed (rpm)
	6-11	F act spd (rpm)
	6-11	Act spd filter
	Speed in %	
	6-11	Ramp ref (%)
	6-11	Ramp output (%)
	6-11	Speed ref (%)
	6-11	Actual spd (%)

6-11	DC link voltage
6-11	Active power
6-11	Output voltage
6-11	Output frequency
6-11	Motor current
6-11	Torque
6-11	T current ref %
6-11	T curr (%)
6-11	F T curr (%)
6-11	T curr filter
6-11	Flux
6-11	Heatsink temp
6-11	Regulation temp
6-11	Intake air temp

I/O

	Digital I/Q
6-11	Virtual dig inp
6-11	Virtual dig out

DRIVE PARAMETER
Motor plate data

6-14	Nominal voltage
6-14	Nominal speed
6-14	Nom frequency
6-14	Nominal current
6-14	Cos phi
6-14	Base voltage
6-14	Base frequency
6-14	Take motor par

Motor parameter

6-20	Magnetizing curr
6-20	Magn working cur
6-20	Rotor resistance
6-20	Stator resist
6-20	Lkg inductance
6-20	Load motor par

Self-tuning
Self-tune 1

6-23	Start part 1
6-23	Stator resist
6-23	Stator resist Nw
6-23	Voltage comp lim
6-23	Volt comp lim Nw
6-23	Comp slope
6-23	Comp slope Nw
6-23	Lkg inductance
6-23	Lkg inductance Nw
6-23	Current P
6-23	Current P Nw

ai5020-b

6-23	Rotor resistance
6-23	Rotor resist Nw
6-23	Current I
6-23	Current I Nw
6-23	Take val part 1

Self-tune 2a

6-23	Start part 2a
6-23	P1 flux model
6-23	P1 flux model Nw
6-23	P2 flux model
6-23	P2 flux model Nw
6-23	Magnetizing curr
6-23	Magnetiz curr Nw
6-23	Flux P
6-23	Flux P Nw
6-23	Flux I
6-23	Flux I Nw
6-23	Voltage P
6-23	Voltage P Nw
6-23	Voltage I
6-23	Voltage I Nw
6-23	Take val part 2a

Self-tune 2b

6-23	Start part 2b
6-23	P1 flux model
6-23	P1 flux model Nw
6-23	P2 flux model
6-23	P2 flux model Nw
6-23	Magnetizing curr
6-23	Magnetiz curr Nw
6-23	Flux P
6-23	Flux P Nw
6-23	Flux I
6-23	Flux I Nw
6-23	Voltage P
6-23	Voltage P Nw
6-23	Voltage I
6-23	Voltage I Nw
6-23	Take val part 2b

Self-tune 3

6-23	Fwd-Rev spd tune
6-23	Test T curr lim
6-23	Start part 3
6-23	Inertia
6-23	Inertia Nw
6-23	Friction
6-23	Friction Nw
6-23	Speed P
6-23	Speed P Nw
6-23	Speed I
6-23	Speed I Nw
6-23	Take val part 3

ai5020-c

Sensorless		
	6-25	Low speed factor
	6-25	Slr speed filter
	6-25	Flux corr factor
V/f control	6-26	V/F shape
	Voltage boost	
	6-27	Vlt boost type
	6-27	Manual boost
	6-27	Actual boost
	Slip compensat	
	6-28	Slip comp type
	6-28	Manual slip comp
	6-28	Actual slip comp
	6-28	Slip comp filt
	6-28	Motor losses %
	V/f spd search	
	6-29	Spd srch time
	6-29	Flux srch time
	6-29	Spd autocapture
	6-29	Delay auto cap
	6-29	Delay retrying
	Energy save	
	6-31	Enable save eng
	6-31	Lock save eng
	6-31	V/f flux level
	6-31	Flux var time
INPUTS VARIABLE		
	Ramp ref	
	Ramp ref 1	
	6-32	Ramp ref 1
	6-32	Ramp ref 1(%)
	Ramp ref 2	
	6-32	Ramp ref 2
	6-32	Ramp ref 2 (%)
	Speed ref	
	Speed ref 1	
	6-34	Speed ref 1
	6-34	Speed ref 1(%)
	Speed Ref 2	
	6-34	Speed ref 2
	6-34	Speed ref 2(%)
	T current ref	
	6-35	T current ref 1
	6-35	T current ref 2

ai5020-d

LIMITS			
	Speed limits		
		Speed amount	
		6-37	Speed min amount
		6-37	Speed max amount
		Speed min/max	
		6-37	Speed min pos
		6-37	Speed max pos
		6-37	Speed min neg
		6-37	Speed max neg
	Current limits		
		6-38	T curr lim type
		6-38	T current lim
		6-38	T current lim +
		6-38	T current lim -
		6-38	In use Tcur lim+
		6-38	In use Tcur lim-
		6-38	Current lim red
		6-38	Torque reduct
	Flux limits		
		6-41	Flux level
	Voltage limits		
		6-41	Dynam vlt margin
RAMP			
	Acceleration		
		6-43	Acc delta speed
		6-43	Acc delta time
	Deceleration		
		6-43	Dec delta speed
		6-43	Dec delta time
	Quick stop		
		6-43	QStp delta speed
		6-43	QStp delta time
	6-44	Ramp shape	
	6-44	S shape t const	
	6-44	S acc t const	
	6-44	S dec t const	
	6-44	Ramp +/- delay	
	6-44	Fwd-Rev	
	6-44	Enable ramp	
	6-44	Ramp out = 0	
	6-44	Ramp in = 0	
	6-44	Freeze ramp	

ai5020-e

SPEED REGULAT.				
	6-48	Speed ref		
	6-48	Speed reg output		
	6-48	Lock speed reg		
	6-48	Enable spd reg		
	6-48	Lock speed I		
	6-48	Aux spd fun sel		
	6-48	Prop. filter		
	Spd zero logic			
		6-49	Enable spd=0 I	
6-49		Enable spd=0 R		
6-49		Enable spd=0 P		
6-49		Enable lck sls		
6-49		Spd=0 P gain		
6-49		Ref 0 level		
6-51		Enable zero pos		
6-51		Lock zero pos		
6-51		Zero pos gain		
Speed up				
	6-52	Speed up gain		
	6-52	Speed up base		
	6-52	Speed up filter		
Droop function				
	6-53	Droop gain		
	6-53	Droop filter		
	6-53	Load comp		
	6-53	Droop limit		
	6-53	Enable droop		
Inertia/loss cp				
	6-54	Inertia		
	6-54	Friction		
	6-54	Torque const		
	6-54	Inertia c filter		
CURRENT REGULAT				
	6-57	Zero torque		
FLUX REGULATION				
	6-59	Flux reg mode		
	6-59	Flux reference		
	6-59	Flux		
	6-59	Out vlt level		
REG. PARAMETERS				
	Percent values			
		Speed regulator		
			6-62	Speed P
			6-62	Speed I

ai5020-f

Current reg

6-62	Current P
6-62	Current I

Dead time comp

6-62	Voltage comp lim
6-62	Comp slope

Flux regulator

6-62	Flux P
6-62	Flux I

Voltage reg

6-62	Voltage P
6-62	Voltage I

Base values**Speed regulator**

6-62	Speed P base
6-62	Speed I base

Current reg

6-62	Current P base
6-62	Current I base

Flux regulator

6-62	Flux P base
6-62	Flux I base

Voltage reg

6-62	Voltage P base
6-62	Voltage I base

In use values

6-62	Speed P in use
6-62	Speed I in use

CONFIGURATION

6-64	Main commands
6-64	Control mode
6-66	Speed base value
6-66	Regulation mode
6-66	Full load curr
6-67	Magn ramp time
6-67	Magn boost curr
6-67	Ok relay func
6-82	Switching freq
6-84	Qstp opt code

a5020i-g

Motor spd fbk

6-68	Speed fbk sel
6-68	Encoder 1 type
6-68	Encoder 1 pulses
6-68	Enc 1 supply vlt
6-68	Encoder 2 pulses
6-68	Encoder repeat
6-68	Refresh enc 1
6-68	Refresh enc 2
6-68	Enable ind store

Drive type

6-72	Mains voltage
6-72	Ambient temp
6-72	Continuous curr
6-72	Software version

Dimension fact

6-73	Dim factor num
6-73	Dim factor den
6-73	Dim factor text

Face value fact

6-73	Face value num
6-73	Face value den

Prog alarms
Undervoltage

6-77	Latch
6-77	OK relay open
6-77	Restart time
6-77	N of attempts

Overvoltage

6-77	Latch
6-77	OK relay Open

Heatsink sensor

6-77	Activity
6-77	Latch
6-77	OK relay open

Heatsink ot

6-77	OK relay open

Intake air ot

6-77	Activity
6-77	Latch
6-77	OK relay open

Regulation ot

6-77	Activity
6-77	Latch
6-77	OK relay open

Module overtemp

6-77	OK relay open

Overtemp motor

6-77	Activity
6-77	Latch
6-77	OK relay open

External Fault		
	6-77	Activity
	6-77	Latch
	6-77	OK relay open
Overcurrent		
	6-77	Latch
	6-77	OK relay open
Output stages		
	6-77	Latch
	6-77	OK relay open
Opt2 failure		
	6-77	Activity
	6-77	OK relay open
Bus loss		
	6-77	Activity
	6-77	Latch
	6-77	OK relay open
	6-77	Hold off time
	6-77	Restart time
Hw opt 1 failure		
	6-77	Activity
	6-77	OK relay open
Enable seq err		
	6-77	Activity
	6-77	Latch
	6-77	OK relay open
BU overload		
	6-77	Activity
	6-77	OK relay open

6-82	Device address
6-84	Ser answer delay
6-83	Pword1

I/O CONFIG.

Analog outputs		
Analog output 1		
	6-86	Select output 1
	6-86	Scale output 1
Analog output 2		
	6-86	Select output 2
	6-86	Scale output 2
Analog output 3		
	6-86	Select output 3
	6-86	Scale output 3
Analog output 4		
	6-86	Select output 4
	6-86	Scale output 4

Analog inputs

Analog input 1

6-89	Select input 1
6-89	An in 1 target
6-89	Input 1 type
6-89	Input 1 sign
6-89	Scale input 1
6-89	Tune value inp 1
6-89	Auto tune inp 1
6-89	Input 1 filter
6-89	Input 1 compare
6-89	Input 1 cp error
6-89	Input 1 cp delay
6-89	Offset input 1

Analog input 2

6-89	Select input 2
6-89	An in 2 target
6-89	Input 2 type
6-89	Input 2 sign
6-89	Scale input 2
6-89	Tune value inp 2
6-89	Auto tune inp 2
6-89	Offset input 2

Analog input 3

6-89	Select input 3
6-89	An in 3 target
6-89	Input 3 type
6-89	Input 3 sign
6-89	Scale input 3
6-89	Tune value inp 3
6-89	Auto tune inp 3
6-89	Offset input 3

Digital outputs

6-95	Digital output 1
6-95	Digital output 2
6-95	Digital output 3
6-95	Digital output 4
6-95	Digital output 5
6-95	Digital output 6
6-95	Digital output 7
6-95	Digital output 8
6-95	Relay 2

Digital inputs

6-96	Digital input 1
6-96	Digital input 2
6-96	Digital input 3
6-96	Digital input 4
6-96	Digital input 5
6-96	Digital input 6
6-96	Digital input 7
6-96	Digital input 8

ai5020-k

Encoder inputs

6-98	Select enc 1
6-98	Select enc 2
6-98	Encoder 1 type
6-98	Encoder 1 pulses
6-98	Encoder 2 pulses
6-98	Refresh enc 1
6-98	Refresh enc 2

ADD SPEED FUNCT

6-101	Auto capture

Adap spd reg

6-102	Enable spd adap
6-102	Sel adap type
6-102	Adap reference
6-102	Adap speed 1
6-102	Adap speed 2
6-102	Adap joint 1
6-102	Adap joint 2
6-102	Adap P gain 1
6-102	Adap I gain 1
6-102	Adap P gain 2
6-102	Adap I gain 2
6-102	Adap P gain 3
6-102	Adap I gain 3

Speed control

6-103	Spd threshold +
6-103	Spd threshold -
6-103	Threshold delay
6-103	Set error
6-103	Set delay

Speed zero

6-105	Speed zero level
6-105	Speed zero delay

FUNCTIONS**Motor pot**

6-108	Enab motor pot
6-108	Motor pot oper
6-108	Motor pot sign
6-108	Motor pot reset

Jog function

6-110	Enable jog
6-110	Jog operation
6-110	Jog selection
6-110	Jog reference

ai5020-I

Multi speed fct

6-111	Enab multi spd
6-111	Multi speed sel
6-111	Multi speed 1
6-111	Multi speed 2
6-111	Multi speed 3
6-111	Multi speed 4
6-111	Multi speed 5
6-111	Multi speed 6
6-111	Multi speed 7

Multi ramp fct

6-116	Enab multi rmp
6-116	Multi ramp sel

Ramp 0
Acceleration 0

6-116	Acc delta speed 0
6-116	Acc delta time 0
6-116	S acc t const 0

Deceleration 0

6-116	Dec delta speed 0
6-116	Dec delta time 0
6-116	S dec t const 0

Ramp 1
Acceleration 1

6-116	Acc delta speed 1
6-116	Acc delta time 1
6-116	S acc t const 1

Deceleration 1

6-116	Dec delta speed 1
6-116	Dec delta time 1
6-116	S dec t const 1

Ramp 2
Acceleration 2

6-116	Acc delta speed 2
6-116	Acc delta time 2
6-116	S acc t const 2

Deceleration 2

6-116	Dec delta speed 2
6-116	Dec delta time 2
6-116	S dec t const 2

Ramp 3
Acceleration 3

6-116	Acc delta speed 3
6-116	Acc delta time 3
6-116	S acc t const 3

Deceleration 3

6-116	Dec delta speed 3
6-116	Dec delta time 3
6-116	S dec t const 3

	Stop control	
	6-119	Stop mode
	6-119	Spd 0 trip delay
	6-119	Jog stop control
	Speed draw	
	6-121	Speed ratio
	6-121	Spd draw out (d)
	6-121	Spd draw out (%)
	Motor setup	
	6-124	Mot setup sel
	6-124	Copy mot setup
	6-124	Actual mot setup
	Overload contr	
	Ovld mot control	
	6-128	Motor cont curr
	6-128	Trip time 50%
	Ovld drv control	
	6-128	I_sqrt_t_accum
	Brake unit	
	6-131	Enable BU
	6-131	BU ovld time
	6-131	BU duty cycle
	6-131	BU DC vlt
	Pwr loss stop f	
	6-133	PL stop enable
	6-133	PL stop t limit
	6-133	PL stop acc
	6-133	PL stop dec
	6-133	PL stop vdc ref
	6-133	PL time-out
	6-133	PL stop I Gain
	6-133	PL stop P Gain
	6-133	PL stop active
	6-133	PL active limit
	6-133	PL next active
	6-133	PL next factor
	6-133	PL time-out sig
	6-133	PL time-out ack
	6-133	PL mains status
SPEC FUNCTION		
	Test generator	
	6-139	Gen access
	6-139	Gen frequency
	6-139	Gen amplitude
	6-139	Gen offset

a5020i-n

6-140	Enable rr adap
6-141	Save parameters
6-141	Load default
6-141	Life time
6-141	Failure register
6-141	Failure reset
6-141	Failure reg del

DC braking

6-148	DC braking mode
6-148	Brk time @ stop
6-148	DC braking curr
6-148	DC braking delay

Links

Link 1

6-143	Source
6-143	Destination
6-143	Mul Gain
6-143	Div Gain
6-143	Input max.
6-143	Input min.
6-143	Input offset
6-143	Output offset
6-143	Input absolute

Link 2

6-143	Source
6-143	Destination
6-143	Mul Gain
6-143	Div Gain
6-143	Input max
6-143	Input min
6-143	Input offset
6-143	Output offset
6-143	Input absolute

Pad parameters

6-146	Pad 0
6-146	Pad 1
6-146	Pad 2
6-146	Pad 3
6-146	Pad 4
6-146	Pad 5
6-146	Pad 6
6-146	Pad 7
6-146	Pad 8
6-146	Pad 9
6-146	Pad 10
6-146	Pad 11
6-146	Pad 12
6-146	Pad 13
6-146	Pad 14
6-146	Pad 15
6-146	Bitword Pad A
6-146	Bitword Pad B

ai5020-o

Option1

Menu

PDC config

PDC inputs

6-152	PDC in 0
6-152	PDC in 1
6-152	PDC in 2
6-152	PDC in 3
6-152	PDC in 4
6-152	PDC in 5

PDC outputs

6-152	PDC out 0
6-152	PDC out 1
6-152	PDC out 2
6-152	PDC out 3
6-152	PDC out 4
6-152	PDC out 5

Virt dig in

6-152	Virt dig in 0
6-152	Virt dig in 1
6-152	Virt dig in 2
6-152	Virt dig in 3
6-152	Virt dig in 4
6-152	Virt dig in 5
6-152	Virt dig in 6
6-152	Virt dig in 7
6-152	Virt dig in 8
6-152	Virt dig in 9
6-152	Virt dig in 10
6-152	Virt dig in 11
6-152	Virt dig in 12
6-152	Virt dig in 13
6-152	Virt dig in 14
6-152	Virt dig in 15

Virt dig out

6-152	Virt dig out 0
6-152	Virt dig out 1
6-152	Virt dig out 2
6-152	Virt dig out 3
6-152	Virt dig out 4
6-152	Virt dig out 5
6-152	Virt dig out 6
6-152	Virt dig out 7
6-152	Virt dig out 8
6-152	Virt dig out 9
6-152	Virt dig out 10
6-152	Virt dig out 11
6-152	Virt dig out 12
6-152	Virt dig out 13
6-152	Virt dig out 14
6-152	Virt dig out 15

Option2

Menu

6-155

Enable OPT2

PID		
	6-156	Enable PI PID
	6-156	Enable PD PID
PID source		
	6-159	PID source
	6-159	PID source gain
	6-159	Feed-fwd PID
PID references		
	6-162	PID error
	6-162	PID feed-back
	6-162	PID offs. sel
	6-162	PID offset 0
	6-162	PID offset 1
	6-162	PID acc time
	6-162	PID dec time
	6-162	PID clamp
PI controls		
	6-164	PI P gain PID %
	6-164	PI I gain PID %
	6-164	PI steady thr
	6-164	PI steady delay
	6-164	P init gain PID %
	6-164	I init gain PID %
	6-164	PI central v sel
	6-164	PI central v 1
	6-164	PI central v 2
	6-164	PI central v 3
	6-164	PI top lim
	6-164	PI bottom lim
	6-164	PI integr freeze
	6-164	PI output PID
	6-164	Real FF PID
PD controls		
	6-168	PD P gain 1 PID
	6-168	PD D gain 1 PID
	6-168	PD P gain 2 PID
	6-168	PD D gain 2 PID
	6-168	PD P gain 3 PID
	6-168	PD D gain 3 PID
	6-168	PD D filter PID
	6-168	PID output PID
	6-169	PID out.sign PID
	6-169	PID output
PID target		
	6-170	PID target
	6-170	PID out scale
Diameter calc		
	6-172	Diameter calc
	6-172	Positioning spd
	6-172	Max deviation
	6-172	Gear box ratio
	6-172	Dancer constant
	6-172	Minimum diameter

DRIVECOM		
	6-195	Malfunction code
	6-195	Control-Word
	6-195	Status word
	6-196	Speed input var
	6-196	Speed ref var
	6-196	Act speed value
Speed amount		
	6-197	Speed min amount
	6-197	Speed max amount
Speed min/max		
	6-197	Speed min pos
	6-197	Speed max pos
	6-197	Speed min neg
	6-197	Speed max neg
Acceleration		
	6-198	Acc delta speed
	6-198	Acc delta time
Deceleration		
	6-198	Dec delta speed
	6-198	Dec delta time
Quick stop		
	6-198	QStp opt code
	6-198	QStp delta speed
	6-198	QStp delta time
Face value fact		
	6-199	Face value num
	6-199	Face value den
Dimension fact		
	6-199	Dim factor num
	6-199	Dim factor den
	6-199	Dim factor text
	6-196	Speed base value
	6-196	Speed input perc
	6-196	Percent ref var
	6-196	Act percentage
SERVICE		
	6-83	Password 2

ai5020-r

5.3. START UP

Warning

The safety instructions, danger warnings and technical data in the previous section of this manual must be observed!

Conventions

Positive speed is clockwise rotation seen from the motor drive shaft end.

Negative speed is counterclockwise rotation seen from the motor drive shaft end.

Positive torque is torque in clockwise direction seen from the motor drive shaft end.

Negative torque is torque in counterclockwise direction seen from the motor drive shaft end.

These conventions are listed for reference. Actual rotation direction depends on mechanical configuration.

5.3.1 PRE POWER CHECKS

5.3.1.1 Setting Jumpers and Switches

Review all jumper and switch positions on the Power Regulation boards of the drive (see table 4.3.1.3 in chapter 4.3.1,).

Analog inputs 1,2,3

Analog input (voltage type) 0...10V / -10...+10V

Jumper S8/S9/S10=OFF

Analog Input (current type) 0...20mA / 4...20mA

Jumper S8/S9/S10=ON

RS485 Termination resistors

First and last drop of the net

Jumper S5/S6=ON

Other drive of the net

Jumper S5/S6=OFF

When using the 6KCV300CTI, RS232/RS485 converter, refer to the "CTI" instruction book.

For initial tune up it is recommended to disconnect any DGF or SBI (LAN cards).

5.3.1.2 Checking the Wiring and Auxiliary Voltages

The following should be checked before powering the drive:

Grounds/grounding

Verify an AC power ground wire from the incoming power / isolation transformer to the AV-300i input ground terminal.

Verify the ground lead of the AV-300i output terminal is wired to the motor, or the motor is properly grounded .

Verify the AC input leads, AC output leads, and control wiring to and from the drive terminals are not grounded.(Remember that the 0V terminal may be intentionally grounded).

Meggering

When meggering the power cables, they must be disconnected or isolated from the AV-300i drive to prevent drive damage.

Connections

Double check all connections to make sure they are tight. Verify that each connection is wired per the wiring diagrams, and are appropriate for the current and voltage levels specified.

Terminals	Description
U1, V1, W1, PE1 (ground)	3 phase AC input 400 or 480 VAC
U2, V2, W2, PE2 (ground)	3 phase AC output to motor, wire the motor according to the rotation desired.
C,D	internal DC power terminals, <i>DB units or external capacitors are wired to these terminals</i>
BR1	external braking resistor connection
26 & 27	command for external DB unit. (if used)
78 & 79	low voltage connection for motor thermistor (type DIN44081 or DIN 44082) when using a motor thermistor, remove the 1 KW resistor <i>If a motor klaxon is used, it must be wired in series with a 1k ohm resistor.</i>
80 & 82	OK relay, normally open dry contact, good for a maximum of 250 VAC, 1 A
83 & 85	relay 2, normally open dry contact, good for a maximum of 250 VAC, 1 A; functionality is programmable.

ai54121

Table 5.3.1.2.1 : Terminals description**Regulation terminals**

1,2 = analog input 1; 3,4 = analog input 2; 5,6 = analog input 3
 7 = + 10 V; 8 = -10V; 9 = common;
 12 = enable; 13 = start; 14 = fast stop;
 15 = external fault; 18 = common for 24 V power supply; 19 = + 24 VDC (internal)
 16 = common point for terminals 12 through 15, terminals 36 through 39, and terminal 41 and terminal 42.
 XS = 9 pin serial port for PC tools, use the 6KCV300CTI (or equivalent) to connect from the PC to the drive.
 XE (ENC1) 15 pin sinusoidal/digital encoder input.

Amps/Volts ratio on Current Test point XY4 – XY5

Drive size	Hall CT ratio / (n. turns x burden resistor ohms x ampl.gain)			
3F75	500 / (1 x 154 x 1)	= 3.24	3030	1000 / (1 x 13 x 1) = 76.92
3001	500 / (1 x 95.3 x 1)	= 5.25	3040	1000 / (1 x 10 x 1) = 100
3002	500 / (1 x 66.5 x 1)	= 7.5	3050	2000 / (1 x 15.8 x 1) = 126.58
3003	500 / (1 x 49.9 x 1)	= 10.02	3060	2000 / (1 x 13 x 1) = 153.85
3005	1000 / (1 x 78.7 x 1)	= 12.7	3075	2000 / (1 x 11 x 1) = 181.82
3007	1000 / (1 x 59 x 1)	= 16.95	3100	2000 / (1 x 7.87 x 1) = 254.13
3010	1000 / (1 x 42.2 x 1)	= 23.7	3125	2000 / (1 x 7.87 x 1) = 254.13
3015	2000 / (1 x 60.4 x 1)	= 9.01	3150	2000 / (1 x 5.9 x 1) = 338.98
3020	2000 / (1 x 45.3 x 1)	= 46.2	3200	4000 / (1 x 9.31 x 1) = 429.65
3025	1000 / (1 x 15.8 x 1)	= 63.29		

ai54122

Table 5.3.1.2.2 :Amps/Volts ratio

Example: 3001 size, 1V = 5.25 A (peak current)

Amps rms = Amps peak / $\sqrt{2}$

- Record motor nameplate data, encoder information, gearbox and mechanical data.

MOTOR DATA

HP (kW)		Cos phi (power factor)	
Amps		Tach type	
Volts		Tach PPR	
Hz		Motor rotation for machine fwd direction [CW/CCW]	
Rpm		Gearbox ratio	

avi54123

Caution!**The following is not allowed:**

- Operating a capacitive load on the drive
- Connecting an external voltage source to the output side of the drive
- Bridging the output side of the AV-300i directly to the AC power (bypass). If the drive is to be bypassed, the motor must be disconnected from the drive before the bypass contactor is closed.

5.3.2 POWER UP CHECKS**Check drive power supplies at the appropriate terminals:**

- Terminal 7 = + 10 V (0V at terminal 9)
- Terminal 8 = - 10 V (0V at terminal 9)
- Terminal 19 = + 24 ... 30 V (0V at terminal 18)

Verify that the hardwired stop and enable controls are operational:**Check DC link voltage (DC link parameter in Monitor/Measurement menu):**

- The value should be: 480 to 650 VDC for 400 VAC input
550 to 715 VDC for 480 VAC input
- The DC link will read higher after the drive is enabled, and even higher if the drive is braking the motor.
- Refer to troubleshooting section for different voltage levels.

5.3.2.1 Basic Settings of the Drive for all the regulation modes**Note!**

These instructions assume the drive has a default configuration. The default setting can be loaded via the load default command in the SPEC FUNCTIONS menu. Executing this command means that all modifications previously entered will be overwritten.

If the Save parameters command is executed after executing Load default command, the previous settings are lost. If the Save parameters command is not entered, the original values are retained after switching off and on the drive.

The defaults also assume that a four-pole motor with a rating that complies with the drive rating is used. Other motors can be used by entering their motor data via the "DRIVE PARAMETER / Motor plate data" menu. The rated values of the motor are entered here to ensure optimum regulation of the motor.

Drive must be disabled to enter configuration data.

See sections 5.1.1, "LEDs" and section 5.1.2, "Moving inside a menu" for information on operating the keypad.

Set AC Input voltage:

This setting is carried out via the **Mains voltage** parameter in the "Drive type" submenu of the BASIC MENU. Select the AC Input voltage connected to the drive .

Note!

If the “Undervoltage” alarm is activated when the drive is switched on for the first time, it can be cleared by pressing the CANC key.

Regulation mode:

This setting is carried out via the **Regulation mode** parameter in the BASIC MENU.

Select “Field oriented”, “Sensorless vect” or “V/f control” mode.

Base for speed related values:

Setting **Speed base value** in the BASIC MENU

This value determines the speed with the max. reference signal (e.g. 10 V) present at the analog input.

This value also defines the basis for percentage values of speed related quantities (range is +/- 200%)

Ramp time:

This setting is carried out via **Acc delta speed**, **Acc delta time**, **Dec delta speed** and **Dec delta time** parameters in the BASIC MENU.

If the maximum possible speed is entered for **Acc delta speed** and **Dec delta speed**, the time then corresponds to the ramp times from zero to maximum speed.

Note!

In the standard drive configuration, **Ramp ref 1** value is set from the analog reference via terminal board points 1 and 2.

or:

Set parameter “**Select input 1**” to the OFF condition.

Select **Ramp ref 1** in the BASIC MENU

Now set the reference value required. The sign determines the rotation direction of the drive. The reference value is not active until the entry is confirmed by pressing ENT on the keypad.

Current limit:

Set in the BASIC MENU with **T current lim +** and **T current lim -**

T current lim + = positive limit (clockwise drive and counterclockwise braking)

T current lim - = negative limit (counterclockwise drive and clockwise braking)

The default maximum value corresponds to total current = 1.36 X continuous current

Save settings:

Use **Save parameters** in BASIC MENU

Parameters must be saved so that they can be used the next time the drive is switched on.

5.3.2.2. Setting Motor parameters

The AV-300i drive is factory set for use with 4-pole standard motors, either for 400V or 460V. Enter specific nameplate data recorded for the motor to insure satisfactory performance.

Proper nameplate data is required for “**Field Oriented**” and “**Sensorless**” modes. For “**V/f control**” mode they are not necessary, however, they are recommended for better current limit control.

When using **V/f control** to operate multiple motors in parallel, the best result is obtained with motors similar or equal to each other.

MOTOR NAMEPLATE SPECIFICATIONS (Mot plate data menu):

- Set the rated voltage of the motor via the **Nominal voltage** parameter. Verify that the voltage is specified according to the motor connection, wye or delta. (Location: **Drive parameters/Mot plate data/Nominal voltage**)
 - Set the nominal speed (rated full load speed) in accordance with the nameplate specification via the **Nominal speed** parameter. (Location: **Drive parameters/Mot plate data/Nominal speed**)
 - Set the nominal frequency of the motor in accordance with the nameplate specification of the motor via the **Nom frequency** parameter. (Location: **Drive parameters/Mot plate data/Nom frequency**)
 - Set the nominal current (rated full load amps) of the motor via the **Nominal current** parameter. Verify that the current specified is according to the motor connection, wye or delta. (Location: **Drive parameters/Mot plate data/Nominal current**)
- In “V/f control” mode with multiple motors, enter a value equal to the sum of **Nominal current** of all the motors.
- Set Cos phi (power factor) per the motor nameplate via the **Cos phi** parameter. (Location: **Drive parameters/Mot plate data/Cos phi**)

• **VOLTAGE/FREQUENCY CHARACTERISTIC, “BASE” OPERATING POINT:**

The parameters **Base voltage** (location: **Drive parameters/Mot plate data/Base voltage**) and **Base frequency** (location: **Drive parameters/Mot plate data/Base frequency**) determine the degree of flux in the motor and the frequency where the field weakening range begins. The assignment of values to these parameters can be carried out according to the examples shown in the section “Motor plate data” .

Note!

The operating level of the magnetic flux of the motor must not exceed the value corresponding to the nominal operating condition. This means that the ratio Base voltage to Base frequency must not exceed the ratio Nominal voltage to Nominal frequency.

When base voltage is very close to or above the line voltage in the field weakening range, the dynamic behavior of the drive is influenced by parameter “Dynamic vlt margin” (menu LIMITS/Voltage limits).

Enter the base frequency via the **Base frequency** parameter.

Enter the base voltage via the **Base voltage** parameter.

Finally, enter **Take motor par** to enable calculation of normalization factors and to estimate values for parameters in the “Motor parameter” submenu.

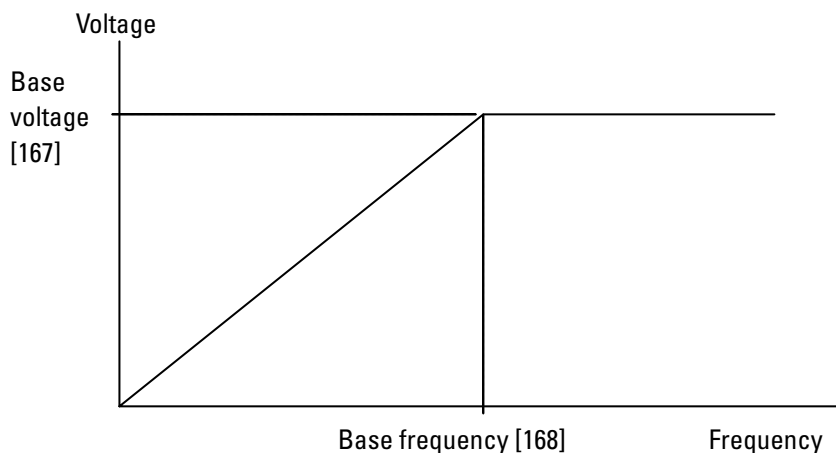


Figure 5.3.2.1.1: Voltage / frequency characteristics

In “**V/f control**”, it is possible to select the shape of the V/f characteristic:

Characteristics	Type of drive
Type 0 ($V = K \times f^{1.0}$)	Constant torque requirement across the whole speed range
Type 0 ($V = K \times f^{1.3}$)	Variable torque between types 0 and 3
Type 0 ($V = K \times f^{1.7}$)	Variable torque between types 0 and 3
Type 0 ($V = K \times f^{2.0}$)	Load where torque is proportional to the speed squared, e.g. fans and certain pump types

ga5070

MAGNETIZING CURRENT, ROTOR RESISTANCE, STATOR RESISTANCE AND LEAKAGE INDUCTANCE:

These values are not normally presented on the nameplate of the motor, although they are very important for the behavior of the drive. If they are available from the manufacturer, enter them in place of estimates computed from the self-tune.

Note!

If the command **Take motor par** is re-used, the manually entered parameters will be overwritten.

Save the setting using **Save parameters** in BASIC MENU.

5.3.2.3. Verify speed feedback setup and encoder polarity (field oriented mode)

A tachometer is required to run the drive in field oriented (vector) mode.

First, note the tachometer rotation direction (for example: A leads B when the tach is turned CW, with respect to the motor drive end), and the direction of the desired motor rotation.

Verify the tach wiring to the drive is correct and that the tach is fed the correct voltage from the drive or separate power supply.

15 pin female connector XE (for a sinusoidal or digital encoder):

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1 B-	2	3 C+	4 C-	5 A+	6 A-	7 0V	8 B+	9 +5V	10 E+	11 E-	12 F+	13 F-	14 G+	15 G-
DE	8 pole	•		•	•	•	•	•	•	•						
SE	8 pole	•		•	•	•	•	•	•	•						
SESC	12 pole	•		•	•	•	•	•	•	•	•	•	•	•		
DEHS	14 pole	•		•	•	•	•	•	•	•	•	•	•	•	•	•

ai3160

Jumpers setting:

Encoder/Jumper setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON(*)	-	-	-	-	-	-
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-	B	B
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON(*)	B	B	B	B	B	B

ai3150

(*) If the encoder is not provided with a zero channel, S17=OFF

- **DE:** 5V digital incremental encoder with $A/\bar{A}, B/\bar{B}, C/\bar{C}$
- **SE:** 5V sinusoidal incremental encoder with $A/\bar{A}, B/\bar{B}, C/\bar{C}$
- **DEHS:** 5V digital incremental encoder with $A/\bar{A}, B/\bar{B}, C/\bar{C}$ and three Hall sensor digital position signals (for AC Brushless motors)
- **SESC:** 5V sinusoidal incremental encoder with $A/\bar{A}, B/\bar{B}, C/\bar{C}$ and two sin/cos channels for absolute position (for AC Brushless motors or positioning).

- The AV-300i must be disabled and not in a run mode.
- Enter parameters for tachometer setup:
 - CONFIGURATION\Motor speed feedback\Speed fbk sel\Encoder 1 or Encoder 2, **Enter**
 - CONFIGURATION\Motor speed feedback\Encoder 1 type\ sinusoidal or digital, **Enter**
 - CONFIGURATION\Motor speed feedback\Encoder 1 pulses\ PPR, **Enter**
- Set Regulation mode to **V/f control mode** (default).
- Enable and run the drive in forward direction with a positive speed reference.
- Select **Enc 1 speed parameter** (MONITOR/Masurement/Speed/Speed in rpm menu):
 - Turn the motor shaft clockwise (view facing the drive end of motor). The values indicated must be positive.
 - If the values do not change or if random values are shown, check the encoder power supply or the encoder connections.
 - If the displayed values are negative, reverse encoder terminals. Channel A+ and A- or B+ and B-
- Set Regulation mode to **Field oriented** mode.
- Save the settings using Save parameters in BASIC MENU.

The drive is now set up and ready to continue with final start up.

5.3.3. SELF TUNING

Note!

In order to execute any of the self-tuning procedures (1, 2a or 2b, 3), Main commands must be set as Digital and ENABLE input (terminal 12) must be driven high (+24V).

If this setting is omitted the message “Set main cmd = Dig” will be displayed.

It is not necessary to set parameters “Enable drive = Enable” or “Regulation mode = Self-tuning”, because they will be automatically set by the drive and reset at the end of the self-tuning procedure.

- Self tuning procedure is divided into three parts:

The first part, “**Self-tune 1**”, identifies the voltage compensation parameters, stator and rotor resistances, and leakage inductance. Then it computes appropriate gains for the current regulator, according to the “optimum module” algorithm.

When “Self- tune 1” is executed, the motor shaft rotation should not rotate.

The second part identifies the magnetizing curve of the motor, that is, parameters that shape the saturation curve and magnetizing current of the motor.

The self tune computes appropriate gains for flux and voltage regulators. The second part is available in two versions, “**Self-tune 2a**” and “**Self-tune 2b**”.

- “Self-tune 2a” requires free shaft rotation at 50% rated motor speed (the shaft must be uncoupled from the load).
- If free shaft rotation is not possible, “Self-tune 2b” can be used because it is executed with the motor at standstill.

“Self-tune 2a” provide results with better accuracy, therefore it should be used whenever possible.

The third part, speed regulator tuning, identifies the total inertia value at the motor shaft ($\text{Kg}\cdot\text{m}^2$), the friction value (or Loss compensation) in $\text{N}\cdot\text{m}$, and computes the Proportional and Integral gains of the speed regulator.

It is necessary to take into account the following limits:

- Nominal current [164] parameter cannot be set to a value lower or equal to $0.3 \times I_{2N}$ (I_{2N} = drive nominal current-class 1 at 400V)
- Magnetizing current [165] parameter must not result in higher than I_{CONT} (drive continuous current).

TO EXECUTE PART 1, enter DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 1.

Start execution by entering “Start part 1”, **Enter**.

The procedure takes a few minutes, and can be interrupted by either powering the AV-300i off or pressing the CANC button.

You may hear some buzzing noise from the motor during this execution.

The progress of the tune is shown with messages such as “Measuring xxx”

At the beginning of “Self-tune 1” a sudden, short rotation may occur due to parasitic torque. This is caused by slot alignment between stator and rotor.

Results of the self-tune may be unreliable, when the message “xxx range error” or “timeout” is displayed. Repeat the execution. Usually this problem disappears after the first trial. If shaft rotation occurs, it will be necessary to lock the rotor in order to get reliable results.

“xxx range error” or “Timeout” messages may also occur for some extreme parameter ranges (see section 6.4.2.1, “Self-tuning”). Repeat execution in this case. If error messages are persistent, a manual tuning procedures (next section) should be used.

After self tuning is finished, the new parameter values (“Nw” suffix) can be compared to existing values by browsing the subsequent menu entries. New parameters can be accepted all together by entering “**Take val part 1**”. In this case existing values are overwritten. “Self-tune 1” can be repeated, whether values from the previous trial have been accepted or not.

Note!

“Take val part 1” does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. The **Save parameters** function, located in the BASIC MENU or SPEC FUNCTIONS menu needs to be used to permanently store values.

TO EXECUTE “Self-tune 2a”, enter menu DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune2a. Start the execution by entering “Start part 2a”, then **Enter**.

The procedure takes a few minutes, and can be interrupted by either powering the AV300i off or pressing the CANC button.

Progress of the tune is indicated by the message “Measuring sat2a”.

WARNING!

The motor shaft will rotate up to 50% rated speed in part 2a of the self tune.

Note!

The shaft must be free to rotate uncoupled from the load, otherwise results may be completely unreliable.

In case of extreme parameter values, a timeout message may occur. Repeat the execution in this case. If an error message is repeated, keep default values for parameters **P1 flux model** and **P2 flux model** and then use the manual tuning procedure for Magnetizing current (see section “Checking and manual tuning of Magnetizing current”).

After self-tuning is finished, new values can be compared to the existing ones. New parameters supersede the previous ones if “**Take val part 2a**” is entered.

Note!

“Take val part 2a” does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. The Save parameters function, located in the BASIC MENU or SPEC FUNCTIONS menu needs to be used to permanently store values.

“Self-tune 2a” can be repeated, whether values from the previous trial have been accepted or not.

If free shaft rotation is not possible, “**Self-tune 2b**” provides an alternative technique that does not require shaft rotation. The menu is DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 2b.

The meaning of parameters is the same as “Self-tune 2a”, replacing “2b” suffix for “2a”.

Magnetizing current [165] parameter must not be higher than I_{CONT} (Drive continuous output current).

Self tune 3**WARNING !**

This procedure requires free rotation of the motor shaft. The Start/Stop command is disregarded, therefore it can not be used on drives with limited travel.

- This procedure is not suitable for use with “hoist” or “elevator” drives.
- It is recommended that hardwired stop control be operational.

CAUTION !

This tune is performed using the torque limit value set in the Test T curr lim parameter. The torque is applied stepwise, with no ramp (profile), therefore the mechanical transmission must not have significant backlash. It must be capable of operation at the torque limit set in the Test T curr lim parameter. The user can reduce the torque limit to a suitable value via the Test T curr lim parameter.

Note !

- Applications where the system inertia is much higher than the motor inertia value , increase the Test T curr lim parameter to avoid a “Time out” error.
- Set Regulation mode parameter (BASIC MENU) to Field oriented or Sensorless vect mode (encoder feedback is required when Field oriented mode is selected).
- Set the current limit (BASIC MENU\ T Current lim +/-) to a value compatible with the motor size and load. (Example when motor is 1/3 of the drive power, the limit should be reduced to a compatible value).
- Set the motor shaft direction: Forward or Reverse via the Fwd-Rev spd tune parameter
- Select the torque current value to be used during the test via the Test T curr lim parameter

TO EXECUTE PART 3, enter DRIVE PARAMETER\Motor parameter\Self tuning\Self tune 3.

Start execution by entering “**Start part 3**”, **Enter**.

The procedure performs an acceleration test at the torque limit value set in **Test T curr lim** parameter. Once up to speed, a deceleration test with no torque applied (coasting) down to zero speed is performed.

The speed value is 33% of the lowest of the following:

- **Speed base value**
- **Motor nominal speed**
- **Base frequency** x 60 / pole pairs (crossover speed)
- **Speed max pos** or **Speed max neg** according to direction of rotation.

The procedure may take a few minutes, depending on inertia and friction values.

Based on inertia and friction values, the drive will calculate the speed loop gains (**Speed P** and **Speed I** parameters).

If self-tuning of the speed regulator is not satisfactory, refer to manual tuning procedure in the next section.

After completion of the **Speed self tune** by the drive, the newly identified parameter values (“Nw” suffix) can be compared with existing values by browsing the subsequent menu entries. Parameters in this menu are read only. Editing of individual parameters must be done in their specific menus. New parameters can be accepted all together by entering “**Take val part 3**” after disabling the drive. Existing values are overwritten. “Self tune 3” can be repeated, whether values from the previous trial have been accepted or not.

Note!

“Take val part 3” does not store values in non-volatile memory, so values are lost if drive power is cycled off and on. You need to enter **Save parameters** in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values in non-volatile memory.

In case of extreme parameter values, error messages can occur. Repeat execution in this case. If the error message is repeated, keep default values and use manual tuning of speed regulator.

5.3.3.1 List of self tune error messages

Generic messages

Description	Note
“Drive disabled”:	Provide enable input by setting terminal 12 high.
“Not ready”:	“Take values part 1” or “Take values part 2a” or “Take values part 2b” or “Take values part 3” can not be executed because the measurement has not been completed correctly. Repeat the self tune command.
“Time out”:	Measurement has not been completed in the proper time.
“Start part...?”:	Press ENT to confirm start of measurement.
“Tuning aborted”:	Measurement aborted by user (CANC button has been pressed).
“Set Main cmd=Dig”:	Go to CONFIGURATION menu and set Main commands = digital.
“Set Ctrl=Local”:	Go to CONFIGURATION menu and set Control mode = Local.
“Reg mode NOK”:	Self tune part 3 can only be executed Regulation mode = Field oriented or Regulation mode = Sensorless vect . Go to BASIC MENU and set Regulation mode properly.

5.3.3.2 Measurement error messages

These messages may occur when extreme parameter values have to be identified. It can be useful to retry the self tune command when any of the following messages occurs. If the messages persist, alternative manual tuning procedures should be used.

Description	Note
“No break point”	Self tune part 1 failed. Check the connections between the inverter and the motor and repeat self tune part 1.
“Overspeed”	Self tune part 3 detected a much higher speed than expected. Repeat self tune 1 or the manual tuning that was performed.
“Drive stalled”:	Increase value of parameter Test T curr lim and repeat Self tune 3
“Load applied”:	Rated load torque at standstill was detected. Self tune 3 is impossible for this type of load.
“T curr too high”:	Reduce value of parameter Test T curr lim for Self tune 3
“Friction null”:	Value of friction is zero or lower than the accuracy limit of the control system.

5.3.4 MANUAL TUNING

5.3.4.1 V/F CONTROL MODE

5.3.4.1.1 Magnetizing current in V/f control

Note!

You may skip this section if Self-tune 2 executed successfully.

For an accurate current limit function in “**V/f control**” mode, it is useful to check the accuracy of magnetizing current by using the following procedure:

- Operate the motor between 50 % **Nominal speed** and **Nominal speed**, making sure electromechanical resonance areas have been avoided.
- **Magnetizing curr** parameter should be adjusted until **Magn working curr** equals the value read in **Motor current** (see Motor current in the Basic menu).

For “**V/f Control**” mode the following sections are relevant:

- Voltage boost (Sect 6.4.2.3.1)
- Slip Compensation (If Used) (Sect 6.4.2.3.2)
- Current Limit setting (Sect 6.6.2)
- DC Braking current (If Used) (Sect 6.15.9)

5.3.4.1.2 Tuning of voltage compensation parameters

Note!

You may skip this section if Self-tune 1 executed successfully.

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate for the distortion, monitor the “current U” variable on an analog output. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is adjusted through the two parameters **Voltage comp lim** and **Comp slope** in the “Dead time comp” menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/ Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

5.3.4.2 SENSORLESS VECT MODE

5.3.4.2.1 Tuning of voltage compensation parameters

Note!

You may skip this section if Self-tune 1 executed successfully.

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate for the distortion, monitor the “current U” variable on an analog output set. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is adjusted through the two parameters **Voltage comp lim** and **Comp slope** in the “Dead time comp” menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/ Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

5.3.4.2.2 Checking and manual tuning of magnetizing current

Note!

You may skip this section if Self-tune 1 executed successfully.

- Operate the drive without load at 50% of Base frequency by setting:

The **Output voltage** parameter in the MONITOR\Measurements menu. It should indicate a value approximately equal to 50% of Base voltage.

If this is not the case, adjust **Magnetizing current** in DRIVE PARAMETER\Motor parameter menu until the required voltage value is obtained.

5.3.4.2.3 Checking and fine tuning of Sensorless parameters

In order to obtain the best setting, a measurement of the motor rpm is suggested using a hand held tachometer. Now a comparison between the real speed and the internal speed can be made.

- **Calibration at no load**

- Set a speed reference equal to approximately 2/3 of the rated motor speed.
- Check the accuracy of motor speed. This can be optimized by adjusting the value of **Leakage inductance**. If speed accuracy does not meet the specification, store the value of **Lkg inductance** that minimizes the error and then adjust **Flux curr factor**. This parameter should adjust out the error.
- Set a speed value equal to approximately 3% of the rated speed. Then observe the error between real motor speed and reference set-point and adjust **Stator resistance** to minimize the error.

In a “Stop” condition, that is zero speed reference, the motor may tend to rotate or, if given a “Start” command, the motor may not follow the reference. In either case the **Voltage comp lim** needs to be decreased.

- **Calibration with load applied**

During the normal operation of the drive with load, it is possible to calibrate the **Rotor resistance** value. The calibration of this parameter will be carried out by observing the real motor speed with load applied. If **Rotor resistance** value is high, the real motor speed will be higher than the reference set-point, and vice-versa.

The **Low speed factor** parameter allows improvement in the available torque at speeds equal to approximately 2% of the rated speed. Increasing the parameter value will increase the available torque.

5.3.4.2.4 Manual tuning of regulator loops

The AV-300i drive contains the following closed loop regulators:

- Current regulators for active current (Torque) and reactive current (Flux). The value of gains are the same for both these regulators.
- Flux regulator (normally requires manual tuning only for applications operating in the constant HP range).
- Speed regulator (Sensorless vect and Field oriented mode)
- Voltage regulator (does not require tuning).

Using the Test generator function

To tune the regulators, an internal test generator can be used. Evaluation to a step response can be made. This process requires using an oscilloscope.

The test generator provides a square-wave signal with an adjustable frequency, amplitude, and offset. The **Gen access** parameter determines which regulator input the signal is assigned to. Further information on this is provided in section 6.16.1, “Test generator”.

The menu structure to access the regulator gains is REG.PARAMETERS \ Percent value. Base values may be changed to extend the numerical ranges of the gains (REG.PARAMETERS \ Base value).

5.3.4.2.4.1 Manual tuning of current regulator

Note!

You can skip this section if Self-tune 1 operated successfully.

- **Drive disabled**
- Select the following settings for the test generator:
 - **Gen access** = F current ref
 - **Gen frequency** = 60 Hz
 - **Gen amplitude** = 10 %
 - **Gen offset** = 60 %
- Current measurement should be done on the regulation card (test points XY4 / XY5).
- Set **Current P** and **Current I** parameters in the REG PARAMETERS / menu to 0.00.

Note!

Voltage saturation may occur during the optimization process (see Figure 5.3.4.1). In this case the value for Gen amplitude and also for Generator offset should be reduced. Take extra care to protect against the voltage saturation effect with motors up to 7.5 kW.

- **Enable drive**
- Increase **Current P** until the reaction time is approximately 1 ms and the overshoot is less than 4 % of the applied step (see Figures 5.3.4.2 to 5.3.4.4)
- Increase **Current I** until the overshoot is greater than 4 %. Then reduce it until it is less than 4% of the applied step (see Figure 5.3.4.5 and 5.3.4.6).
- Stop and disable drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command

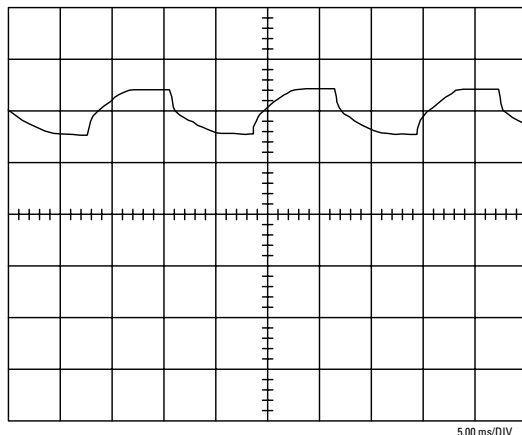


Figure 5.3.4.1 Phase U. current reaches saturation: Gen amplitude and Generator offset set too high.

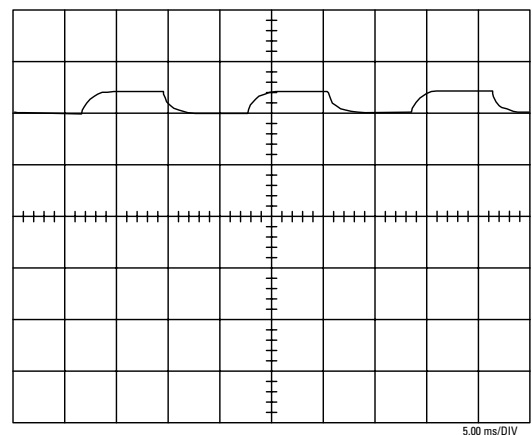


Figure 5.3.4.2 Current in phase U. "Current P" parameter is too small.

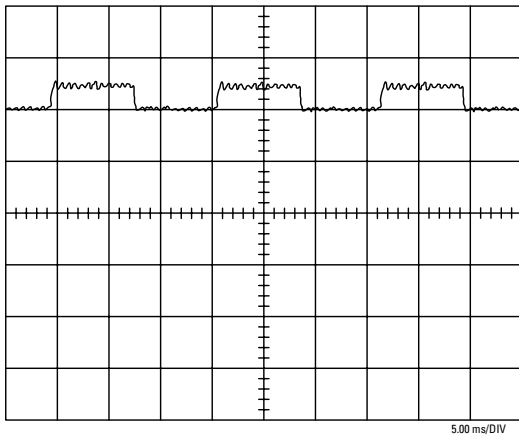


Figure 5.3.4.3: Current in phase U. "Current P" parameter is too high.

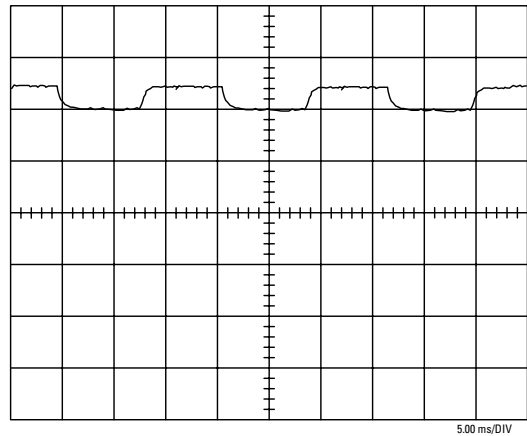


Figure 5.3.4.4: Current in phase U. "Current P" parameter is set correctly.

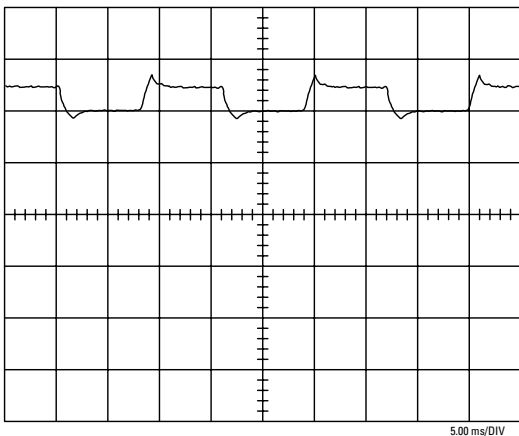


Figure 5.3.4.5: Current in phase U. "Current I" parameter is too high.

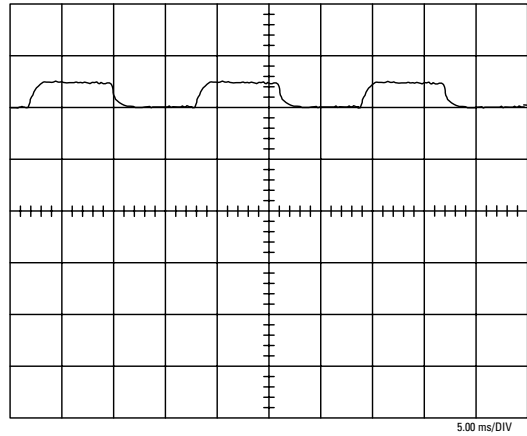


Figure 5.3.4.6: Current in phase U. "Current P" and Current I" parameters are set correctly.

5.3.4.2.4.2. Manual tuning of flux regulator

Note!

This section can be skipped if Self-tune 2a or 2b have been performed successfully.

If self-tuning has failed or has not been correctly carried out, then manual tuning can be used.

This operation is usually required only for applications in the constant HP range.

- **Drive disabled**
- Select the following settings for the test generator:
 - Gen access = Flux ref
 - Gen frequency = 2 Hz
 - Gen amplitude = 10 %
 - Gen offset = 20 %
- Measure the actual value via an analog output. Set "**Flux**" to an analog output and "**F current ref**" to a second analog output. (see section 6.13, "I/O Configuration").
- Set **Flux P** and **Flux I** parameters in the REG PARAMETERS / ... to zero.
- **Enable the drive and start**

Increase Flux P until the reaction time is approx. 40 ... 60 ms and the overshoot is less than 4 %. Insure that saturation does not occur to the variable **F current ref** (see Figure 5.3.4.7). If saturation does occur;

- Reduce **Gen amplitude** and/or **Gen frequency**.
- Increase **Flux I** until the overshoot is greater than 4%. Then reduce it until it is just less than 4 % (see Figures 5.3.4.10 and 5.3.4.11).
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

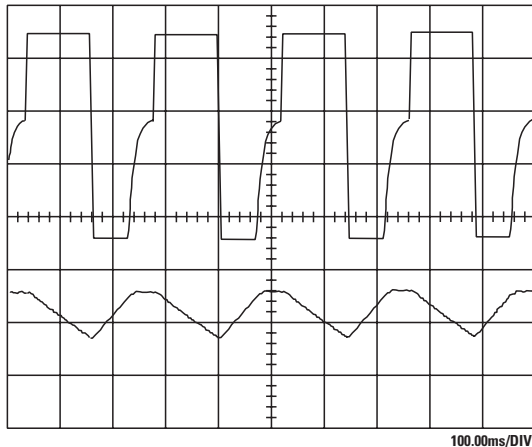


Figure 5.3.4.7: F current ref, Above; Flux, below; Test generator amplitude and/or frequency too high. Decrease both.

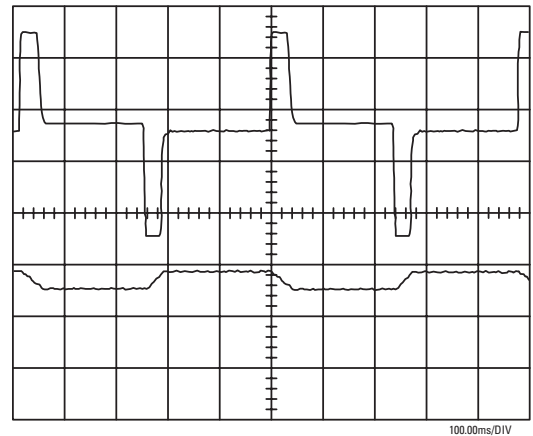


Figure 5.3.4.8: F current ref, Above; Flux, below. Flux P is too high

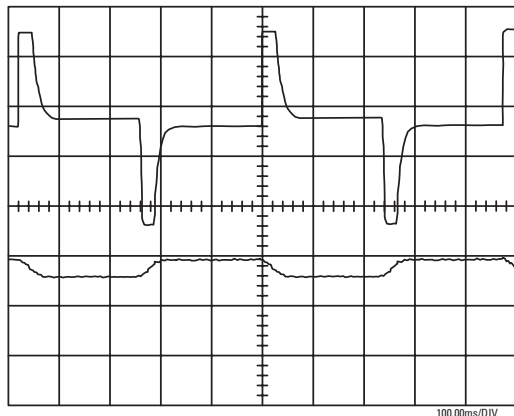


Figure 5.3.4.9: F current ref, Above; Flux, below. Flux P set correctly.

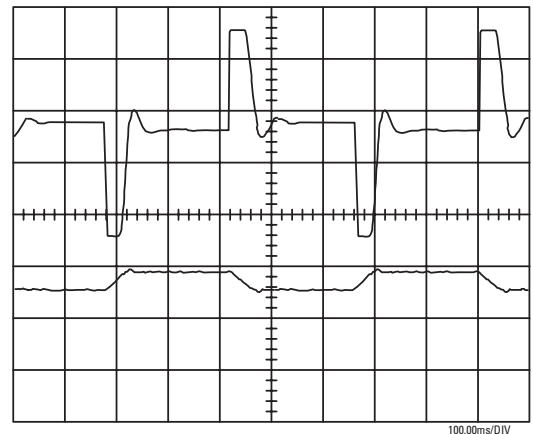


Figure 5.3.4.10: F current ref, Above; Flux, below; Flux I is too high.

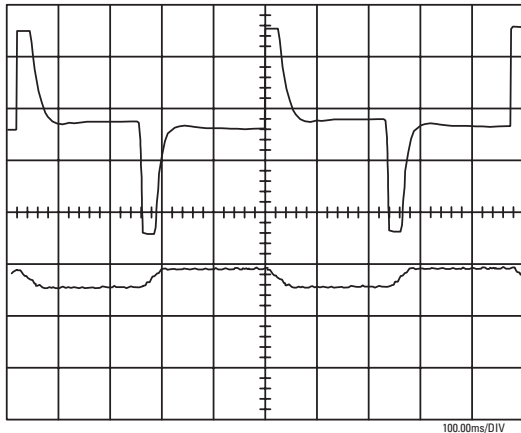


Figure 5.3.4.11: Above, F current ref; below, Flux. Flux P are Flux I are set correctly.

5.3.4.2.4.3. Manual tuning the Speed regulator

- **Drive disabled**
- Select the following settings for the test generator (high inertial loads may require different setting):
 - **Gen access** = Ramp ref
 - **Gen frequency** = 0.2 Hz
 - **Gen amplitude** = 10 %
 - **Gen offset** = 10 %
- Measure the actual value via an analog output. For this the **Actual speed** variable must be assigned to an analog output and the **Torque current** variable to a second analog output (see section 6.13, "I/O Configuration").
- Set the **Acc delta speed** parameter in the BASIC MENU to the highest possible value and the **Acc delta time** parameter to 1 s.
- If possible set the deceleration via **Dec delta speed** and **Dec delta time** in the same way. This is normally only possible with loads with a very low inertia or drives using a braking unit. Otherwise the values should be set so that there is no overvoltage alarm when the motor is regenerating.
- Set the **Speed P** and **Speed I** parameters in the REG PARAMETERS / menu to zero.
- **Enable the drive and start**
- Increase **Speed P** until the overshoot is less than 4 % with a fast response time.
- Increase the **Speed I** parameter until the overshoot is greater than 4 %.
Then reduce it until it is less than 4 %.
- Stop and disable the drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

Note!

If the ripple level on the estimated speed is significant, it is possible to attenuate it by increasing the value of the **Sls speed filter**. This parameter represents the time constant of the low-pass filter applied to the estimated speed. Increasing the value of **Sls speed filter** does reduce the available bandwidth of the speed regulator.

In some cases it is necessary to have variable gains in the speed regulator above the Base speed range. For this purpose the AV-300i is provided with an adaptive speed regulator. For further information on this function see section 6.14.2, "Adaptive spd reg".

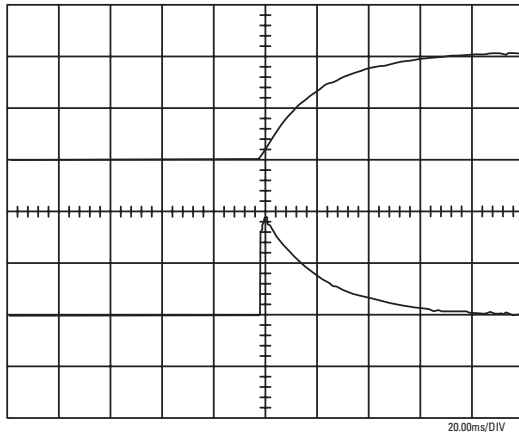


Figure 5.3.4.12: Motor speed, Above; Torque current, below. Speed P is too small.

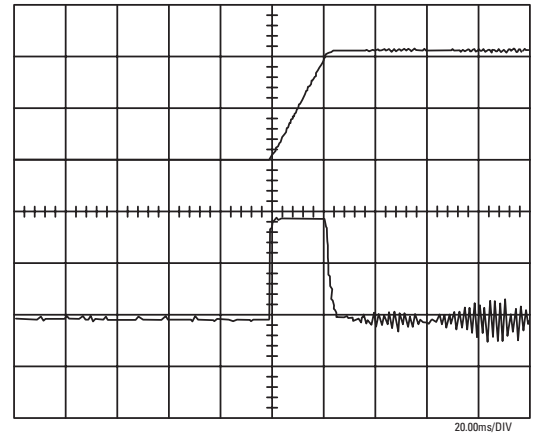


Figure 5.3.4.13: Motor speed, above; Torque current, below. Speed P is too high.

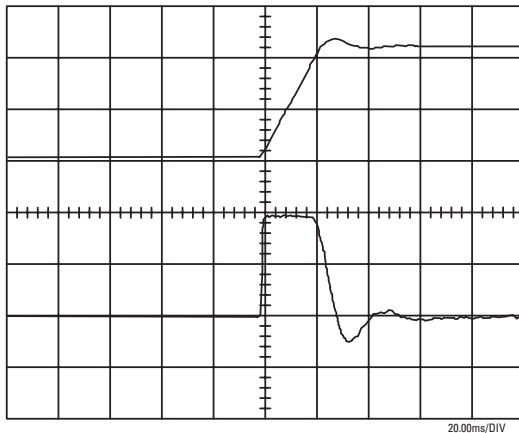


Figure 5.3.4.14: Motor speed, above; Torque current, below. Speed I is too high.

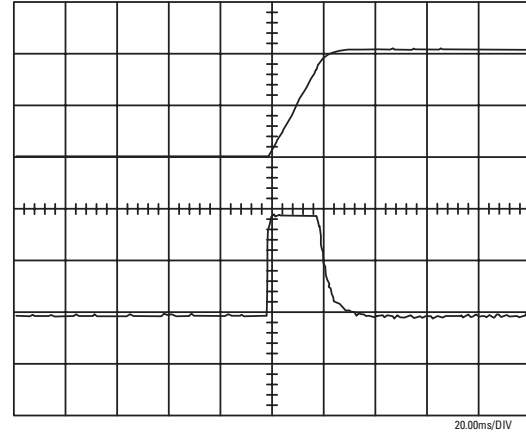


Figure 5.3.4.15: Motor speed. above; Torque current, below. Speed P and Speed I are set correctly.

5.3.4.3 FIELD ORIENTED MODE

5.3.4.3.1 Checking and manual tuning of magnetizing current

Note!

Skip this section if Self-tune 2 executed successfully.

- Operate the drive without load at 50% of Base frequency by setting:

$$\text{Ramp ref 1 [rpm]} = \frac{60 \times \text{Basefrequency} \times 0.5}{\text{N. of pole pairs}}$$

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The **Output voltage** parameter in the MONITOR\Measurements menu should indicate a value approximately equal to 50% of base voltage. If this is not the case, adjust **Magnetizing current** in DRIVE PARAMETER\Motor parameter menu until the required voltage value is obtained.

5.3.4.3.2 Manual tuning of Rotor resistance

Note!

Skip this section if Self-tune 1 executed successfully.

There are three methods for this test:

The **first method** is based on steady-state load test. It offers the best accuracy and should be used if the mechanical system is compatible with the procedure.

- Operate the drive at 50% of base frequency, (as in section 5.3.4.3.1, “Checking and manual tuning of magnetizing current”), but with load applied.
- Check that the drive is not in current limit.
- Compare **Output voltage** with the reading at no load. The value should be approximately the same, possibly 2-3% higher. If a strong voltage difference appears when load is applied, tune the value of **Rotor resistance** until **Output voltage** reaches the correct value. Increase Rotor resistance if **Output voltage** is too high, and vice-versa.

If load test cannot be used, other methods based on dynamic response are available. However, the current regulator must be properly tuned in order to use these methods (for manual tuning of the current regulator, see section 5.3.4.3.3.1, “Manual tuning of current regulator”).

As an alternative to the steady-state load tests, the following two methods are based on dynamic response tests. The **Rotor resistance** parameter in the DRIVE PARAMETER / Motor parameter menu can be adjusted in the two following ways:

Method 2: Through a step change in the speed reference evaluate the speed response (see below).

Method 3: Through a step change in the torque reference value evaluate the speed response (see below).

Method 2

If the incorrect rotor resistance value is set, an unstable speed will occur on accelerations in current limit. The following can be used for calculating the correct value.

- **Drive disabled**
- Select the following settings for the test generator:
 - **Gen access** = Ramp ref
 - **Gen frequency** = 0.1 Hz
 - **Gen amplitude** = 50 % of the required speed jump
 - **Gen offset** = same value as for **Gen amplitude**
- Measure the actual value via an analog output. For this the Actual spd variable must be assigned to an analog output and Torque current to a second analog output (see section 6.13, “I/O Configuration”).
- Set the Acc delta speed and Acc delta time parameters in the BASIC menu so that the drive accelerates in current limit (shortest possible acceleration time).
- Set the deceleration time via Dec delta speed and Dec delta time so that there is no overvoltage alarm when the drive decelerates.
- **Enable drive and start**
- Ensure that the drive works in current limit when accelerating. If not, shorten the acceleration time accordingly or reduce the current limit.
- Speed oscillations will occur if the **Rotor resistance** value is incorrect, as shown in Figure 5.3.4.14.
- Change the value until the behavior shown in Figure 5.3.4.15 is established.
- Stop and disable the drive.
- If the **T current lim +** parameter was reduced, it should be reset to its original value.
- Set **Gen access** = Not connected
- Save settings via **Save parameters** command.

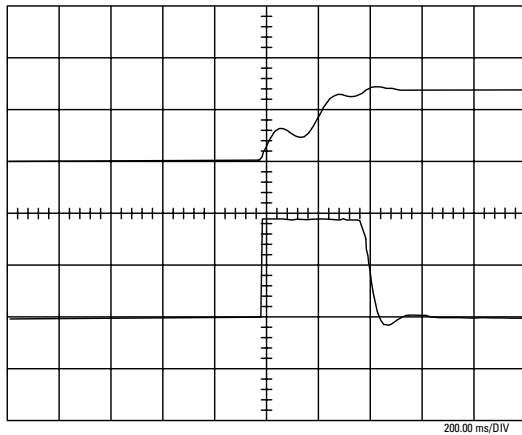


Figure 5.3.4.16: Motor speed, above; Torque current, below. The rate is incorrect. Change the “Rotor Resistance” value until the behavior corresponds to Figure 5.3.4.13.

Method 3

In order to check whether an incorrect value for Rotor resistance is present, a square wave torque reference value should be specified that has an average value of zero. Since the speed depends on the acceleration torque, it must have a sawtooth shape with sharp corners. If the corners are rounded, an incorrect value has been entered for rotor resistance.

Note!

The motor must be operated without load applied with this method

- **Drive disabled**
- Preset the following settings for the test generator:
 - **Gen access** = T current ref
 - **Gen frequency** = 20 Hz
 - **Gen amplitude** = 5 %
 - **Gen offset** = 0 %
- Measure the actual values via an analog output. Set the Actual speed variable to an analog output and Torque current variable to a second analog output (see section 6.13, “I/O Configuration”).
- **Enable drive and start**

The motor shaft should turn in both directions. If the measured speed is too low, the value for **Gen amplitude** should be increased and/or the value for **Gen frequency** should be reduced (change the values in small increments, in order to avoid uncontrolled behavior).

- Change the **Rotor resistance** value until the speed signal measured is sawtooth-shaped and has sharp corners.
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

Note!

For motors rated 40 HP and higher, thermal drift of the **Rotor resistance** may cause a change in the performance. In this case on-line adaption for Rotor resistance should be enabled via the parameter **Enable rr adap** in the SPEC FUNCTION menu (see section 6.16.2).

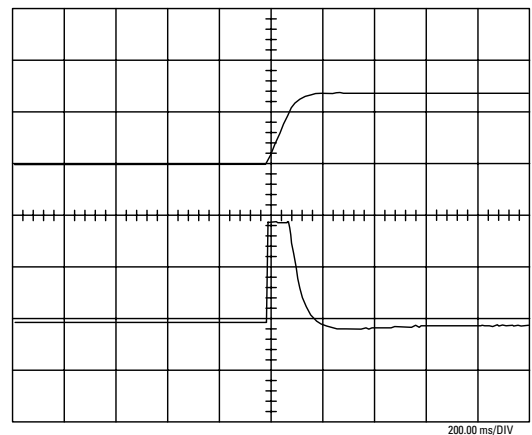


Figure 5.3.4.17: Motor speed, above; Torque current, below; Correct setting for Rotor resistance.

5.3.5 ENHANCED REGULATOR FEATURES

5.3.5.1. Setting the Speed zero logic

The drive is factory set with the speed zero logic disabled. A detailed description of the drive settings is in section 6.8.2., "Spd zero logic".

Speed zero logic enables special tuning parameters when zero speed is detected.

Ref 0 level is used to define the switch threshold for the speed zero logic. References below this threshold are considered zero.

Selecting the proportional gain at zero speed is as follows:

Speed P gain equals **Spd=0 P gain** at zero speed (Enable spd=0 P = Enabled).

Speed P gain equals the normal P gain (Enable spd=0 P = Disabled).

Deactivate the P gain specified with **Spd=0 P gain** when:

The reference value is over **Ref 0 level** (Enable spd=0 R = Enabled).

The reference value or **Actual speed** exceeds thresholds (Enable spd=0 R = Disabled).

Enable spd=0 I is only effective if **Enable spd=0 P** has been enabled

Disable the I component of the speed regulator with speed=0:

Integral component disabled **Enable spd=0 I** = Enabled

Integral component enabled **Enable spd=0 I** = Disabled

When the motor is stopped, it is possible to avoid position overshoots by the speed I. When the motor is switched off, it can not turn any load and therefore this function is not suitable for all applications!

In Sensorless mode enabling **Enable lck sls** disables speed control and field rotation when the speed reaches the zero threshold. This function is provided to avoid drift.

Direct current, equal to the magnetizing current, is injected into the motor and no significant torque production is possible.

5.3.5.2 Anti Drift function (only for field oriented control)

Enabling this function locks the rotor of the motor at zero speed, using an internal position control.

It is activated via a digital input or Bus, using the command **Lock zero pos**. It is active when the zero speed threshold(**Speed zero level**) is reached.

Enable the Anti Drift function:

Anti Drift function enabled **Enable zero pos** = Enabled

Anti Drift function disabled **Enable zero pos** = Disabled

Lock zero pos This command operates the Anti drift function through a the digital input, keypad or Bus.

Zero pos gain [%] Proportional gain of the position control

Also refer to parameters ADD SPEED FUNCT / Speed zero / Speed zero level and Speed zero delay

Anti Drift application example:

- Enable zero pos = Enabled
- Lock zero pos = Enabled
- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is active and the motor reaches 10 rpm, the position control is automatically activated after 100 msec.

To restart, it is necessary to set the command Lock zero pos = Disabled before the START command is given

5.3.5.3 Adaptive speed

Note!

The adaptive speed regulation is used if the gain of the speed regulator has to be changed anywhere in the speed range or as a function of other selectable inputs. The details of the different parameters are described in section 6.14.2, "Adaptive spd reg".

Enable adaptive speed regulation with the drive disabled. **Enable spd adap** = Enabled. This makes the settings of **Speed P** and **Speed I** invalid.

Specify the controlling variable which will switch the speed regulator gains. Normally this is based on speed (**Select adap type** = Speed).

If the gain is to be changed on the basis of a different variable, set **Select adap type** = Adap reference. The other variable must be connected to the drive via an analog input. It is also possible to set **Adap reference** via the serial interface or a bus.

The setting of **Adap speed 1** and **Adap speed 2** produces three ranges that can have different gains. Enter the value as a percentage of the **Speed base value** or the maximum value of **Adap reference**.

For **Select adap type** = Speed: The optimization is carried out as previously described for the Speed regulator. Note the following:

- **Gen offset** is assigned a value that is in the lower range to be optimized, however outside of the transition range specified by **Adap joint XX**.
- Use **Gen amplitude** to define the jump so that the speed stays within the range to be optimized.
- This optimization must be set for each range separately and the regulator parameters by range via **Adap P gain XX** and **Adap I gain XX**.
- Run through the entire speed range after the ranges have been optimized.
- Instabilities within the transitions from one range to the next can be reduced by changing the values for **Adap joint XX**. Increase the values for a more gradual transition.

For **Select adap type** = Adap reference: the optimization depends on the system so that no general setting instructions can be given here.

The gains of the speed regulator set via **Adap P gain 1** and **Adap I gain 1** are active at the zero speed threshold and when the drive is disabled. When the zero speed logic is enabled, the gains that were set when the motor is switched off are valid.

5.3.5.4 Speed-up function

With loads having a high moment of inertia (large torque current to make a speed change) it is possible to “force” the speed regulator during speed changes using the function “Speed-up”. The figures 5.3.5.4.1 and 5.3.5.4.2 show the influence of this function.

Parameters used in the example:

Speed up base	14 rpm/ms
Speed up gain	50 %
Speed up filter	20 ms

- See section 6.8.4 for other parameter details.

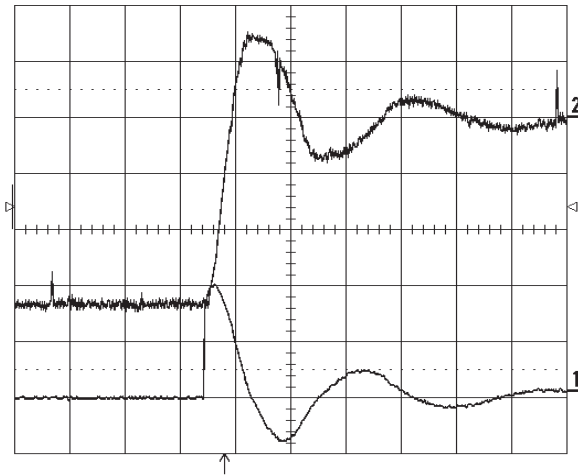


Figure 5.3.5.4.1: Actual spd., above. Motor current, below; jumps with the speedchanges due to a high moment of inertia. The function Speed-up is not active.

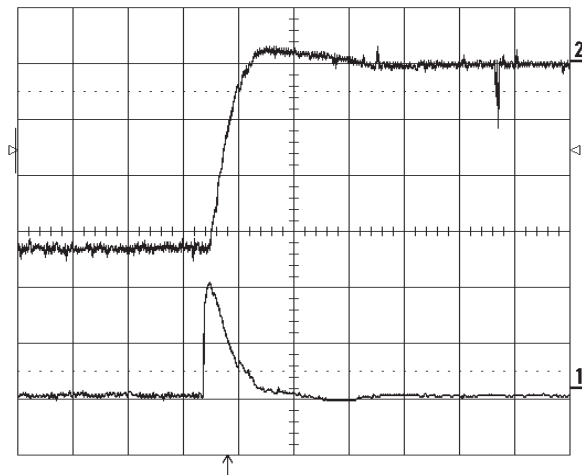


Figure 5.3.5.4.2: Above: Actual spd. Below: Motor current The same drive with Speed-up function active

5.3.6 TROUBLESHOOTING

See OVERFLOW LIST on chapter 6.4.1. and chapter 8.

6. Function Description

Menu structure

BASIC MENU	Parameters required for the basic setup of the drive
MONITOR	Display of reference values, speed, voltage, current, frequency...
DRIVE PARAMETER	Entry of motor parameters, self-tuning, definition of the saturation curve for the field weakening range, sensorless parameters, V/f control parameters and functions
INPUT VARIABLES	Ramp reference value, speed reference value, torque reference value
LIMITS	Speed limitation, Current limitation, Flux limitation, Voltage limitation
RAMP	Acceleration, deceleration, quick stop, ramp shape
SPEED REGULAT	Configuration of the speed regulator, Speed zero logic, Anti Drift, Speed up function, Droop function, Inertia Loss comp
CURRENT REGULAT	Configuration of the current regulator
FLUX REGULATION	Configuration of the flux regulator
REG PARAMETERS	Parameters for speed, current, flux regulation
CONFIGURATION	Operating mode, regulation mode, encoder type, factor function, programmable failure alarms, address, PWM frequency, password
I/O CONFIG	Configuration of programmable digital and analog inputs and outputs, Tach follower
ADD SPEED FUNCT	Auto capture, adaptive speed regulation, speed control, speed zero logic
FUNCTIONS	Motor potentiometer, jog function, internal multi-speed function, multi-ramps, overload control, Brake Unit control, Stop control, Power loss management
SPEC FUNCTION	Test generator, saving parameters, loading factory default settings, failure register, signal adjustments, PAD parameters, DC Braking functions
OPTIONS	Access to the Field Bus Card parameter (option 1), access to the DGF optional Card (option 2), PID function
DRIVECOM	Parameter settings for the DRIVECOM profile
SERVICE	Service menu, only accessible to service personnel of the manufacturer

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6.1. Enable Signals

The following hardware enable signals are always required, whether the device is to be controlled via the terminal strip, the keypad or the serial interface.

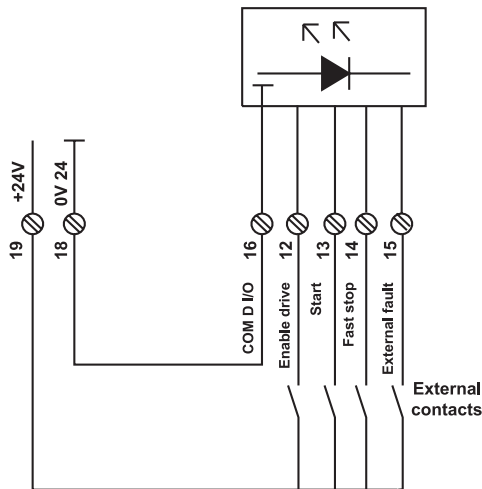


Figure 6.1.1: Enables via potential free contacts and PLC

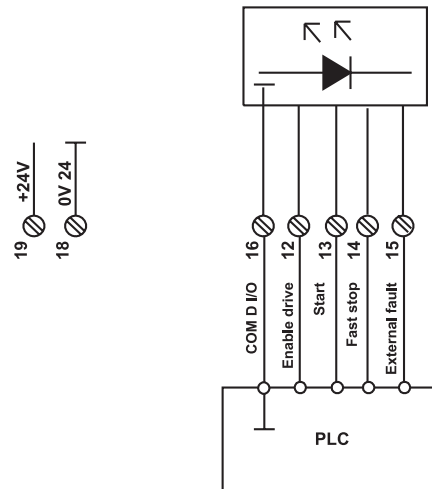


Figure 6.1.2: Enables via PLC

Figure 6.1.1 show the connection principle

The enable signals are activated via a +15 ... 30 V voltage at the appropriate terminals. The inputs are protected against reverse polarity.

Negative voltage, 0 V and a missing signal are interpreted as disable signals.

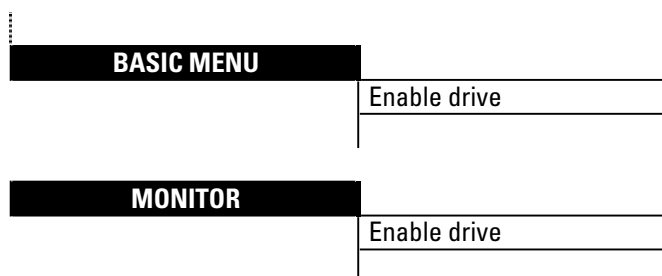
The reference point for the enable signals is terminal 16.

When using an operator keypad/serial interface, the signals on the appropriate terminals and the corresponding commands must be sent via the keypad/serial interface. If an enable is removed via a signal on the terminals, the appropriate command must be sent via the keypad/serial interface in addition to the signal on the terminal in order to restart the drive.

There are four types of enable signals that have a different effect on the behavior of the AV-300i Drive.

- **Enable drive** enables inverter modulation
- **Start** enables regulation
- **Fast stop** sets the speed reference value to zero with a fast ramp so that the drive is stopped as quickly as possible
- **External fault** incorporates external fault conditions into the enable logic

6.1.1. Enable drive



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable drive	314	0	1	Disabled	Terminal 12 + 15...30V 0V
Enable					
Disable				(0)	

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The **Enable drive** command activates the AV-300i Drive.

An auxiliary contact on the AC Input contactor may be wired in the Drive enable (terminal 12).

When the **Enable drive**=disable and terminal 12=0 V, no other control commands (e.g. **Jog +**, **Jog -** or **Start**) are accepted.

Removal of the **Enable drive** command (**Enable drive**=disable) while the drive is running causes the motor to coast stop. Neither electrical braking nor controlled stopping of the motor within a prescribed time during this slow down is possible. Restart of the drive during this time is not allowed.

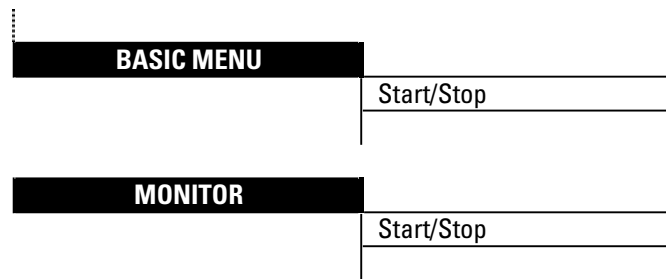
When operated via the keypad the **Enable drive** command is provided in the BASIC MENU and in the MONITOR menu.

Using the **Enable drive** command from keypad (**mains command**=Digital), requires the active voltage level on terminal 12.

Using the **Enable drive** command from terminal 12 requires that the "**Main command**=terminals".

Enable drive in the menu is a read only parameter.

6.1.2. Start/Stop



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Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Start/Stop	315	0	1	Stop	Terminal 13 + 15...30V 0V
Start					
Stop				(0)	

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When the "**Main commands**" is set to "Digital", the **Start/Stop** parameters are used for starting the drive. The STOP button on the keypad is able to stop the drive (active voltage level is also required on terminal 13).

When the "**Main commands**" is set to "Terminals", **Start/Stop** are read only parameters.

Note:

The following signals (at a high state) are required for operating the drive in addition to the **Start** command:

- **Enable drive**
- **Fast stop**
- **External fault**

The behavior of the drive after the **Start** command depends on the parameter settings:

- When using the ramp (**Enable ramp** = Enabled and **Enable spd reg** = Enabled) the drive accelerates to the required speed according to the programmed ramp. If the Start command is removed, the drive decelerates to zero according to the programmed ramp. If the Start command is reapplied during the deceleration time, the drive accelerates to the set speed.
- If the **Speed ref 1** input reaches the speed regulator without a ramp (**Enable ramp** = Disabled and **Enable spd reg** = Enabled), the drive accelerates to the required speed in the shortest possible time once the Start command has been applied. When the Start command is removed, the **Speed ref 1** value is set to zero immediately. The Start command does not precondition the **Speed ref 2** input.
- When using the torque current regulator (**Enable spd reg** = Disabled) the **Start** command enables the torque current reference value **T current ref 1** or disables it after the **Start** command is removed. The Start command does not precondition the **T current ref 2** input.

The **Start** command is not required for the Jog function mode.

If the **Start** command and **Jog +** or **Jog -** are applied at the same time, the **Start** command is given priority.

If the **Start** command is applied during Jog operation, the Jog operation is aborted.

6.1.3. Fast Stop

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Fast stop No fast stop Fast stop	316	0	1	No fast stop (1)	Terminal 14

GA6020g

Terminal 14: + 15 ... 30 V = Fast stop disabled, 0 V = Fast stop enabled.

Note:

This function cannot be actuated via the keypad!

Application: **Fast stop** is actuated in emergencies and hazardous situations to stop the drive in the shortest possible time. This method of stopping employs an intermediate circuit and braking unit which absorbs energy and thus brings the drive to a stop in a shorter time than a coast stop.

The **Fast stop** input signal is always required to be high for operation of the drive. A removal of the command when the drive is running initiates braking with the ramp specified by the parameters **Qstp delta speed** and **Qstp delta time**.

When the drive is brought to a stop, it is still enabled and has torque. The **Enable drive** command must be removed for it to be disconnected.

The drive behavior after the **Fast stop** command depends on the type of operating mode selected:

- 1) Operation via the terminal strip with the **Main commands** = Terminals:
 - The drive keeps braking as long as there is low voltage on terminal 14. When voltage is restored, the drive automatically accelerates to the required reference value (provided the other enable commands are still active).
- 2) Operation via the terminal strip with the **Main commands** = Digital:
 - The drive executes braking until it has come to a stop. When voltage is restored on terminal 14, there is no automatic restart. The **Start** command must be re-entered from the keypad.
 - If the **Fast stop** command is used via the serial interface while there is voltage present on terminal 14, the fast stop is executed until the drive is at a stop. The **Start** command must be entered for the drive to be restarted.

6.1.4. Quick stop

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Quick stop	343	0	1	No Quick stop	
Quick stop					
No Quick stop				(1)	

GA6025g

Note:

This function cannot be actuated via the keypad!

Application: **Quick stop** is actuated in emergencies or hazardous situations to bring the drive to a stop in the shortest possible time. This method of stopping employs an intermediate circuit and braking unit (when supplied) which can absorb energy and bring the drive to a stop in a shorter time than a coast stop.

- **Quick stop** function can be assigned to a programmable digital input.
- If the Qstp Opt code = Ramp stop, the drive stops with the ramp defined by **Qstp delta speed** and **Qstp delta time** parameters.
- If the **Qstp Opt code** = DC braking curr, the drive is stops by injection of DC current (section 6.16.7)
- **When the drive is at a stop, it is disabled and thus has no torque.** The **Start** command must be given again for the drive to be re-enabled and started.

6.1.5. External fault

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
External fault	-	-	-	-	Terminal 15

GA6030g

Terminal 15: + 15...30 V = No ext. fault, 0 V = ext. fault

The **External fault** command enables an external signal to be incorporated in the failure alarm modes of the inverter.

Application example

The drive is being used for closed-loop control of a single drive without contactors. A temperature-dependent contact, which opens under excessive temperature, is located in the motor. Connect this contact between +24 V and terminal 15. When the contact opens (= overtemperature) the drive will be disabled.

- During operation a signal is always required on terminal 15, whether the commands are transmitted via the terminal strip or not.
- In the event of an external fault, the drive will behave according to the configuration set in the "Programmable alarms".

6.2. Basic menu

BASIC MENU	
	Enable drive
	Ramp ref 1
	Start/Stop
	Actual spd
	Motor current
	Drive type
	Mains voltage
	Ambient temp
	Continuous curr
	Software version
	Regulation mode
	Acc delta speed
	Acc delta time
	Dec delta speed
	Dec delta time
	T current lim +
	T current lim -
	Encoder 1 type
	Encoder 1 pulses
	Speed base value
	Save parameters

ga0421g

The BASIC MENU provides the parameters required for the initial commissioning of the drive. The data that is factory set for the default motor refers to a four-pole machine at either 400V or 460V. The motor data in the DRIVE PARAMETER menu should be changed accordingly if a different motor is used.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable drive Enable Disable	314	0	1	Disabled (0)	Terminal 12
Start/Stop Start Stop	315	0	1	Stop (0)	Terminal 13
Actual Spd [rpm]	122	-8192	+8192	—	Analog output 1*
Motor Current [A]	231	0.00	S		Analog output 4**
Mains voltage 230V 400V 460V	333	0	2	460 V (2)	
Ambient temp 50°C 40°C	332	0	1	40°C (1)	—
Software version	331				
Continuous curr	802	S	S	S	
Regulation mode Sensorless Field oriented V/f control Self-tuning	321	0	3	V/f control (3)	
Acc delta speed [FF]	21	0	232-1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	232-1	100	
Dec delta time [s]	30	0	65535	1	
Ramp ref 1 [FF]	44	-2*P45	-2*P45	0	Terminals 1/2
T current lim + [%]	8	0	F	S	*
T current lim - [%]	9	0	F	S	*
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Speed base value [FF]	45	0	16383	1500	
Save parameters	256	0	65535		

GA6035ai

* This function can be assigned to a programmable analog input

** This function is assigned to programmable analog outputs (optional card required)

S= Factory set value dependent on the size of the drive.

See index for further information on the individual parameters.

Enable drive

When controlling the drive via the keypad, the drive is activated via the **Enable drive** parameter. Voltage is also required on terminal 12. The “Start” command is required to run the drive.

Enable Drive enabled

Disable Drive disabled

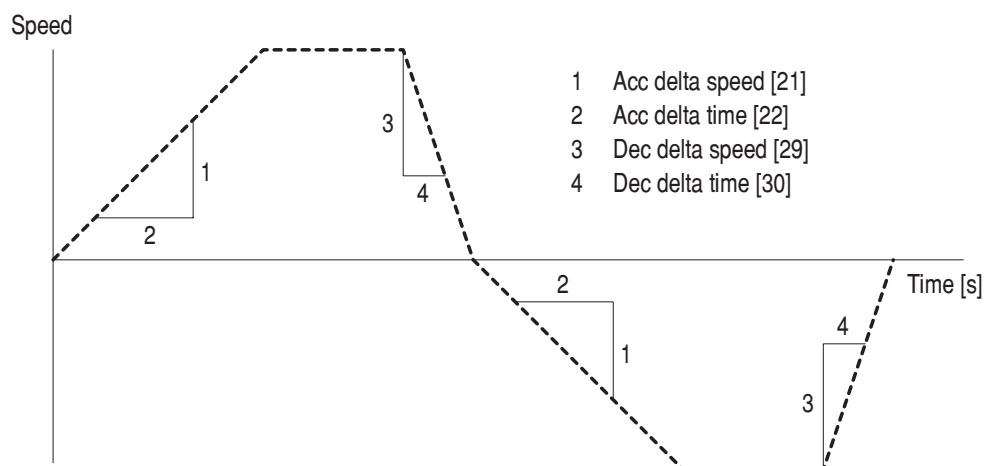
Start/Stop

If the **Start** menu is selected via the keypad, the Start/Stop status is displayed. (dedicated keys on the keypad are available to execute Start/stop, voltage is still required on terminal 13).

Actual spd	Display of actual speed value in rpm.
Motor current	Display of motor line current in A_{RMS}
Mains voltage	Rated value for the Line voltage present (e.g. 460 V). This value is used as a reference for the undervoltage trip.
Ambient temp	Selection of Ambient temperature. Temperature characteristics specified on the nameplate of the inverter. 40°C (104°F) The drive is able to provide current continuously at an ambient temperature of up to 40°C (104°F). 50°C (122°F) The drive is able to provide current continuously at an ambient temperature of up to 50°C (122°F). (See section, 3.1, "Permissible environmental conditions").
Software version	Display of the version number of the drive's operating system
Continuous current	Indicates the continuous current of the drive in relation to different derating values. E.g. Mains voltage (K_v) - PWM frequency (K_f) - Ambient temperature (K_t). This parameter is automatically set up according to the formula: $I_{CONT} = I_{2N} \times K_v \times K_t \times K_f$ For the derating factor values see table 2.3.2.1
Regulation Mode	This parameter determines the type of drive regulation. Sensorless The drive operates in a sensorless control mode. An encoder is not necessary for motor speed feedback. In this case the speed and position of motor shaft are estimated by a control algorithm. Self-tuning Automatic commissioning (see section 5.3.3, "Self-tuning"). Field oriented The drive operates in a field-oriented vector control mode. Either a sinusoidal encoder or a digital encoder is needed to provide motor speed feedback to the drive. This mode provides the best regulation performance. V/f control The motor is not vector controlled but operates according to a specified voltage/frequency characteristic curve. (See section 6.4.2.3, "Voltage/ Frequency characteristics").

The acceleration of the drive is specified as a ratio of the parameters **Acc delta speed** and **Acc delta time**, the deceleration is a ratio of the parameters **Dec delta speed** and **Dec delta time** (see Figure below). They are the same for both rotation directions of the motor.

Acc delta speed	Has the same dimension as the ramp reference value and depends on the factor function.
Acc delta time	Is specified in seconds. When "0" is entered, the ramp output follows the reference value directly.



Dec delta speed	Has the same dimension as the ramp reference value and depends on the factor function.
Dec delta time	Is specified in seconds. Entering "0" causes the ramp output to follow the reference value directly.
Ramp ref 1	1st reference value for the ramp. The value entered depends on the factor function.
T current lim +	Setting of current limit in the drive for the positive current direction (clockwise drive or counter-clockwise braking).
T current lim -	Setting of current limit in the drive for the negative current direction (counter-clockwise drive or clockwise braking).
	These values are specified as a percentage of full load torque curr (see section 6.9, "Current regulation").
Encoder 1 type	Specifying the encoder type on the XE connector (standard connection) Sinusoidal Encoder with sinusoidal outputs Digital Encoder with digital outputs
Encoder 1 pulses	Number of pulses per revolution
Speed base value	The Speed base value is defined by the units specified by the factor function. It is the base value for all speed values (reference values, adaptive speed regulation..) Given as a percentage, and corresponds to 100% speed. Changing this parameter is only possible when the drive is disabled (Enable drive = Disabled). The Speed base value does <u>not</u> define the maximum possible speed. However, the maximum range for speed percentage is $\pm 200\%$ of speed base value.
Save parameters	Saves parameters into non-volatile memory.

When the drive is switched on, the last saved parameters are read in. It is absolutely necessary to save parameters once they have been modified otherwise any changes made will be cancelled when power to the drive is removed.

6.3. MONITOR

MONITOR				
	Enable drive			
	Start/Stop			
	Measurements			
		Speed		
		Speed in DRC []		
			Ramp ref (d)	
			Ramp output (d)	
			Speed ref (d)	
			Actual spd (d)	
			F act spd (d)	
			Act spd filter	
		Speed in rpm		
			Ramp ref (rpm)	
			Ramp outp (rpm)	
			Speed ref (rpm)	
			Actual spd (rpm)	
			Enc 1 speed (rpm)	
			Enc 2 speed (rpm)	
			F act spd (rpm)	
			Act spd filter	
		Speed in %		
			Ramp ref (%)	
			Ramp output (%)	
			Speed ref (%)	
			Actual spd (%)	
	DC link voltage			
	Active power			
	Output voltage			
	Output frequency			
	Motor current			
	Torque			
	T current ref			
	T curr (%)			
	F T curr (%)			
	T curr filter			
	Flux			
	Heatsink temp			
	Regulation temp			
	I/O			
	Digital I/Q			
	Virtual dig inp			
	Virtual dig out			

ga0422ai

The MONITOR menu shows all references and actual operating parameters. The values related to speed are given in rpm (revolutions per minute), as a percentage of the **Speed base value** and in the dimension specified by the factor function.

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable drive Enable Disable	314	0	1	Disabled (0)	Terminal 12
Start/Stop Start Stop	315	0	1	Stop (0)	Terminal 13
Ramp ref (d) [FF]	109	-32768	+32767	—	*
Ramp ref (rpm)	110	-32768	+32767	—	
Ramp ref (%)	111	-200.0	+200.0	—	
Ramp output (d) [FF]	112	-32768	+32767	—	*
Ramp output (rpm)	113	-32768	+32767	—	
Ramp output (%)	114	-200.0	+200.0	—	
Speed ref (d) [FF]	115	-32768	+32767	—	*
Speed ref (rpm)	118	-32768	+32767	—	
Speed ref (%)	117	-200.0	+200.0	—	
Actual spd (d) [FF]	119	-32768	+32767	—	Analog out. 1*
Actual spd (rpm)	122	-8192	+8192	—	
Actual spd (%)	121	-200.0	+200.0	—	
Act spd filter [s]	923	0.001	0.100	0.001	
F act spd (rpm)	924	-32768	32767	-	*
F act spd (d) [FF]	925	-32768	32767	-	*
Enc1 speed (rpm)	427	-8192	+8192	-	*
Enc2 speed (rpm)	420	-8192	+8192	-	*
DC link voltage [V]	227	0	999	—	*
Active power [%]	229	-500	+500	—	*
Output voltage [V]	233	0	500	—	*
Output frequency [Hz]	324	0.0	500.0	—	—
Motor current [A]	231	0.00	S	—	Analog out. 4*
Torque [%]	230	-500	+500	—	*
I current ref [%]	41	-500	+500	—	*
T curr filter [s]	926	0.001	0.250	0.100	*
T curr (%)	927	-500	500	-	*
F T curr (%)	928	-500	500	-	*
Flux [%]	234	0.00	100.00	—	*
Heatsink temp [°C]	881	-	-	-	—
Regulation temp [°C]	1147	-	-	-	—
Intake air temp [°C]	914	-	-	-	—
Dig input term	564	0	65535	—	—
Dig input term 1	565	0	1	—	—
Dig input term 2	566	0	1	—	—
Dig input term 3	567	0	1	—	—
Dig input term 4	568	0	1	—	—
Dig input term 5	569	0	1	—	—
Dig input term 6	570	0	1	—	—
Dig input term 7	571	0	1	—	—
Dig input term 8	572	0	1	—	—
Dig input term 9	573	0	1	—	—
Dig input term 10	574	0	1	—	—
Dig input term 11	575	0	1	—	—
Dig input term 12	576	0	1	—	—
Dig input term 13	577	0	1	—	—
Dig input term 14	578	0	1	—	—
Dig input term 15	579	0	1	—	—
Dig input term 16	580	0	1	—	—
Dig output term	581	0	65535	—	—
Virtual dig inp	582	0	65535	—	—
Virtual dig out	583	0	65535	—	—

Ga0044ai

* This function can be assigned to a programmable analog output.

Enable drive	When operating the drive via the keypad, it is activated via the Enable drive parameter. A voltage is also required on terminal 12. The Start command is also required to start the drive. Enable Drive enabled Disabled Drive disabled
Start/Stop	If the Start menu is selected via the keypad, the Start/Stop status is displayed.
Ramp ref (d)	Total reference value for the ramp using the units specified by the factor function.
Ramp ref (rpm)	Total reference value for the ramp in rpm (revolutions per minute).
Ramp ref (%)	Total reference value for the ramp as a percentage of the Speed base value .
Ramp output (d)	Ramp output in the dimension specified by the factor function.
Ramp outp (rpm)	Ramp output in rpm (revolutions per minute)
Ramp output (%)	Ramp output as a percentage of the Speed base value
Speed ref (d)	Total speed reference value using the units specified by the factor function.
Speed ref (rpm)	Total speed reference value in rpm (revolutions per minute).
Speed ref (%)	Total speed reference value as a percentage of the Speed base value
Actual spd (d)	Actual speed using the units specified by the factor function.
Actual spd (rpm)	Actual speed in rpm (revolutions per minute).
Actual spd (%)	Actual speed as a percentage of the Speed base value
Act spd filter	1 st order Low pass filter time constant on Actual speed.
F act spd (rpm)	Filtered value of Actual speed in rpm.
F act spd (d)	Filtered value of Actual speed in the units specified by the factor function.
Enc1 speed [rpm]	This parameter provides the value of speed measured from Encoder 1, regardless of the encoder chosen for speed feedback.
Enc2 speed [rpm]	This parameter provides the value of speed measured from Encoder 2, regardless of the encoder chosen for speed feedback.
DC link voltage	DC bus voltage
Active Power	[%]Active power of the drive as a percentage of the <u>rated</u> active power, if the Full load curr parameter corresponds to the rated motor current and the motor is operating with rated flux. If the RS-300 "Line regen converter" is being used this parameter is also accessible via: - PDC (for BUS card) with full range equal to: $32767 \text{ (7FFFH)} = \sqrt{3} \times \text{Line voltage} \times \text{Full load current}$ - Programmable analog output (code selection = 78) with full range = 10V: $\sqrt{3} \times \text{Mains voltage} \times \text{Full load current} = 10 \text{ V}$ These selections are possible only with the Regulation mode = Sensorless or Field oriented mode
Output voltage	Line to line output voltage of the inverter in V_{RMS}
Output frequency	Output frequency in Hz
Motor current	Motor current in A_{RMS}
Torque	Torque of the drive as a percentage of the rated motor torque if the Full load curr parameter corresponds to the rated motor current and the motor is operating with rated flux.
T current ref	Total current reference value as a percentage of Full load torque curr (see section 6.9, "Current regulation").
T curr filter	1 st order Low pass filter time constant on Torque current .

T curr (%)	Torque current value in percentage. It can be directed to an analog output (Select: Torque [29])
F T curr (%)	Filtered value of Torque current in percentage.
Flux	Calculated flux in the motor as a percentage of the rated flux
Heatsink temp	Reading of the heatsink temperature in °C
Regulation temp	Reading of the regulation card temperature in °C
Heatsink air temp	Reading of the cooling air temperature in °C
Digital I/O	Status of the digital input and output of the base drive and the optional digital input card.

Display: I 1 2 3 4 5 6 7 8 E S F
 Q 1 2 3 4 5 6 7 8

A I/O is displayed only if a voltage is present on the corresponding terminal. E.g., if the inputs 1 and 4 are displayed, that means that the digital inputs 1 and 4 on the regulation card are at high level (Digital inputs 5 to 8 will be displayed only if a second input card is connected).

E = Enable drive (terminal 12)

S = Start (terminal 13)

F = Fast stop (terminal 14)

When a serial line or a Bus is used, the status of the digital I/O can be read by means of the **Dig input term** and **Dig output term** parameters.

Dig input term Status of the digital inputs on the drive and optional digital input card to be read by the serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Input	Bit n.	Input
0	I/O, Terminal 36 (Digital Input 1)	6	I/O, Terminal 33 (Digital Input 7)
1	I/O, Terminal 37 (Digital Input 2)	7	I/O, Terminal 34 (Digital Input 8)
2	I/O, Terminal 38 (Digital Input 3)	8	AV-300i, Terminal 12 (Enable drive)
3	I/O, Terminal 39 (Digital Input 4)	9	AV-300i, Terminal 13 (Start/Stop)
4	I/O, Terminal 31 (Digital Input 5)	10	AV-300i, Terminal 14 (Fast stop)
5	I/O, Terminal 32 (Digital Input 6)		

ai6045

Dig input term 1*	Status of the digital input 1 (terminal 36)
Dig input term 2*	Status of the digital input 2 (terminal 37)
Dig input term 3*	Status of the digital input 3 (terminal 38)
Dig input term 4*	Status of the digital input 4 (terminal 39)
Dig input term 5*	Status of the digital input 5 (terminal 31, on optional digital input card)
Dig input term 6*	Status of the digital input 6 (terminal 32, on optional digital input card)
Dig input term 7*	Status of the digital input 7 (terminal 33, on optional digital input card)
Dig input term 8*	Status of the digital input 8 (terminal 34, on optional digital input card)
Dig input term 9*	Status of the digital input on terminal 12 (Enable Drive)
Dig input term 10*	Status of the digital input on terminal 13 (Start)
Dig input term 11*	Status of the digital input on terminal 14 (Fast stop)
Dig input term 12*up to 16*	Not used

Dig output term Status of the digital outputs on the drive and optional digital input card to be accessed by the serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Output	Bit n.	Output
0	Terminal 41, on Regulation card (Digital output 1)	4	Terminal 53, on Option card (Digital output 5)
1	Terminal 42, on Regulation card (Digital output 2)	5	Terminal 54, on Option card (Digital output 6)
2	Terminal 51, on Option card (Digital output 3)	6	Terminal 56, on Option card (Digital output 7)
3	Terminal 52, on Option card (Digital output 4)	7	Terminal 57, on Option card (Digital output 8)

ai6050

Virtual dig inp Status of the virtual digital inputs**

Virtual dig out Status of the virtual digital outputs**

* Available only via RS 485 interface line or via Field Bus.

** The virtual inputs and outputs are used only in connection with a Bus, which can provide faster communication. For further details see the Network Bus manual.

6.4. Drive Parameter

6.4.1. Motor plate data

DRIVE PARAMETER

Mot plate data

Nominal voltage
Nominal speed
Nom frequency
Nominal current
Cos phi
Base voltage
Base frequency
Take motor par

GA0423g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Nominal voltage [V]	161	1	999	400	
Nominal speed [rpm]	162	1	99999	S	
Nom frequency [Hz]	163	1	999	60	
Nominal current [A]	164	0.1	999.0	S	
Cos phi	371	0.1	0.99	S	
Base voltage [V]	167	1	999	460	
Base frequency [Hz]	168	1	999	60	
Take motor par	694	0	1	-	

GA6055ai

S = depending on device type or size

In the “Mot plate data” submenu, data from the motor nameplate and information on the desired “base” operating point must be entered. These are required in order to:

- Compute appropriate normalization factors for the regulator
- Compute estimated values for the motor parameters required by the regulator (see section “Motor parameter”).

Nominal voltage	Rated voltage of the motor (given on the nameplate). Enter here the voltage that the inverter should supply at the rated frequency of the motor.
Nominal speed	Rated full load speed of the motor in rpm (revolutions per minute)
Nom frequency	Rated frequency of the motor in Hz.
Nominal current	Rated current of the motor at rated horsepower and voltage. In case of “ V/f control ” with multiple motors, enter a value equal to the sum of rated currents of all the motors.
Cos phi	Motor power factor.
Base voltage	Max. working voltage before constant HP range begins.
Base frequency	Frequency at which the constant HP range begins.
Take motor par	This command must be entered after entering appropriate values for all parameters listed above. It causes calculation of normalization factors (a) and motor parameter estimates (b).

Nominal voltage, Nominal speed, Nom frequency, Nominal current, Cos phi, Base voltage and Base frequency must be entered manually (default value of **Cos phi** can be used if value not available from the nameplate). After setting these parameters, **Take motor par** must be entered in order to compute items (a) and (b) above. The drive can not be operated until **Take motor par** is entered. If some values are inconsistent, or motor size is far too small compared to the inverter size, an error message indicating numerical overflow is given, and the previous set of parameters in the “Mot plate data” submenu is restored.

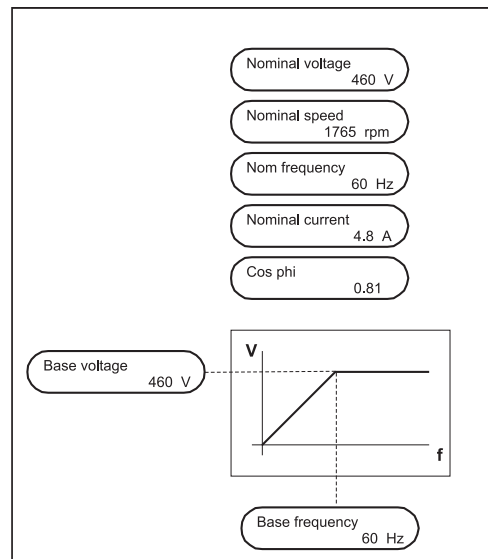


Figure 6.4.1.1: Motor plate data

OVERFLOW LIST

CODE	CAUSES
10 ; 54	The ratio between the Encoder 1 pulses[416] and the number of motor poles pair must be higher than 128
3 ; 4	The Stator resistance [436] value is too high. The motor is not compatible with the drive size used.
5 ; 8 ; 9 ; 15	The Leakage inductance [437] value is too high. The motor is not compatible with the drive size used.
16 ; 24	The Rotor resistance [166] value is too high. The motor is not compatible with the drive size used.

- 17 The Nominal voltage [161] and Nom frequency [163] values produce motor nominal flux that is too high.
- Verify these values: the Nominal voltage value is too high and/or the Nom Frequency value is too small.
- 18 The Base voltage [167] and Base frequency [168] values produce motor nominal flux that is too high.
- Verify these values: the Base voltage value is too high and/or the Base frequency value is too small
- 23 The ratio between nominal flux (Nominal voltage, Nom frequency) and working flux (Base voltage , base frequency) is too high.
- Verify the above parameters value.
The Magnetizing current [165] value is too high.
- Verify that this value is lower than Full load curr.
- 27 The Base voltage value is too high. The maximum value is 500V.
- 28 The Base frequency value is too high. This value must be lower than 500Hz
- 59 The Magnetizing working curr [726] is too high.
- Verify that the nominal flux value (Nominal voltage and Nom frequency) is lower than the working flux value (Base voltage and Base frequency). Check the parameters value.
The Magnetizing current value is too high.
- Verify that this value is lower than Full load curr.
- 64 The Motor cont curr [656] value, of the motor thermal protection function (menu Ovld mot contr), produces continuous current that is too low in comparison to the inverter size. This error can also be due to a low setting of the Nominal current [164] parameter ($\leq 0.3 \times I_{2N}$).
- 66 The Nominal speed [162] value is wrong.
The set value produces too small (or too high) slip value.
- Parameters computed in (b) are an estimate, they can be overwritten if actual values are available from the motor manufacturer (see section “Motor parameter”). Alternatively, these values can be overwritten by the values identified by the Self-tuning procedure (see section 5.3.3 “Self-tuning”).
 - Manual assignment of values in the “Motor parameter” submenu, or Self-tuning procedure, must be executed only after entering **Take motor par** command. If the **Take motor par** is entered after manual assignment or Self-tuning procedure, the values will be overwritten again.

SETTING OF THE BASE SETPOINT

The coordinated setting of **Base voltage** and **Base frequency** determines the working flux and starting threshold of flux weakening.

Setting them equal to the nominal value of the motor yields operation at nominal flux in the constant torque region and weakened flux at frequencies higher than **Base frequency**.

Different settings allow working at a lower flux (Base Voltage/Base frequency < Nominal voltage/Nominal Frequency).

Operation with a flux higher than the nominal one is not allowed.

The **Base voltage** and **Base frequency** setting at values higher than Nominal Voltage and Nominal Frequency will cause an error message “Overflow” when the “**Take motor par**” command is entered.

VOLTAGE AVAILABLE ON THE DRIVE OUTPUT

The **Base voltage** value is also the value of the output voltage in flux weakening condition.

The maximum available value is determined by the actual value of the line voltage reduced by the **dynamic regulation margin** (LIMITS\Voltage Limits\Dynam Vlt Margin).

The Base voltage setting must be adjusted according to the application.

If the application requires the maximum static performances of the motor (torque and power) without any particular dynamic requirements, the Base voltage must be set equal to the nominal value of the motor.

If, however, the application can not tolerate any torque fluctuations when a line voltage dip occurs, Base voltage must be set to a value lower than the fluctuation range of the Line voltage.

The following are some examples with different V/f settings:

Example 1

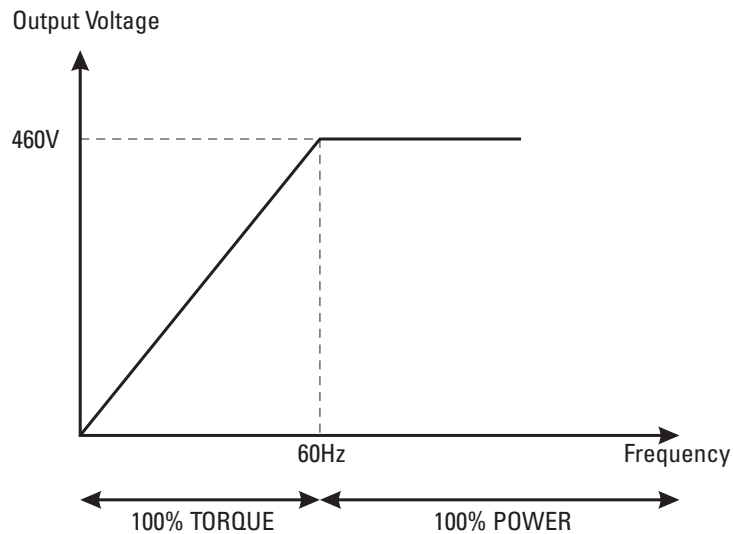
Use of a standard motor 460 V / 60 Hz

Base voltage 460 V

Base frequency 60 Hz (standard)

The motor works with nominal and full torque to 60 Hz.

Beyond 60 Hz the voltage is constant, the flux is weakened and the motor supplies constant power equal to the nominal (rated) power.



Example 2

Use of a standard motor 460V / 60Hz

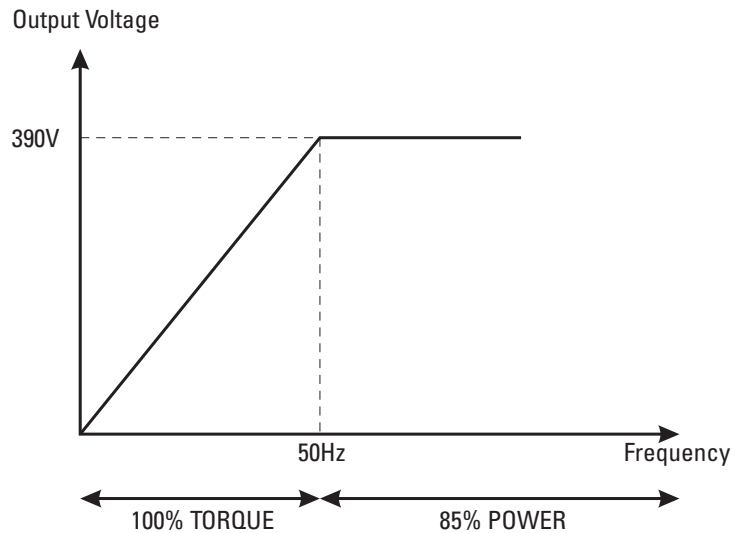
Application requiring total immunity from torque disturbances due to Line voltage fluctuation.

Base voltage 460 V -15% = 390 V

Base frequency 60 Hz -15% = 50 Hz

The motor works at nominal flux and full torque until 50 Hz (85% of nominal speed).

Beyond 60 Hz the voltage is constant, the flux is weakened and the motor supplies constant power equal to 85% of the nominal (rated) power.



Example 3

Use of a motor **qualified for inverter duty** (insulation, speed, losses, etc...) with wye / delta connection winding.

Motor Plate Data:

Nominal voltage	265 (delta) / 460 V (wye)
Nominal current	100 A (delta) / 58 A (wye)
Nominal frequency	60 Hz
Cos phi (power factor)	0.87
Nominal power	30 kW (40HP)
Nominal speed	1725 rpm
Maximum speed	3000 rpm

Case 3/a

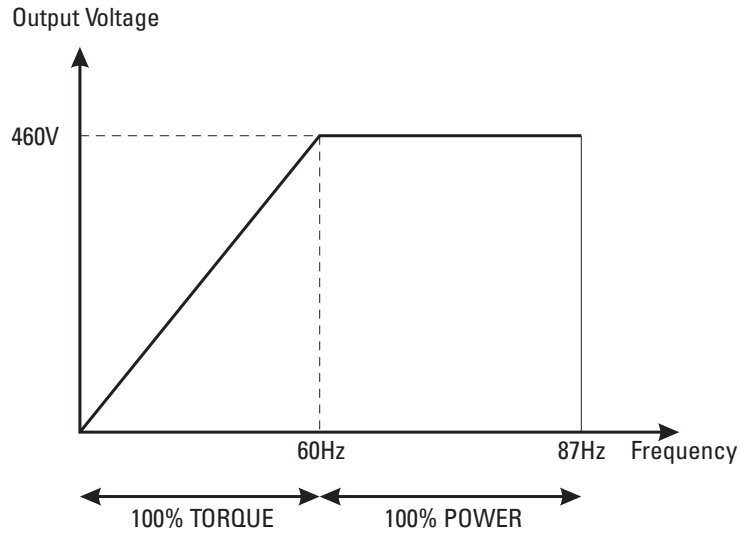
Application with constant torque until 1725 rpm and constant power until 2500 rpm.

Connect the motor in a wye connection and select a drive 6KAVI43030 (nominal current 63 A).

Set the drive as follow:

Nominal voltage	460 V (wye)
Nominal current	58 A (wye)
Nominal frequency	60 Hz
Cos phi	0.87
Nominal speed	1725 rpm
Base voltage	460 V
Base frequency	60 Hz

The motor supplies full torque up to nominal speed and full power (30 kW / 40 HP) up to the maximum speed.



Case 3/b

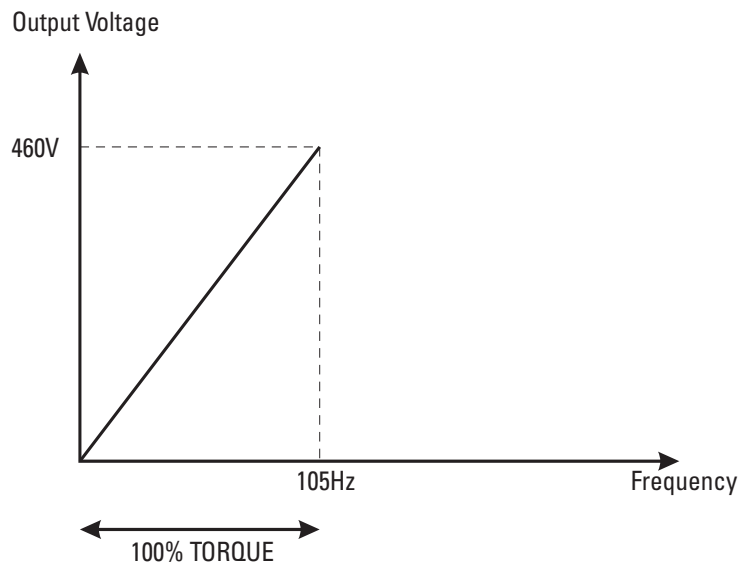
Application with constant torque until 2500 rpm.

Connect the motor in a delta connection and select a drive 6KAVI43060 (nominal current >100 A).

Set the drive as follow:

Nominal voltage	265 V (wye)
Nominal current	100 A (wye)
Nominal frequency	60 Hz
Cos phi	0.87
Nominal speed	1725 rpm
Base voltage	460 V
Base frequency	105 Hz (note! 60 Hz x 460 V / 265 V).

The motor supplies full torque until the maximum speed with a maximum power approximately equal to: 30 kW (40 HP) x 2500 rpm / 1725rpm 43 kW (58 HP).



6.4.2. Motor parameter

DRIVE PARAMETER	Motor parameter
	Magnetizing cur
	Magn working cur
	Rotor resistance
	Stator resist
	Lkg inductance
	Load motor par

GA0424g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Magnetizing cur [A]	165	0.1	999.0	S	
Magn working cur [A]	726	0.1	999	S	
Rotor resistance [Ohm]	166	0.0001	S	S	
Stator resist [Ohm]	436	0.0001	S	S	
Lkg inductance [H]	437	0.00001	9.00000	S	
Load motor par Std for 400V Std for 460V	251	0	1	Std for 400V (0)	

GA6060g

S = depending on device type and size

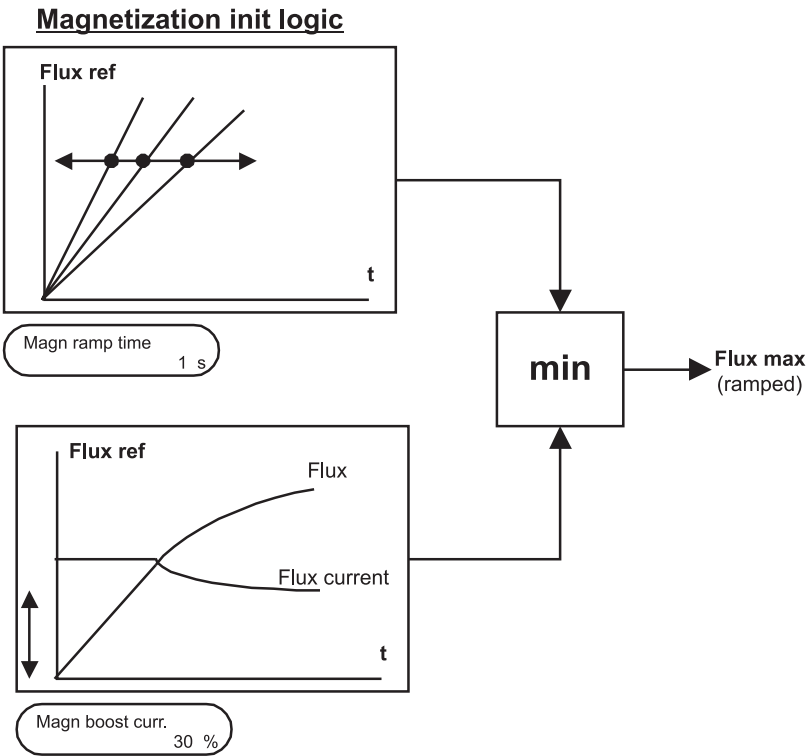
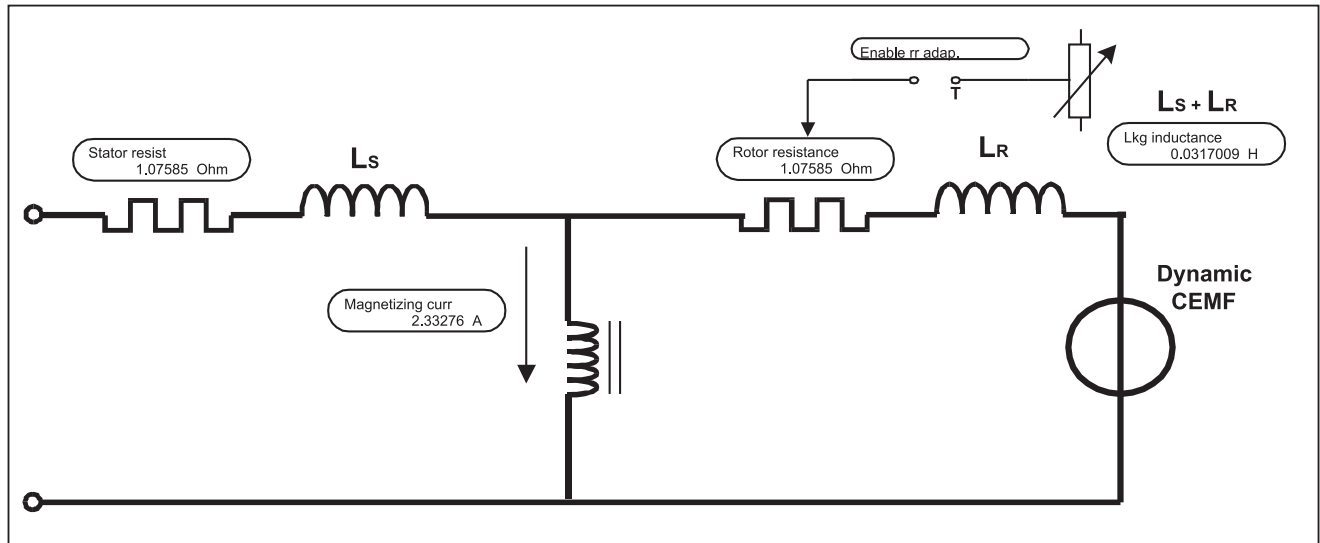


Figure 6.4.2.1 : Motor parameter



The “Motor parameter” submenu contains parameters used inside the regulation (Flux model). These parameters can be either:

- Estimated from plate data values using the **Take motor par** command (see section 5.3.2.2 “Setting Motor Parameters”).
- Manually assigned, if values are available
- Identified by the Self-tuning procedure (see section 5.3.3 “Self-tuning”).

Additionally, if using the standard recommended motor series for 400 V or 460 V, nameplate data, motor parameters and suitable controller gains can be loaded automatically.

Magnetizing curr	Value of magnetizing current (approx. equal to no load current) at nominal voltage and frequency. The magnetizing transient when the drive is enabled can be modified by making an appropriate setting of the Magn curr boost and Magn ramp time parameters in the CONFIGURATION menu.
Magn working curr	Value of magnetizing current corresponding to the actual setting of Base voltage and Base frequency .
Rotor resistance	Rotor resistance of the motor in Ohms.
Stator resistance	Stator resistance of motor in Ohms.
Lkg inductance	Leakage inductance in Henries.
Load motor par	It automatically sets motor nameplate data, parameters and regulator gains corresponding for a standard recommended motor, either for 400V or 460V.

If the value of **Magnetizing curr** is too low, the motor does not provide the nominal torque.

If the value for the **Rotor resistance** is incorrect, the motor may show speed instability, or it may be unable to deliver the nominal torque (Field oriented mode). The speed accuracy may decline (Sensorless mode).

The procedures required for fine adjustment are described in section 5.3, “Start up”.

6.4.2.1. Self tuning

DRIVE PARAMETER			
		Motor parameter	
		Self-tuning	
		Self-tune 1	
			Start part 1
			Stator resist
			Stator resist Nw
			Voltage comp limit
			Volt comp lim Nw
			Comp Slope
			Comp slope Nw
			Lkg inductance
			Lkg inductance Nw
			Current P
			Current P Nw
			Rotor resistance
			Rotor resist Nw
			Current I
			Current I Nw
			Take val part 1
		Self-tune 2a	
			Start part 2a
			P1 flux model
			P1 flux model Nw
			P2 flux model
			P2 flux model Nw
			Magnetizing curr
			Magnetiz curr Nw
			Flux P
			Flux P Nw
			Flux I
			Flux I Nw
			Voltage P
			Voltage P Nw
			Voltage I
			Voltage I Nw
			Take val part 2a
		Self-tune 2b	
			Start part 2b
			P1 flux model
			P1 flux model Nw
			P2 flux model
			P2 flux model Nw
			Magnetizing curr
			Magnetiz curr Nw
			Flux P
			Flux P Nw
			Flux I
			Flux I Nw
			Voltage P
			Voltage P Nw
			Voltage I
			Voltage I Nw
			Take val part 2b
		Self-tune 3	
			Fwd-Rev spd tune
			Test T curr lim
			Start part 3
			Inertia
			Inertia Nw
			Friction
			Friction Nw
			Speed P
			Speed P Nw
			Speed I
			Speed I Nw
			Take val part 3

ga0425g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Start part 1	676	0	65535	-	
Take val part 1	677	0	65535	-	
Stator resist [Ohm]	436	0.0001	9.0000	S	
Stator resist Nw [Ohm]	683	S	S	-	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Volt comp lim Nw [V]	685	0.1	30.0	-	
Comp slope [V/A]	645	0.1	50.0	13.0	
Comp slope Nw [V/A]	686	0.1	50.0	-	
Lkg inductance [H]	437	0.00001	9.00000	S	
Lkg inductance Nw [H]	684	S	S	-	
Current P [%]	89	0.00	100.00	S	
Current P Nw [%]	687	S	S	-	
Rotor resistance [Ohm]	166	0.0001	9.0000	S	
Rotor resist Nw [Ohm]	682	S	S	-	
Current I [%]	90	0.00	100.00	S	
Current I Nw [%]	688	S	S	-	
Flux P [%]	91	0:00	100.00	S	
Flux P Nw [%]	907	0:00	100.00	S	
Flux I [%]	92	0:00	100.00	S	
Flux I Nw [%]	908	0:00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage P Nw [%]	1024	0.00	100.00	S	
Voltage I [%]	902	0:00	100.00	4.00	
Voltage I Nw [%]	909	0:00	100.00	S	
Start part 2a	678	0	65535	-	
Take val part 2a	679	0	65535	-	
Start part 2b	680	0	65535	-	
Take val part 2b	681	0	65535	-	
P1 flux model	176	0.00	1.00	S	
P1 flux model Nw	689	S	S	S	
P2 flux model	692	1	20	S	
P2 flux model Nw	690	S	S	S	
Magnetizing curr [A]	165	0.1	999.0	S	
Magnetiz curr Nw [A]	690	S	S	S	
Fwd-Rev spd tune	1029	1	2	Fwd direct. (1)	
Fwd direction					
Rev direction					
Test T curr lim	1048	0	S	20	
Start part 3	1027	0	65535	-	
Inertia [Kg*m*m)	1014	0.001	999,999	S	
Inertia Nw [Kg*m*m)	1030	0.001	999,999	-	
Friction [N*m]	1015	0.000	99,999	S	
Friction Nw [N*m]	1031	0.000	99,999	-	
Speed P [%]	87	0.00	100.00	S	
Speed P Nw [%]	1032	0.00	100.00	-	
Speed I [%]	88	0.00	100.00	S	
Speed I Nw [%]	1033	0.00	100.00	-	
Take val part 3	1028	0	65535	-	

S = Dependent on the size of the drive

Ga6065g

Self-tuning	Automatic commissioning (See section 5.3.3, "Self-tuning")
Start part 1	Start the first step of self commissioning
Take val part 1	Acquire the parameters after first step
Start part 2a	Start the second step of self commissioning (with rotating motor)
Take val part 2a	Acquire the parameters after second step
Start part 2b	Start the second step of self commissioning (with the motor at standstill)
Take val part 2b	Acquire the parameters after second step
Start part 3	Start speed self tune
Stator resistance	Stator resistance of the motor in ohms
Stator resistance Nw	New value of stator resistance of motor in ohms identified by Self-tuning
Voltage comp lim	Value of the voltage compensation
Volt comp lim Nw	New value of the voltage compensation identified by Self-tuning
Comp slope	Compensation gradient value
Comp slope Nw	New value of Compensation gradient identified by Self-tuning
Lkg inductance	Leakage inductance in Henries
Lkg inductance Nw	New value of Leakage inductance in Henries identified by Self-tuning
Current P	Proportional coefficient of the current regulator in percentage
Current P Nw	New value of proportional coefficient of the current regulator in percentage identified by Self-tuning
Rotor resistance	Rotor resistance of the motor in ohms
Rotor resist Nw	New value of Rotor resistance of the motor in ohms identified by Self-tuning
Current I	Integral coefficient of the current regulator in percentage
Current I Nw	New value of integral coefficient of the current regulator in percentage identified by Self-tuning
P1 flux model	First parameter needed to define the value of the motor magnetizing curve
P1 flux model Nw	New value identified by self-tuning
P2 flux model	Second parameter needed to define the value of the motor magnetizing curve
P2 flux model Nw	New value identified by self-tuning
Magnetizing curr	Magnetizing current value of the motor
Magnetiz curr Nw	New magnetizing current value of the motor identified by Self-tuning
Flux P	Proportional coefficient of the flux regulator in percent
Flux P Nw	New value of proportional coefficient of the flux regulator in percent identified by the Self tuning
Flux I	Integral coefficient of the flux regulator in percent
Flux I Nw	New value of integral coefficient of the flux regulator in percent identified by the Self tuning
Voltage I	Integral coefficient of the voltage regulator in percent
Voltage I Nw	New value of integral coefficient of the voltage regulator in percent identified by the Self tuning
Voltage P	Proportional coefficient of the voltage regulator in percentage
Voltage P Nw	New value of Proportional coefficient of the voltage regulator in percentage identified by the Self tuning

Fwd-Rev spd tune	Direction of rotation for the speed self tune test (Forward or Reverse; Forward is clockwise as seen from shaft drive end).
Test T curr lim	Torque current lim applied during Speed Self tune tests
Inertia	Inertia value in Kg*m ² . (1 Kg*m² = 23.76 lb*ft²)
Inertia Nw	New Inertia value in Kg*m ² identified during the Speed self tune procedure.
Friction	Friction value or Loss compensation in N*m. (1 N*m = 0.738 lb*ft)
Friction Nw	New Friction value or Loss compensation in N*m identified during the speed self tune procedure.
Speed P	Proportional gain of the speed regulator in percentage.
Speed P Nw	New value of Proportional gain of the speed regulator in percentage computed during the speed self tune procedure.
Speed I	Integral gain of the speed regulator in percentage.
Speed I Nw	New value of Integral gain of the speed regulator in percentage computed during the speed self tune procedure.
Take val part 3	Acquire the parameters after the self tune procedure (overwrite current values).

Note!

This is not a permanent save. Go to “Save Parameters” in BASIC MENU or SPEC FUNCTIONS to save to non-volatile memory.

Note!

A range control exists over the parameters identified by the self-tuning procedure. In case an out of range error message occurs, a “parameter_name range error” is displayed. The following parameters may have range errors: Rs (stator resistance), DTL (Voltage comp lim), DTS (Comp slope), Ls (stator inductance), U (Voltage used during Rr tuning process), Rr (rotor resistance), PIS (stator current regulator proportional gain) and IIS (stator current regulator integral gain).

For more information on the procedure to follow in case of a range error message see chapter 5.3.3 “self-timing.”

6.4.2.2. Sensorless

DRIVE PARAMETER

Sensorless

Low speed factor

Sls speed filter

Flux corr factor

GA0426g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Low speed factor	646	0	32000	5000	
Sls speed filter [s]	643	0:01	0:50	0.01	
Flux corr factor	647	0.50	1.00	0.90	

GA6070g

- Low speed factor

This parameter influences the performance during Low speed operation (2% of nominal speed). If the drive cannot provide the required torque at low speed, this parameter will have to be increased. This parameter can produce instability if set too high.
- Sls speed filter

This parameter represents the time constant of the low-pass filter for the estimated speed. By increasing this parameter it is possible to reduce the noise level of the estimated speed; consequently lowering the speed regulation dynamics too.
- Flux corr factor

This parameter is a correction factor on the estimated rotor flux.

In case of high inertia load or regenerative operation, a speed instability might occur that can be avoided by decreasing this parameter.

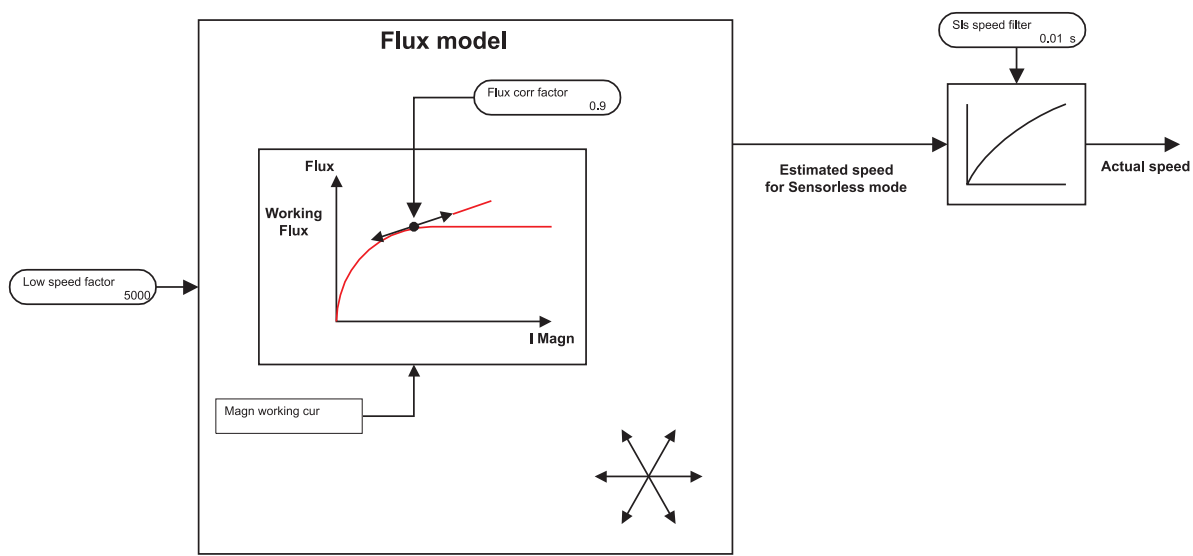


Figure 6.4.2.2.1: Sensorless

6.4.2.3. V/f control

DRIVE PARAMETER	
	V/f control
	V/f shape

GA0427g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
V/f shape	712	0	3	$V = K \cdot f^{1.0}$ (0)	

GA6075g

- V/f shape

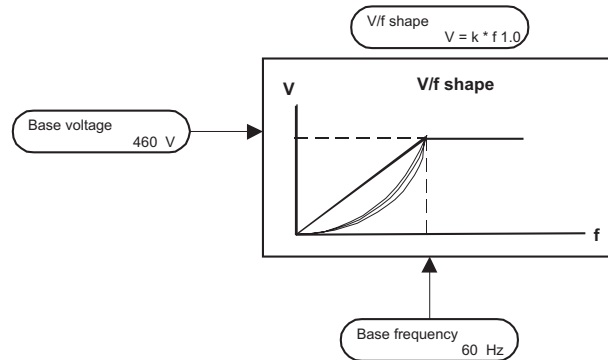
There are essentially four different types of V/f characteristics, which can be specified by this parameter. This parameter specifies the characteristics between zero and the knee of the characteristic curve.

Type 0 $V = K \cdot f^{1.0}$ (use this selection for constant torque loads)

Type 1 $V = K \cdot f^{1.5}$ (Loads between constant torque and variable torque)

Type 2 $V = K \cdot f^{1.7}$ (Loads between constant torque and variable torque)

Type 3 $V = K \cdot f^{2.0}$ (Variable torque loads)



The basic selection criteria for the V/f characteristics (V/f shape) available can be taken from the following table.

Characteristics	Type of load
0	Constant torque requirement across the whole speed range
1	Mixed load between types 0 and 3
2	Mixed load between types 0 and 3
3	Load where the torque is proportional to the speed squared, e.g. fans and certain types of pumps

GA6080g

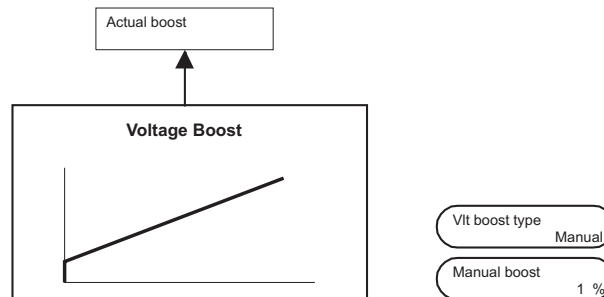
6.4.2.3.1. Voltage boost

V/f control	Voltage boost
	Vlt boost type
	Manual boost
	Actual boost

GA0428g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Vlt boost type	709	0	1	Manual (0)	
Manual					
Automatic					
Manual boost [%]	710	0.0	10.0	0.0	
Actual boost [%]	711	0.0	100.0	—	

GA6085g



The resistive impedance of the stator windings causes a voltage drop within the motor, which results in a reduction in torque in the lower speed range. Compensation can be made for this effect by boosting the output voltage. This compensation is carried out continuously across the whole speed range in proportion to the output current but is most effective at low speeds.

Vlt boost type

Selection of the Boost type:

Manual Boost value can be set manually via **Manual boost**

Automatic Boost value is derived from Motor parameters

Manual boost

Value in percentage of the **Nominal voltage** [161], the voltage boost specified is independent of the V/f characteristic selected (parameter 712).

Actual boost

Actual boost as a percentage of the **Nominal voltage**

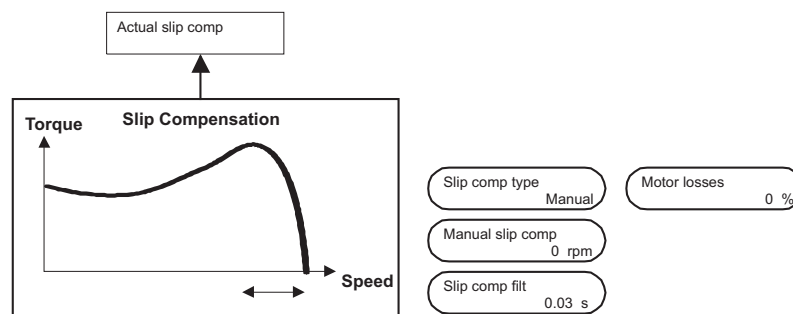
6.4.2.3.2. Slip compens

V/f control	Slip compens
	Slip comp type
	Manual slip comp
	Actual slip comp
	Slip comp filt
	Motor losses

GA0429g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Slip comp type	722	0	1	Manual (0)	
Manual					
Automatic					
Manual slip comp [rpm]	723	0	200	0.0	
Actual slip comp [rpm]	724	-400	+400	0	
Slip comp filter [s]	725	0.003	0.300	0.030	
Motor losses %	727	0.0	20.0	0.0	

GA6090g



If an induction motor is being used, the mechanical speed will vary with the load due to the slip of the motor. In order to adjust for this speed error the slip compensation function can be used.

During the "Slip comp" calibration make sure that the drive is not in a Current limit condition as it is not possible to make a calibration in Current limit. If this compensation is set too high it can cause instability.

Losses in the motor may cause **Actual slip comp** not to be zero even if the drive is not loaded. The **Motor losses** parameter can be used to adjust this compensation to zero at no load.

Slip comp type	Selection of the Slip compensation type: Manual compensation Automatic compensation value set by base motor parameters
Manual slip comp	Compensation value to be applied when the motor supplies nominal torque
Actual slip comp	Actual slip compensation in rpm
Slip comp filt	Time constant of 1st order lowpass filter of slip compensation. The value is specified in seconds. Increasing this value helps damping oscillations that may arise with load steps (especially negative ones).
Motor losses %	Total losses of the motor, as a percentage of rated output power; this value is used to adjust slip compensation at no load.

6.4.2.3.3. V/f spd search

V/f control	V/f spd search
	Spd srch time
	Flux srch time
	Spd auto capture
	Delay auto cap
	Delay retrying

GA0430g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Spd srch time [s]	893	0.01	10.00	10.00	
Flux srch time [s]	894	0.01	20.00	1.00	
Spd auto capture [FF]	895	-32768	32767	1500	
Delay auto cap	896	0	10000	1000	
Delay retrying	897	0	10000	1000	

GA6091g

Enabling this function allows an automatic restart in case of non-latched alarm (retrying).

The same parameters can also be used to engage a spinning motor (auto capture).

Retrying: For an alarm to cause a momentary stop of the drive (for example Undervoltage), must be set as Latch = OFF (CONFIGURATION/Prog Alarms menu).

Autocapture: To catch a spinning motor; for example the case of a motor being switched between the AC line and the drive. Activation is by setting Autocapture = ON (ADD SPD FUNCT menu)

Spd srch time	This parameter determines change in the drive output frequency. It represents the time in which the frequency goes from 0 to the motor base frequency, if the current were equal to the rated value during the acceleration.
Flux srch time	This parameter determines change of the drive flux. It represents the time it takes for the flux to change from 0 to the motor rated flux, with the output current being equal to the rated current of the motor.

Delay retrying	Delay time for “Retrying” motor demagnetization
Spd auto capture	It represents the starting speed of the catch on the fly feature.
Delay auto cap	Delay time during “auto capture” for motor demagnetization

Autorestart after a momentary alarm: Retrying

Before starting the autocapture procedure, it is necessary to consider motor demagnetization, to avoid high current transients due to the e.m.f. (electromotive force).

The demagnetization time can be set in milliseconds through the **Delay retryings** parameter. Generally, the larger the motor the higher the setting of this parameter; too low of a setting can cause high insertion current (Overcurrent alarm). The autocapture procedure starts after the demagnetization time has elapsed. This function is related to **Spd srch time** and **Flux srch time** parameters.

This procedure begins by producing a frequency equal to the one at which the drive was working before the alarm. Then the motor flux will be increased to match the output frequency.

If the output current is high with respect to the rated current of the motor, the output frequency is reduced and the speed of the flux insertion is decreased.

Generally the faster the motor deceleration at shut off, the larger must be the value of **Spd srch time**.

If during the synchronization procedure the Overcurrent alarm occurs, it is necessary to increase the value of **Flux srch time**.

At the end of the autocapture process, the drive should restart and be in normal mode.

Catch a spinning motor: Autorestart

The procedure is similar to the one mentioned above. The demagnetization time is set by the **Delay auto cap** parameter and the start of the speed search by the **Spd auto capture** parameter.

Example: 4 pole motor bypass from the AC line (60Hz) to inverter.

- Enable the **Autocapture** function (ADD SPD FUNCT)
- Set **Spd auto capture** = 1725
- Drive in STOP condition
- Disconnect the motor from the line and transfer it to the inverter

Warning !

Never apply line voltage to the inverter output (terminals U2, V2, W2). Pay particular attention to the switching sequence between the AC line and the inverter.

- Give the START command to the inverter

If necessary modify the parameters **Spd srch time** and **Flux srch time** as described above.

Warning !

When this function is selected, the drive will automatically restart once power is reconnected to the unit. This function should only be used on applications where there is no danger to persons or machines during automatic restart. All applicable safety regulations should be followed.

6.4.2.3.4. Energy save function

V/f control		Energy save			
		Enable save eng Lock save eng V/f flux level Flux var time			
		GA0431g			
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable save eng Disable Enable	898	0	1	Disabled (0)	
Lock save eng OFF ON	899	0	1	OFF (0)	*
V/f flux level [%]	900	0	100	100	**
Flux var time [s]	901	1	100	10	

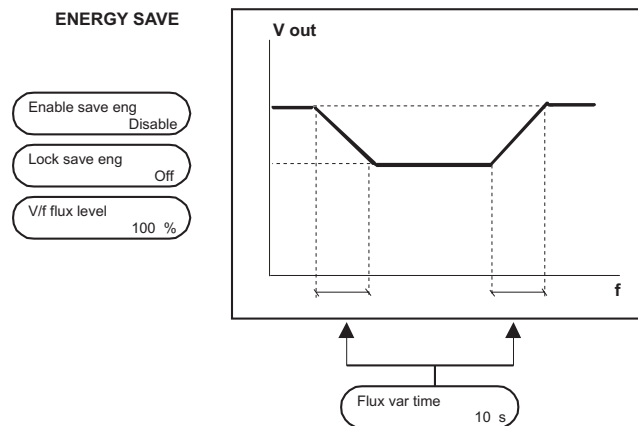
GA6092g

* This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

When a motor is found to use only partial power during normal running conditions, enabling this function reduces the motor flux current to save energy costs.

Enable save eng	Enable	Energy save function enabled
	Disable	Energy save function not enabled
Lock save eng	This command enables the Energy save function through the digital input, Keypad or Bus.	
V/f flux level	Percentage value of the motor flux	
Flux var time	Time to obtain the flux variation	



This function can be activated via the “**Enable save eng**” parameter by using the serial interface or via keypad.

Using the **V/f Flux level** parameter you can change the percentage value of the motor flux that is required. With the **Flux var time** parameter you can set the time it takes to get to the reduced flux and vice versa.

6.5. Input Variables

The AV-300i Drive enable the reference values for the ramp and the speed regulator to be specified in different units:

- as a percentage of the **Speed base value**
- in units that the user can define himself with the factor function, e.g. as a speed in m/s. The default factory setting is rpm (revolutions per minute).

When entering a value in one of these two parameters, the other is updated with the equivalent value.

Example:

A motor has a maximum speed of 1450 rpm. This corresponds to 100 % and at the same time the user-defined value for this speed is 10,000 bottles per hour.

Changing the reference value to 50 % will automatically result in a change of the other value to 5,000 bottles per hour.

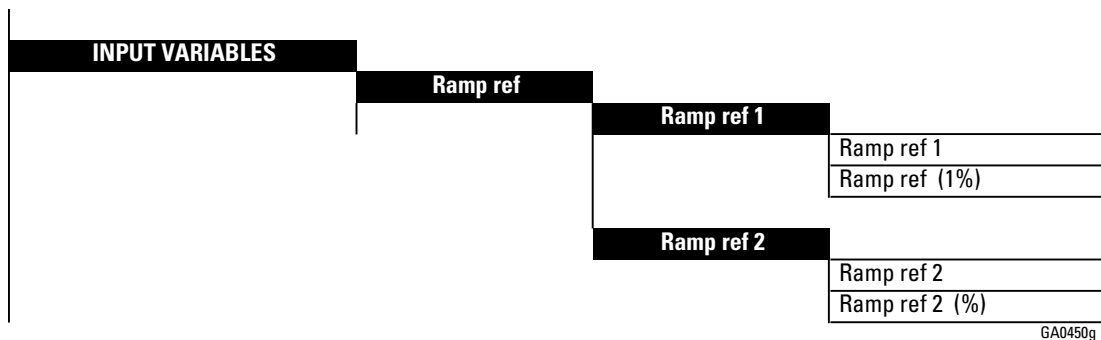
The table below shows the relationship between the reference values. In the event of a change, the other parameters are overwritten automatically.

Parameters of the same value	No.	Dimension
Ramp ref 1	44	factor function
Ramp ref 1 (%)	47	%
Speed input var*	44	factor function
Speed input perc*	46	%
Ramp ref 2	48	factor function
Ramp ref 2 (%)	49	%
Speed ref 1	42	factor function
Speed ref 1 (%)	378	%
Speed ref var*	115	factor function
Percent ref var*	116	%
Speed ref 2	43	factor function
Speed ref 2 (%)	379	%

GA6095g

* Defined in the DRIVECOM menu

6.5.1. Ramp ref



GA0450g

The ramp reference value specifies the speed the drive should reach once the acceleration phase has been completed. Modifications to the ramp reference value are therefore transferred to the ramp accordingly. The amplitude of the ramp reference value determines the motor speed while the plus/minus sign determines the direction of rotation.

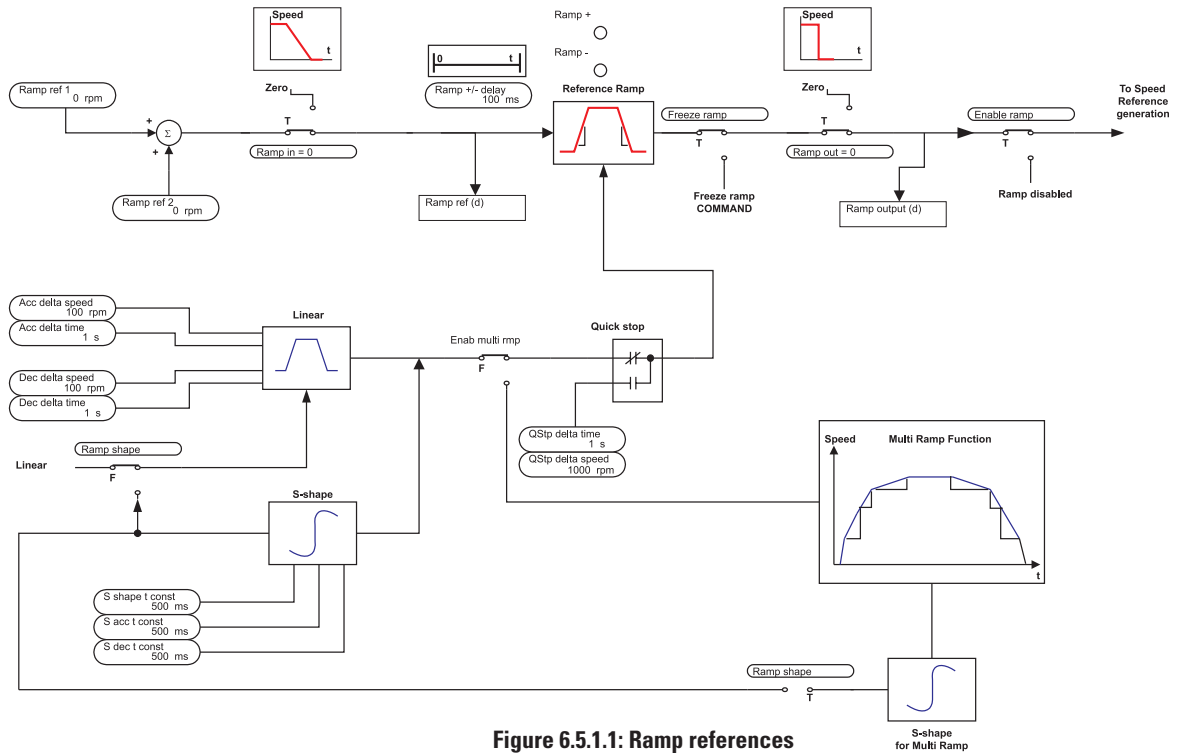


Figure 6.5.1.1: Ramp references

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp ref 1 [FF]	44	-2 x P45	+2 x P45	0	Analog input 1 (Terminals 1 + 2)*
Ramp ref 1 (%)	47	-200.0	+200.0	0.0	
Ramp ref 2 [FF]	48	-2 x P45	+2 x P45	0	*
Ramp ref 2 (%)	49	-200.0	+200.0	0.0	
Ramp ref (rpm)	110	-32768	+32767	-	**
Ramp ref (d) [FF]	109	-32768	+32767	-	
Ramp ref (%)	111	-200.0	+200.0	-	

GA6100g

* This parameter can be assigned to one of the programmable digital inputs

** This parameter can be assigned to one of the programmable analog inputs

Ramp ref 1	1st reference value for the ramp. The value to be entered depends on the factor function.
Ramp ref 1 (%)	1st reference value as a percentage of the Speed base value
Ramp ref 2	2nd reference value for the ramp. The value to be entered depends on the factor function.
Ramp ref 2 (%)	2nd reference value as a percentage of the Speed base value
Ramp ref (rpm)	Total reference value for the ramp in rpm (revolutions per minute)
Ramp ref (d)	Total reference value for the ramp in the unit is specified by the factor function.
Ramp ref (%)	Total reference value of the ramp as a percentage of the Speed base value

The entire Ramp reference value **Ramp ref** consists of the signed addition of **Ramp ref 1** and **Ramp ref 2** (see Figure 6.5.1.1).

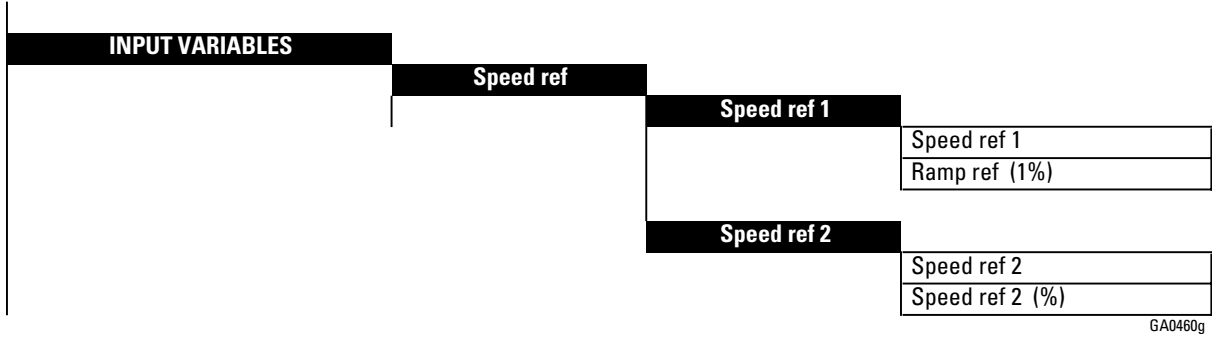
Example 1: **Ramp ref 1** = + 50 % **Ramp ref 2** = + 30 %
Ramp ref = 50 % + 30 % = 80 %

Example 2: **Ramp ref 1** = + 40 % **Ramp ref 2** = - 60 %
Ramp ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via the terminal board input.

A minimum limit can be specified for the **Ramp ref (rpm)**, **Ramp ref (d)** and **Ramp ref (%)** parameters.

6.5.2. Speed ref



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed ref 1 [FF]	42	-2*P45	+2*P45	0	Ramp output *
Speed ref 1 (%)	378	-200.0	+200.0	0.0	
Speed ref 2 [FF]	43	-2*P45	+2*P45	0	*
Speed ref 2 (%)	379	-200.0	+200.0	0.0	
Speed ref (rpm)	118	-32768	+32767		
Speed ref (d) [FF]	115	-32768	+32767		**
Speed ref (%)	117	-200.0	+200.0		

GA6105g

* This parameter can be assigned to one of the programmable digital inputs

** This parameter can be assigned to one of the programmable analog inputs

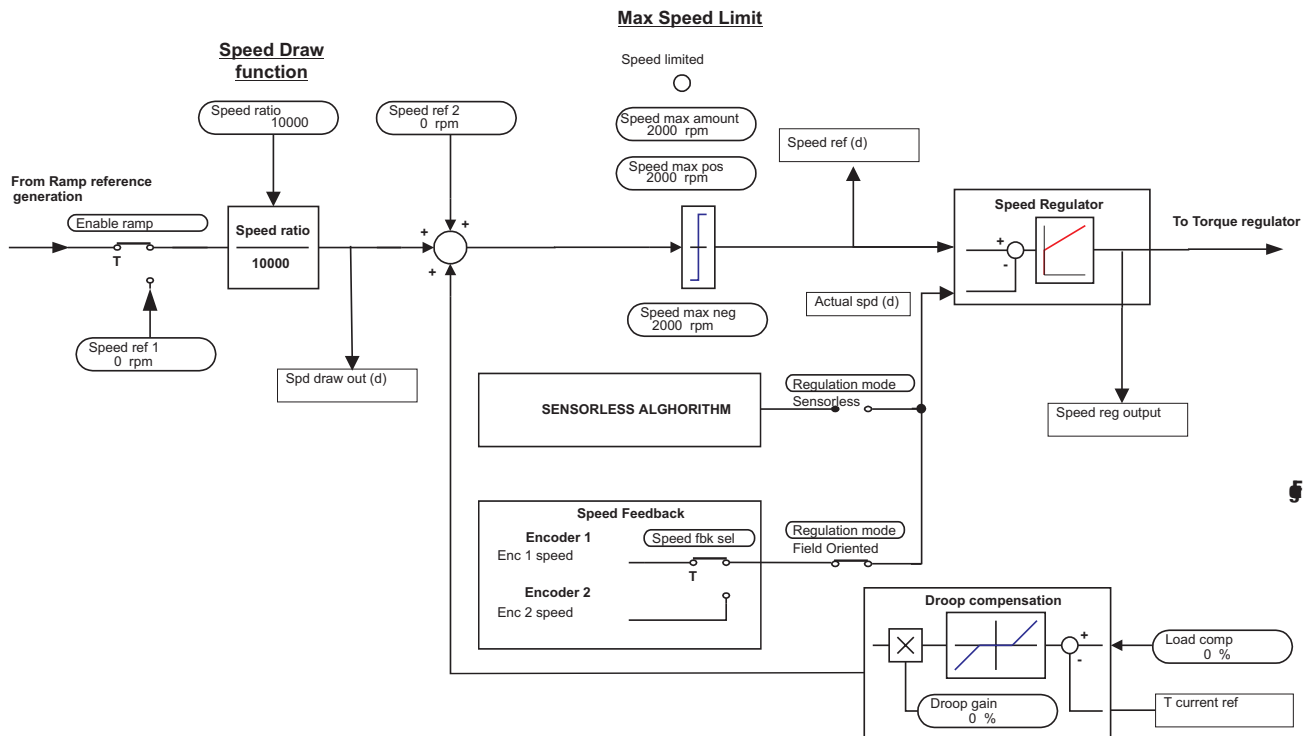


Figure 6.5.2.1: Speed references

The speed reference value defines the required speed the drive must run. The drive responds to the reference value directly, except in cases where the torque available is insufficient for this purpose. In this case, the drive operates in current limit until the selected speed has been reached. The speed reference value determines the speed of the motor, while the plus/minus sign determines the direction of rotation.

Speed ref 1	1st reference value for the speed. The value to be entered depends on the factor function.
Speed ref 1 (%)	1st speed reference value as a percentage of the Speed base value
Speed ref 2	2nd reference value for the speed. The value to be entered depends on the factor function.
Speed ref 2 (%)	2nd speed reference value as a percentage of the Speed base value
Speed ref (rpm)	Total speed reference value in rpm (revolutions per minute).
Speed ref (d)	Total speed reference value in the units specified by the factor function.
Speed ref (%)	Total speed reference value as a percentage of the Speed base value

The total speed reference value consists of the signed addition of **Speed ref 1** and **Speed ref 2**.

Example 1: **Speed ref 1** = +50% **Speed ref 2** = + 30 %
Speed ref = 50 % + 30 % = 80 %

Example 2: **Speed ref 1** = + 40 % **Speed ref 2** = - 60 %
Speed ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via the terminal board input.

The speed reference value has an upper and a lower limit.

If the ramp is selected, (**Enable ramp** parameter= Enabled), the reference value input **Speed ref 1** is automatically linked with the ramp output.

6.5.3. Torque current reference value (T current ref)



GA0470g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T current ref 1 [%]	39	***	***	0	Speed reg output *
T current ref 2 [%]	40	***	***	0	*
T current ref [%]	41	-500	+500	-	**

GA6110g

* This parameter can be assigned to one of the programmable digital inputs

** This parameter can be assigned to one of the programmable analog inputs

*** This value depends on full load torque current **FLt 100 mf** (see section 6.9)

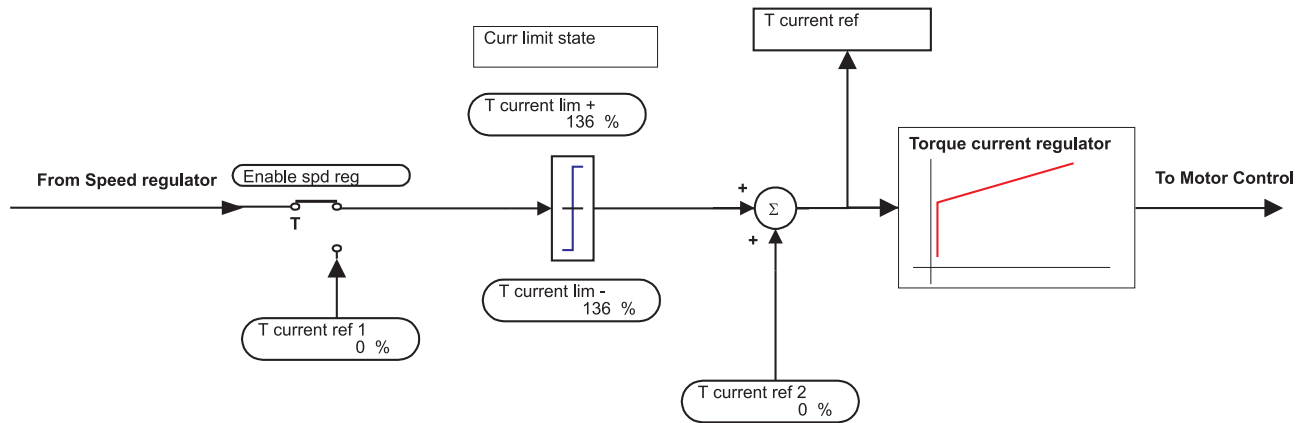


Figure 6.5.3.1: Torque references

The torque current reference value is proportional to the active current of the motor and determines the torque, the sign of the torque determines the direction. For most applications **T current Ref 1** comes from the speed regulator output. **T current ref 2** can also be used as an additional input.

- T current ref 1** First current reference value.
T current ref 2 Second current reference value.
T current ref Total current reference value.

T current ref, **T current ref 1**, **T current ref 2** are specified as a percentage of:
 Full load torque current I_{lt} 100mf (see section 6.9, "Current regulation")

The total current reference value consists of the signed addition of **T current ref 1** and **T current ref 2**.

Example 1: **T current ref 1** = + 50 % **T current ref 2** = + 30 %
 T current ref = 50 % + 30 % = 80 %

Example 2: **T current ref 1** = + 40 % **T current ref 2** = - 60 %
 T current ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via the terminal board input.

The torque current reference value has an upper limit.

6.6. Limits

6.6.1. Speed Limits

LIMITS					
		Speed limits			
		Speed amount			Speed min amount
					Speed max amount
					Speed min/max
		Speed max pos			
		Speed min neg			
		Speed max neg			
GA0480g					

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	$2^{32} - 1$	0	
Speed max amount [FF]	2	0	$2^{32} - 1$	2000	
Speed min pos [FF]	5	0	$2^{32} - 1$	0	
Speed max pos [FF]	3	0	$2^{32} - 1$	2000	
Speed min neg [FF]	6	0	$2^{32} - 1$	0	
Speed max neg [FF]	4	0	$2^{32} - 1$	2000	
Speed limited	372	0	1		*

GA6115a

* This function can be assigned to a programmable digital output.

Speed min amount	It defines the minimum speed for both directions. A value below the minimum value is not possible, regardless of the reference value selected. This parameter effects the ramp input. If the Speed min amount parameter is changed, the parameters Speed min pos and Speed min neg are set to the same value. If either of these parameters is subsequently changed, the last change is valid. The value to be entered is based on the factor function.
Speed max amount	It defines the maximum speed for both directions. This parameter affects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the direction of rotation (see Figure 6.5.2.1). If the Speed max amount parameter is changed, the Speed max pos and Speed max neg parameters are set to the same value. If either of these values is subsequently changed, the last change is valid. The value to be entered is based on the factor function.
Speed min pos	It defines the minimum speed for the clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This function effects the ramp input (see Figure 6.5.1.1). The value of the parameter to be entered is based on the factor function.
Speed max pos	It defines the maximum speed for the clockwise rotation of the motor. This function effects the input of the speed regulator and therefore takes into account both the reference values that come from the ramp as well as the directly entered values (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.
Speed min neg	It defines the minimum speed for the counter clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This parameter effects the ramp input (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.
Speed max neg	It defines the maximum speed for the counter clockwise rotation of the motor. This

parameter effects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the directly entered value (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.

Speed limited

Message that indicates that the reference value is limited by the entered minimum and maximum limit values.

Speed limited Reference value limited since the value selected is beyond the range of the limits defined.

Speed not limited Reference value within the defined limit values.

Note!

The **Speed min amount**, **Speed min pos** and **Speed min neg** parameters have an affect on the **Ramp ref 1** reference value, the motor potentiometer function and the multi-speed function. They do not, however, have an affect on the **Ramp ref 2** parameter!

6.6.2. Current limits

LIMITS																			
	<table> <tr> <th>Current limits</th><th></th></tr> <tr><td>T curr lim type</td><td></td></tr> <tr><td>T current lim [%]</td><td></td></tr> <tr><td>T current lim +</td><td></td></tr> <tr><td>T current lim -</td><td></td></tr> <tr><td>In use T curr lim +</td><td></td></tr> <tr><td>In use T curr lim -</td><td></td></tr> <tr><td>Current limit red</td><td></td></tr> <tr><td>Torque reduct</td><td></td></tr> </table>	Current limits		T curr lim type		T current lim [%]		T current lim +		T current lim -		In use T curr lim +		In use T curr lim -		Current limit red		Torque reduct	
Current limits																			
T curr lim type																			
T current lim [%]																			
T current lim +																			
T current lim -																			
In use T curr lim +																			
In use T curr lim -																			
Current limit red																			
Torque reduct																			

GA0490g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T curr lim type T lim +/- T lim mot gen	715	0	1	T lim +/- (0)	
T current lim [%]	7	0	****	S	**
T current lim + [%]	8	0	****	S	**
T current lim - [%]	9	0	****	S	**
Curr limit state	349	0	1		Digital output 5 ***
In use T cur lim + [%]	10	0	****		
In use T cur lim - [%]	11	0	****		
Current lim red [%]	13	0	****	100	
Torque reduct Torque red. not active Torque red. active	342	0	1	Not active (0)	*

GA6120g

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

*** This function can be assigned to one of the programmable digital outputs.

**** This value depends on Full load torque curr Flt 100 mf (see chapter 6.9.)

S= Dependent on size of drive.

The current limit parameters effect the input of the current regulator and only take into account the active current of the drive.

T curr lim type

This parameter determines the behavior of the drive in a current limit condition.

T lim +/-

The active positive torque limit is T current lim + and the active negative torque limit is T current lim -.

T lim mot gen

With this selection 3 conditions are possible:

1 - If the motor speed > +1% of motor rated speed the active positive torque limit is **T current lim+** and the active negative torque limit is **T current lim-**

2 - If the motor speed < -1% of motor rated speed the active positive torque limit is **T current lim-** and the active negative torque limit is **T current lim+**.

3 - If -1% of Motor nom speed < motor speed < +1% of motor rated speed, both the active positive torque limit and the active negative torque limit are **T current lim+**.

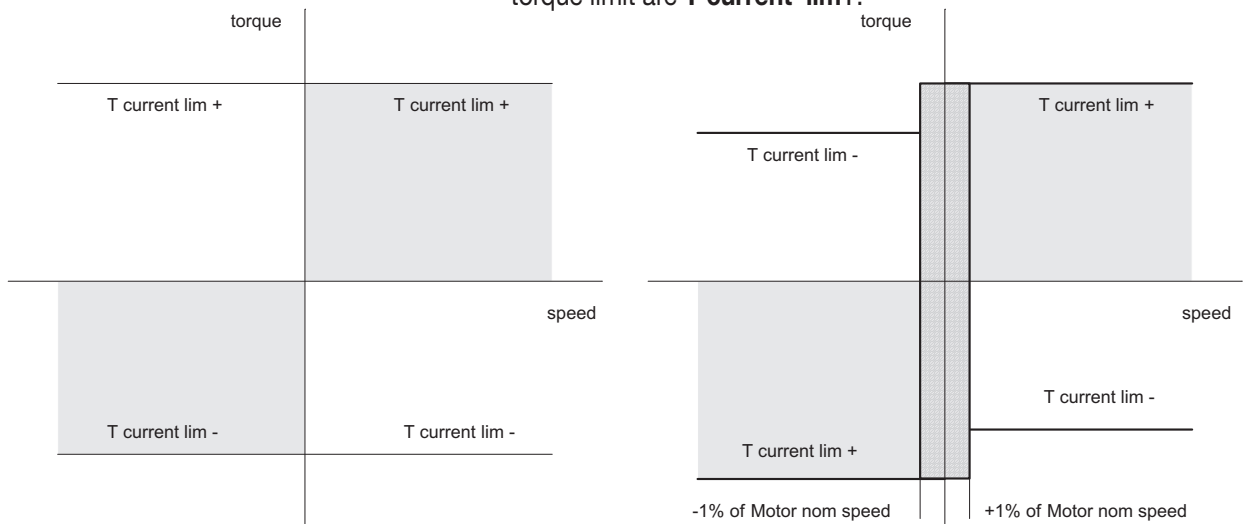


Figure 6.6.2.1: Tlim +/- , T lim not gen

In **Sensorless** mode there is also the following internal limitation :

Note!

Parameter **Full load curr [179]** must be set equal to **Nominal Current [164]** of the motor.

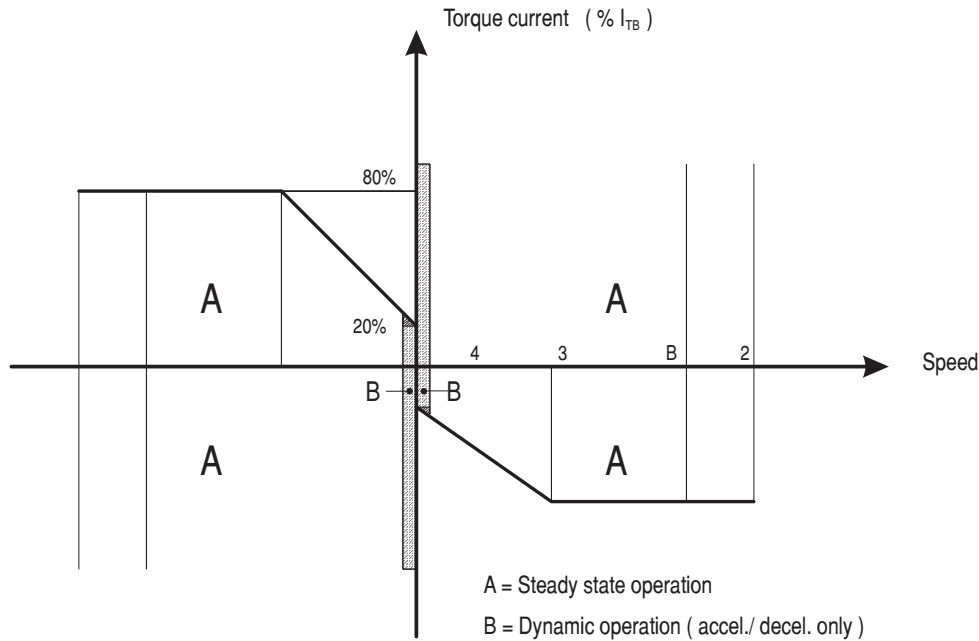


Figure 6.6.2.3: Current limits in sensorless mode

ω_B = Speed @ Base frequency

$\omega_2 = 2.5 \times \omega_B$

$\omega_3 = 0.2 \times \omega_B$

$\omega_4 = 0.02 \times \omega_B$

I_{TB} = Torque current at **Base voltage [167], Base frequency [168]**

$$I_{TB} = \sqrt{(I_N)^2 - (I_{work})^2}$$

Where:

I_N = Nominal current [164]

I_{work} = Magn working curr [726]

T current lim

Symmetrical current limit for both current directions. If the **T current limit** parameter is changed, the Parameter **T current lim +** and **T current lim -** parameters are set to the same value. If either of these parameters is subsequently changed, the last change is valid.

T current lim +

Setting of the drive current limit for the positive current direction (clockwise drive and counter-clockwise braking).

T current lim -

Setting of the drive current limit for the negative current direction (counter-clockwise drive and clockwise braking).

T current lim, T current lim+, T current lim - are specified as a percentage of full load torque curr Flt 100 mf (see section 6.9 "Current regulation").

Curr limit state

It indicates whether the drive is working in current limit or not.

Current limit reached

Drive working in current limit. "I limit" LED lights up on keypad.

Current limit not reached

Drive not working in current limit.

In use Tcur lim +

Positive Current limit value in use

In use Tcur lim -

Negative Current limit value in use

Current lim red

Selection of **T current lim +/-** value, for use with **Torque reduct** (torque reduction) function.

Torque reduct

Selects torque reduction function. This function can be assigned to a programmable digital input. When the torque reduction function is active, the current limit is reduced to the percentage defined with the **Current lim red** parameter.

High Torque reduction not active

Low Torque reduction active

Example of the **Current lim red** and **Torque reduct** parameters.

T current limit (or **T current lim +/-**) = 80 %

Current lim red = 70 %

Torque reduct = Low (not active) Current limit = 80 %

Torque reduct = High (active) Current limit = 70 %

The value for **T current lim** can be set in the BASIC MENU.

6.6.3. Flux limit



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux level	467	0	100	100	**

GA6121g

** This parameter can be assigned to one of the programmable Analog inputs or analog outputs.

Flux Level Percentage limit of the working flux.

Working flux is internally computed according to the settings of the **Base Voltage** and **Base frequency** parameters. See also chapter 6.10 Flux regulation

6.6.4. Voltage limits



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dynamic vlt margin [%]	889	1.0	10.0	1.0	

GA6122g

Dynamic vlt margin It corresponds to the voltage regulation margin with respect to the nominal one available.

In case a **Base voltage** setting is close to or equal to the actual value of the line voltage, **Dynamic vlt margin** represents the margin allowable by the voltage regulator when step loads are suddenly applied.

A 5% value allows a very fast response to a step load but at a loss of voltage (and maximum power).

The minimum value (1%) allows a maximum output voltage, around 98%, of the main line voltage but at a loss in the quality of dynamic response.

6.7. Ramp

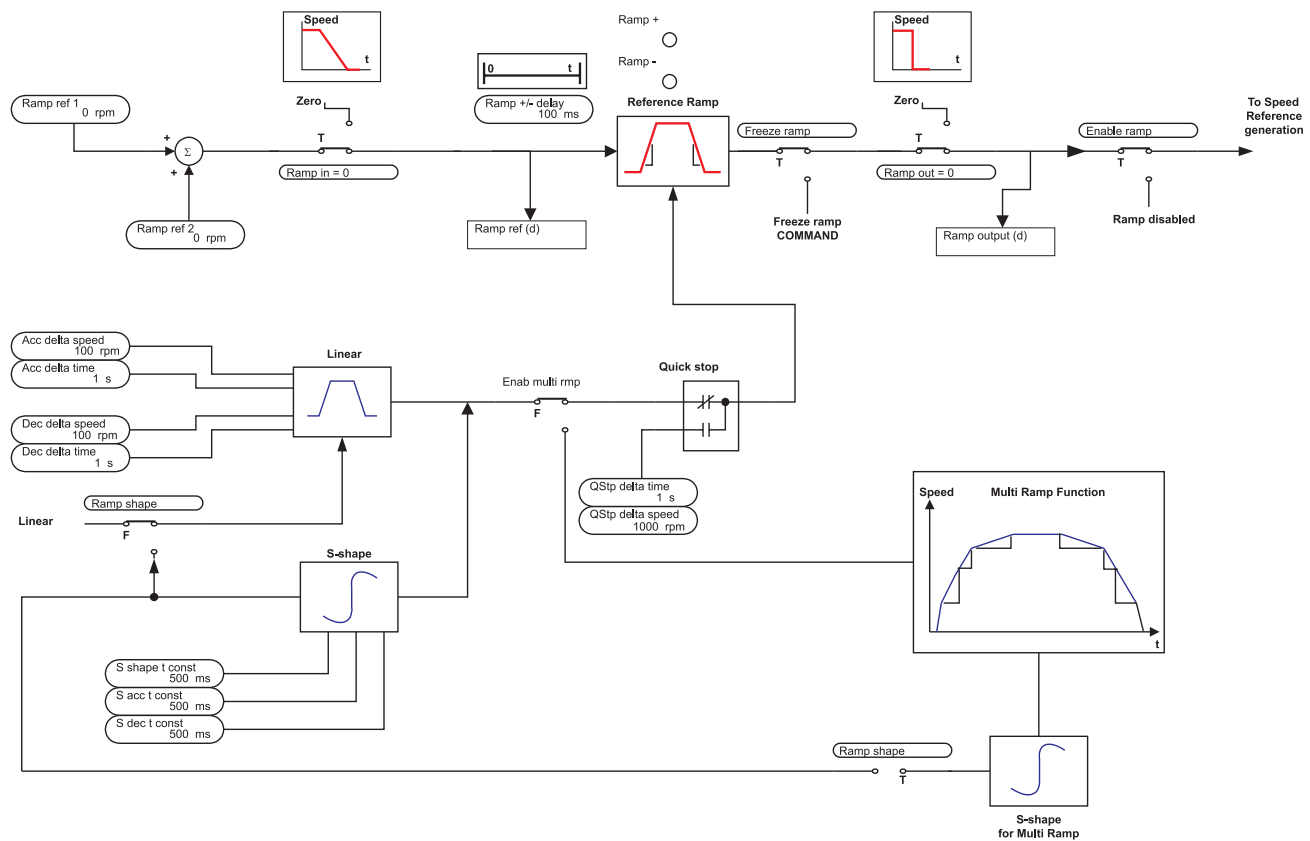


Figure 6.7.1: Ramp

The ramp determines the acceleration and deceleration times of the drive. These times can be set independently of each other. A separate ramp is provided for fast stop. This ramp can be activated via the serial interface or a bus or via terminal strip (Fast Stop).

The ramp can either be linear or S-shaped.

The reference values can be defined in three ways

- with the **Ramp ref 1** and/or **Ramp ref 2** reference values
- with the multi-speed function
- with the motor potentiometer function

The Ramp generator can be used in a stand alone configuration. When the Ramp generator is disabled (**Enable Ramp** = disabled), the Enable drive, Start/Stop and Fast stop commands have no more influence on the Ramp generator. In such a condition it is free to run and can be used separately.

6.7.1. Acceleration, Deceleration, Quick Stop

RAMP	
Acceleration	
	Acc delta speed
	Acc delta time
Deceleration	
	Dec delta speed
	Dec delta time
Quick stop	
	Qstp delta speed
	Qstp delta time

GA0510g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	$2^{32} - 1$	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	$2^{32} - 1$	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	$2^{32} - 1$	1000	
Qstp delta time [s]	38	0	65535	1	

GA6125g

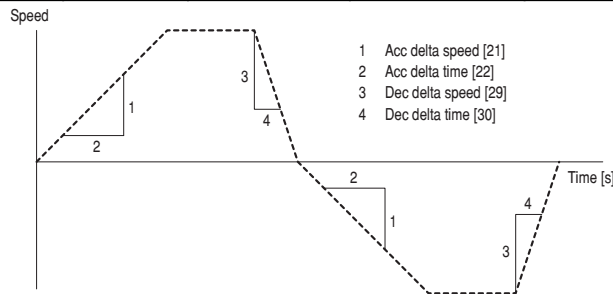


Figure 6.7.1.1: Accel, Decel, and Quick stop

Acc delta speed

Has the same units as the ramp reference value and is based on the factor function.

Acc delta time

Is defined in seconds. If "0" is entered, the ramp output directly follows the reference value.

Dec delta speed

Has the same units as the ramp reference value and is based on the factor function.

Dec delta time

Is defined in seconds. If "0" is entered, the ramp output directly follows the reference value.

Qstp delta speed

Has the same units as the ramp reference value and is based on the factor function.

Qstp delta time

Is defined in seconds. If "0" is entered, the ramp output directly follows the reference value.

Quick stop

Activates the Quick stop ramp and disables the Drive when halted.

Fast stop

Activates the Quick stop ramp and holds the motor at zero speed under control.

The acceleration of the drive is defined as a ratio of the **Acc delta speed** and **Acc delta time** parameters (see Figure 6.7.1.1). It is the same for both directions of rotation.

The deceleration of the drive is defined as a ratio of the parameters **Dec delta speed** and **Dec delta time** (see Figure 6.7.1.1). It is the same for both directions of rotation.

The Quick Stop and Fast stop functions provide an independent deceleration ramp for the emergency braking of the drive. The ramp output in this case is not set to zero immediately but after a set time. The deceleration of the drive via the Quick Stop function is defined as the ratio of the **Qstp delta speed** and **Qstp delta time** parameters. It is the same for both directions of rotation. If the parameter **Qstp Opt code** = DC Braking curr, the drive is stopped by injection of DC current.

6.7.2. Ramp shape and control commands

RAMP	
	Ramp shape
	S shape t const
	S acc t const
	S dec t const
	Ramp +/- delay
	Fwd-rev
	Enable ramp
	Ramp out = 0
	Ramp in = 0
	Freeze ramp

GA0520g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp shape Linear S shaped	18	0	1	Linear (0)	
S shape t const [ms]	19	100	3000	500	
S acc t const [ms]	663	100	3000	500	
S dec t const [ms]	664	100	3000	500	
Ramp+	346	0	1		Digital output 1 **
Ramp-	347	0	1		Digital output 2 **
Ramp +/- Delay [ms]	20	0	65535	100	
Fwd-Rev No direction Fwd direction Rev direction No direction	673	0	3	Fwd (1)	
Forward sign	293	0	1	0	
Reverse sign	294	0	1	0	
Enable ramp (Enabled/Disabled)	245	0	1	Enabled (1)	
Ramp in = 0 Active Not Active	345	0	1	Not active (1)	*
Ramp out = 0 Active Not Active	344	0	1	Not active (1)	*
Freeze ramp Active Not Active	373	0	1	Not active (1)	*
Ramp outp (rpm)	113	-32768	+32767		
Ramp output (d)	112	-32768	+32767		***
Ramp output (%)	114	-200.0	+200.0		

GA6130g

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable digital output.

*** This parameter can be assigned to a programmable analog output.

The shape of the ramp is determined by the **Ramp shape** and **S shape t const** parameters.

Ramp shape	Linear	Linear ramp
	S shaped	S-shaped ramp
S shape t const	Determines the curve for S-shaped ramps (see Figure 6.7.2.1).	

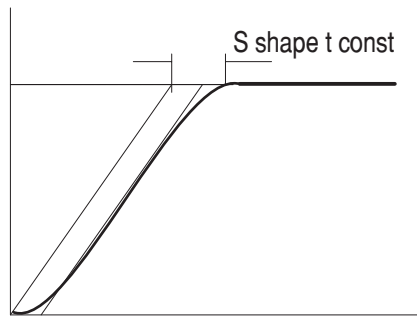


Figure 6.7.2.1: Ramp shape

The value of **S shape t const** is added to the ramp time of the linear ramp. The ramp time is thus lengthened by the value defined by the **S shape t const** parameter. This is done regardless of the speed change involved!

S acc t const	Determines the curve for S-shaped acceleration ramps
S dec t const	Determines the curve for S-shaped deceleration ramps

If very different **S acc t const** and **S dec t const** values are used, it is possible to have a discontinuous speed reference during the change of the motor direction.

Speed changes (= Ramp active) are indicated by the **Ramp +** and **Ramp -** parameters.

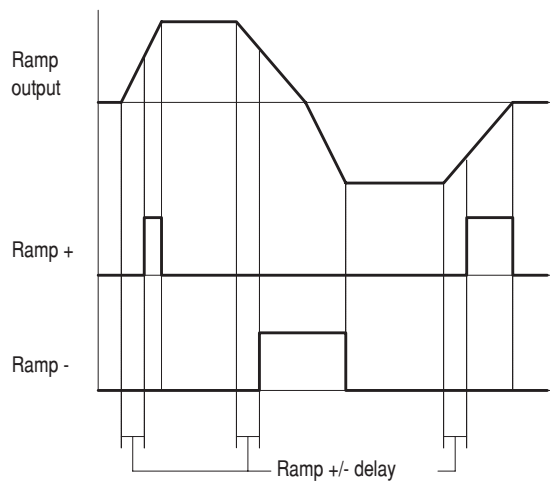


Figure 6.7.2.2: Ramp delay

Ramp +	Active during acceleration if the drive has a positive rotation.
Ramp -	Active during deceleration if the drive has a negative rotation.
Ramp +/- delay	It defines a delay time for Ramp+ and Ramp- signals to become active.
Fwd-Rev	Changes the sign of the Ramp reference. When Fwd direction is selected the Ramp reference is multiplied by +1. When Rev direction is selected the Ramp reference is multiplied by -1.
Forward sign	Sets the Fwd direction of the Ramp reference. It can be programmed on a digital input.

Reverse sign Sets the Rev direction of the Ramp reference. It can be programmed on a digital input. When both Fwd and Rev are 0 or 1, or Fwd-Rev is 0 or 1 the multiplier is 0.

The behavior of the ramp is defined by the **Enable Ramp**, **Ramp In = 0**, **Ramp Out = 0** and **Freeze ramp** parameters.

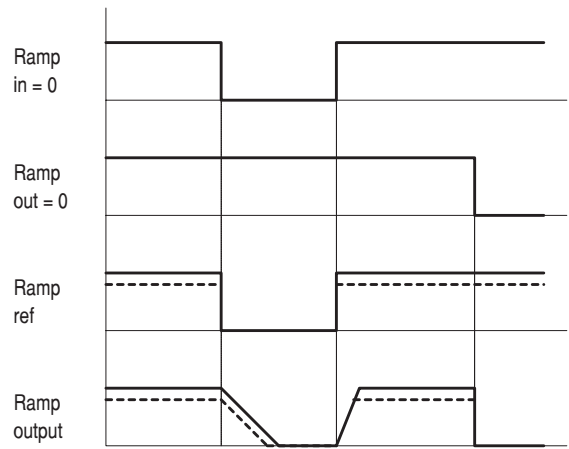


Figure 6.7.2.3: Ramp control

This parameter can only be programmed with a disabled drive.

Enable Ramp	Enabled	Ramp function enabled.
	Disabled	Ramp function disabled.
Ramp in = 0	Not Active	Ramp input is enabled. The Ramp Ref=1 parameter corresponds to the reference value set.
	Active	The ramp input is disabled. Ramp Ref = 0
Ramp out = 0	Not Active	The ramp output is enabled.
	Active	The ramp output is set to zero immediately.
Freeze ramp	Not Active	The value at the ramp output is maintained, regardless of reference value changes at the ramp input.
	Active	The ramp output follows the reference value changes according to the times set.
Ramp outp (rpm)	Ramp output in rpm (revolutions per minute)	
Ramp output (d)	Ramp output in the dimension defined by the factor function	
Ramp output (%)	Ramp output as a percentage of the Speed base value	

Drive operation is only possible with the ramp function enabled. **Enable ramp** = Enabled.

When the ramp input is enabled via **Ramp in = 0**, the acceleration time of the drive starts. If the input is disabled through this parameter, the drive slows down according to the deceleration time.

When the ramp output is set to zero via **Ramp out=0**, the drive brakes at current limit (maximum available torque). The ramp function (including **Quick Stop**) has no effect.

6.8. Speed Regulation

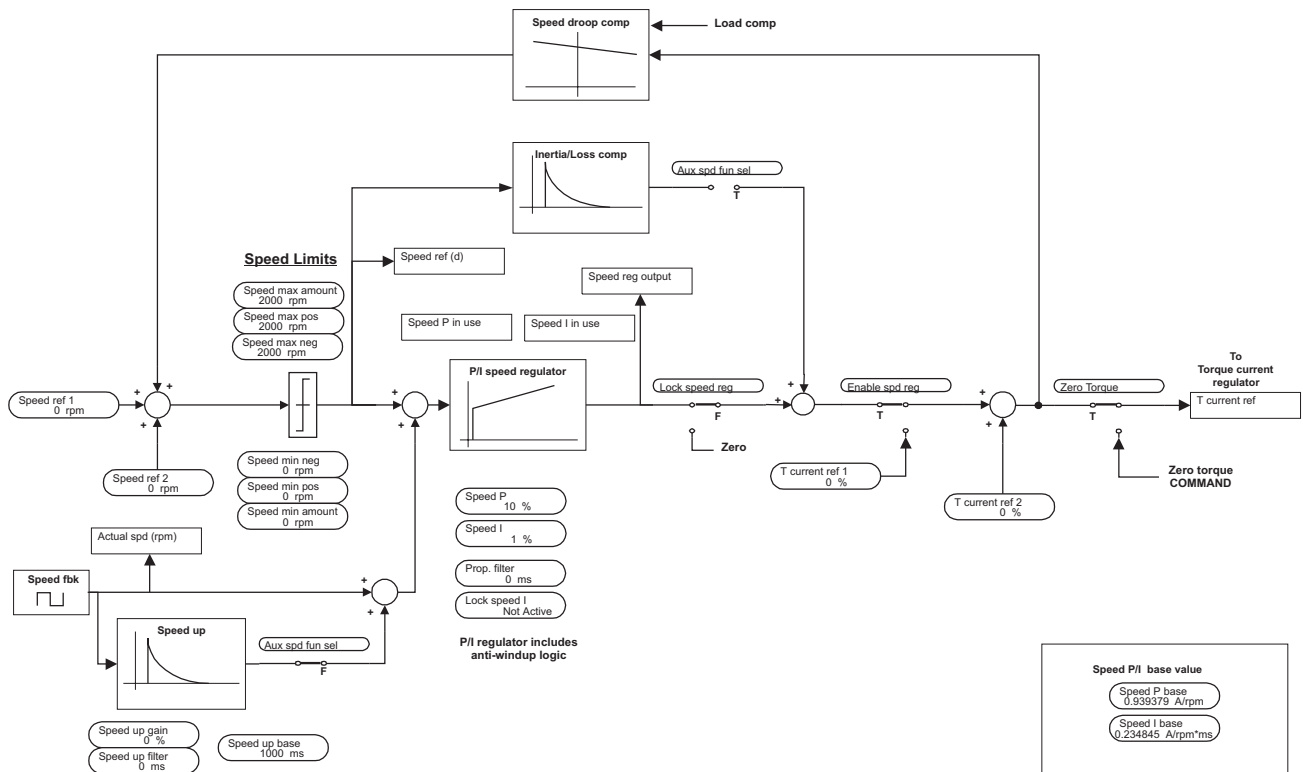


Figure 6.8.1: Speed regulator

The AV-300i Drives are provided with a speed regulator circuit that can be adapted to the requirements of various applications. The drive is factory set with typical P and I gains.

The following functions are also provided:

- “Speed up” function in order to avoid oscillations with a high moment of inertia loads.
- Speed zero logic for regulator behavior when the motor is stopped.
- Speed loop gain modification as a function of operating speed or an external reference (Adap Reference).
- Catch a spinning motor for engaging a running motor.
- Speed control logic.
- Speed signals.
- Droop function for load sharing.

The internal structure of the speed regulator is shown on chapter 9 (“Speed regulator PI part” block diagram).

6.8.1. Speed regulator

SPEED REGULAT

Speed ref

Speed reg output

Lock speed reg

Enable spd reg

Lock speed I

Aux spd fun sel

Prop filter

Ga0530

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ref [rpm]	118	-32768	+32767	-	**
Speed reg output	236	-	-	-	T current ref 1**
Lock speed reg	322	0	1	OFF	*
ON					
OFF				(0)	
Enable spd reg	242	0	1	Enabled	
Enabled				(1)	
Disabled					
Lock speed I	348	0	1	Not active	*
Active					
Not active				(1)	
Aux spd fun sel	1016	0	1	Speed up	
Speed up				(0)	
Inertia/loss cp					
Prop filter [ms]	444	0	1000	0	

Ga6130

Ga6135

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

Speed ref	Total speed reference value in rpm (revolutions per minute)
Speed reg output	Output value of the speed regulator, used as the reference value for the torque current regulator

Note!

Speed reg output [%] contains valid information even if the speed regulator is disabled (Enable speed reg = Disabled). If the Speed reg output is enabled, it contains the sum of actual speed regulator output and **T current ref 2**.

Lock speed reg	This parameter is used in order to disconnect the speed regulator output from the torque current regulator during operation. When this happens, the torque current reference value is set to zero and the drive coasts to a halt. This coasting time then depends on the rotating mass and the friction within the system. When this function is shut off and the connection between the speed regulator and the current regulator is restored, the drive will restart and accelerate in current limit.
ON	Speed regulator / torque current regulator connection opened (= 15...30V when using a digital input.)
OFF	Speed regulator / torque current regulator connection present (= 0V when using a digital input).

Enable spd reg	This parameter can only be changed when the drive is switched off.	
Enabled	The speed regulator is enabled. The regulator output is connected to the input of the torque current regulator. Speed reg output = T current ref 1	
Disabled	The speed regulator is disabled.	
Lock speed I	Not active	The I component of the speed regulator is active
	Active	The I component of the speed regulator is set to zero
Aux spd fun sel	Selection of the Speed up or Inertia/loss comp function (see chapter 5.3.5.4 & 6.8.4 for other details).	
Prop filter	Time constant of the filter in the speed feedback circuit. Filtering of the high frequency components of the speed feedback signal is useful in the situation where there is an elastic coupling between motor and load (couplings or belts).	

Note!

The speed regulator must be enabled with the **Enable spd reg** parameter in order to use “Prop filter”.

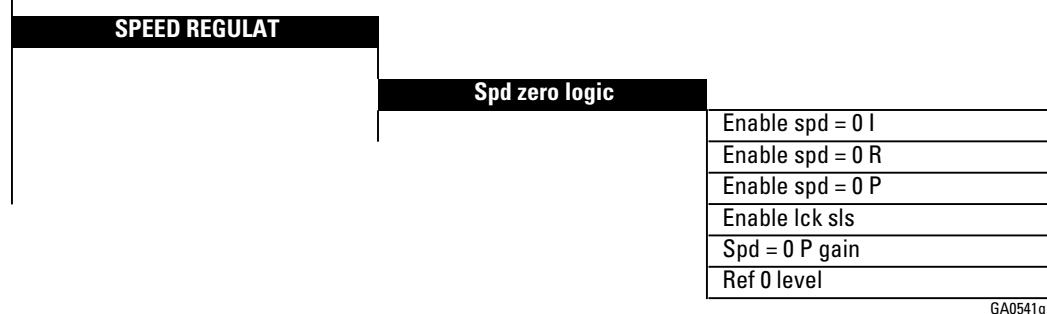
The reference value for the speed regulator consists of the sum of **Speed ref 1** and **Speed ref 2**.

For Field oriented mode the speed signal is supplied by an encoder that is mounted to the motor shaft. The higher the resolution of the encoder, the better the accuracy of the regulator. In Sensorless mode, the speed is computed by the flux model block in the regulator.

The regulator parameters can all be set independently.

For the speed PI regulator diagram block, please refer to the diagram in chapter 9.

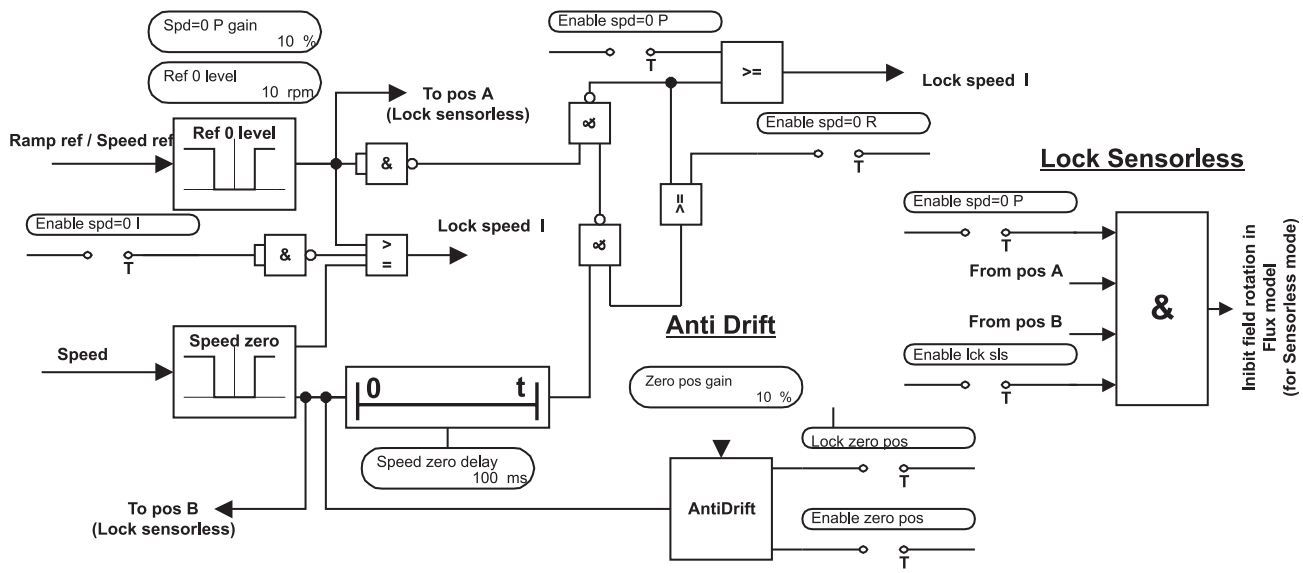
6.8.2. Spd zero logic



GA0541g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd=0I	123	0	1	Disabled	
Enable Disable				(0)	
Enable spd=0R	124	0	1	Disabled	
Enable Disable				(0)	
Enable spd=0P	125	0	1	Disabled	
Enable Disable				(0)	
Spd=0P gain [%]	126	0.00	100.00	10.00	
Enable lck sls	422	0	1	Disabled	
Enable Disable				(0)	
Ref 0 level [FF]	106	1	32767	10	

GA6140g

Speed zero logic**Figure 6.8.2.1: Speed adaptive and Speed zero logic**

The speed zero logic defines the behavior of the drive when the motor is at a stop.

Enable spd=0 I	Enabled	The I component of the speed regulator is set to zero when the speed reference value and the actual value = 0. The regulator loop is then made up of the proportional gain component only. The I component is enabled when a reference value is entered and acceleration begins.
	Disabled	The I component of the speed regulator is effective when the motor is in a stop condition.
Enable spd=0 R	Enabled	Only effective if Enable spd=0 P is enabled. The proportional Spd=0 P gain is used when the drive is stopped. When the speed reference value is above the value defined by Ref 0 level , the standard speed P gain parameter is used.
	Disabled	The proportional Spd=0 P gain parameter used when the drive is at a stop condition is not used. The normal speed P gain parameter is functional.
Enable spd=0 P	Enabled	When reference value and Actual speed are both below Ref 0 level and Speed zero level ("ADD SPEED FUNCT/Speed zero" menu), and after the time delay defined by Speed zero delay , the proportional and integral gains of the speed regulator loop are set respectively to Spd=0 P gain and to zero. Spd=0 P gain deactivation is based on the Enable spd=0 R parameter.
	Disabled	The speed regulator retains its normal proportional gain when the drive is at a halt.
Spd=0 P gain		Proportional gain of the speed regulator, that is used only when the Enable spd=0 P function has been enabled.
Enable lck sls		This parameter is used for Sensorless control. This function (Enabled lck sls=Enabled) disables speed control and field rotation when the speed reaches the zero speed threshold. This avoids motor drift. Direct current equal to magnetizing current is injected into the motor so that no significant torque can be produced by the motor. This function is active when Enable Spd = 0 P is enabled.
Ref 0 level		Threshold for speed zero logic and for zero reference detection. Defined in the units specified in the factor function. References below this threshold are defined as zero.

6.8.3. Anti Drift Function

SPEED REGULAT						
		Spd zero logic				
				Enable zero pos		
				Lock zero pos		
				Zero pos gain		
GA0493g						
Parameter		No.	Value			Standard Configuration
			min	max	Factory	
Enable zero pos		890	0	1	Disabled (0)	
Disable Enable						
Lock zero pos		891	0	1	OFF (0)	*
OFF ON						
Zero pos gain [%]		892	0	100	10	
GA6123g						

* This parameter can be assigned to one of the programmable digital input

Enabling this function locks the rotor of the motor at zero speed without drift, it uses an internal position control. It is activated via digital input or Bus control, using the command **Lock zero pos**. It becomes active when zero speed (**speed zero level**) detection is reached.

Enable zero pos Enable Anti drift function enabled
 Disable Anti drift function not enabled

Lock zero pos This command enables the Anti drift function through the digital input, keypad or Bus

Zero pos gain [%] Proportional gain of the position control

Also refer to parameters ADD SPEED FUNCT / Speed zero / **Speed zero level** and **Speed zero delay**

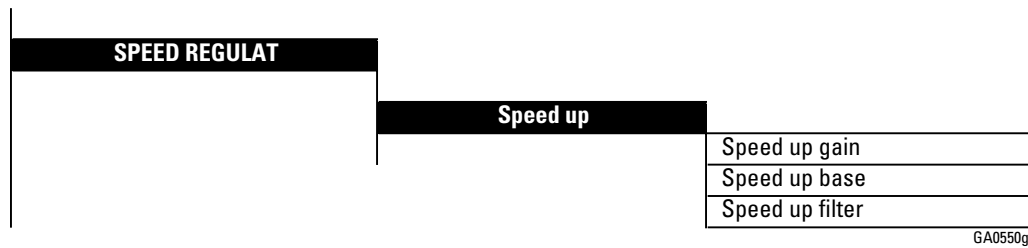
Application example:

- Enable zero pos = Enabled
- Lock zero pos = Enabled
- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is given and the motor decels to 10 rpm, the position control is automatically activated after 100 msec and the drive comes to a stop and holds zero speed.

To restart the motor, it will be necessary to reset the **Lock zero pos** command to disable before the START command is given.

6.8.4. Speed up



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed up gain [%]	445	0.00	100.00	0.00	
Speed up base [ms]	446	0	16000	1000	
Speed up filter [%]	447	0	1000	0	

GA6150g

The Speed-up function is used to eliminate oscillations with high inertia loads. It is made up of a derivative part in the speed feedback circuit, which increases the integral gain of the speed regulator and limits the overshoot. It is also useful in case of cyclical non constant loads on the motor (ex. cams). The feedback applied to the speed regulator is made of two components:

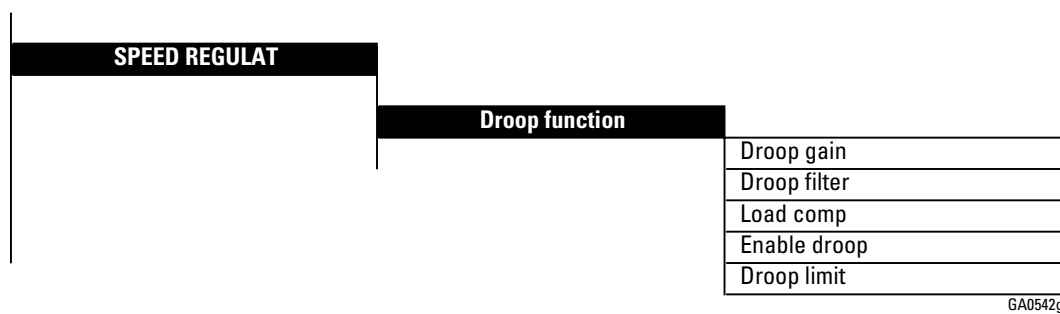
- the motor speed
- the output signal from the Speed up function

This function is mutually exclusive with the **Inertia/loss comp** function. Selection must be done via the **Aux spd fun sel** [1016] parameter. (SPEED REGULAT menu). See section 6.8.1 Speed regulator.

Speed up gain	Speed up function gain as a percentage of Speed up base
Speed up base	Speed up function max. gain. The defined value corresponds to 100% of the Speed up gain parameter.
Speed up filter	Time constant of the filter in the derivative part of the Speed up function.

(see example figure 5.3.5.4.1 and 5.3.5.4.2)

6.8.5. Droop function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Droop gain [%]	696	0.00	100.00	0.00	
Droop filter [ms]	697	0	1000	0	
Load comp [%]	698	F	F	0	*
Enable droop (Enable / Disable)	699	0	1	Disabled (0)	**
Droop limit [FF]	700	0	2*P45	1500	

GA6145ai

* This parameter can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog outputs.

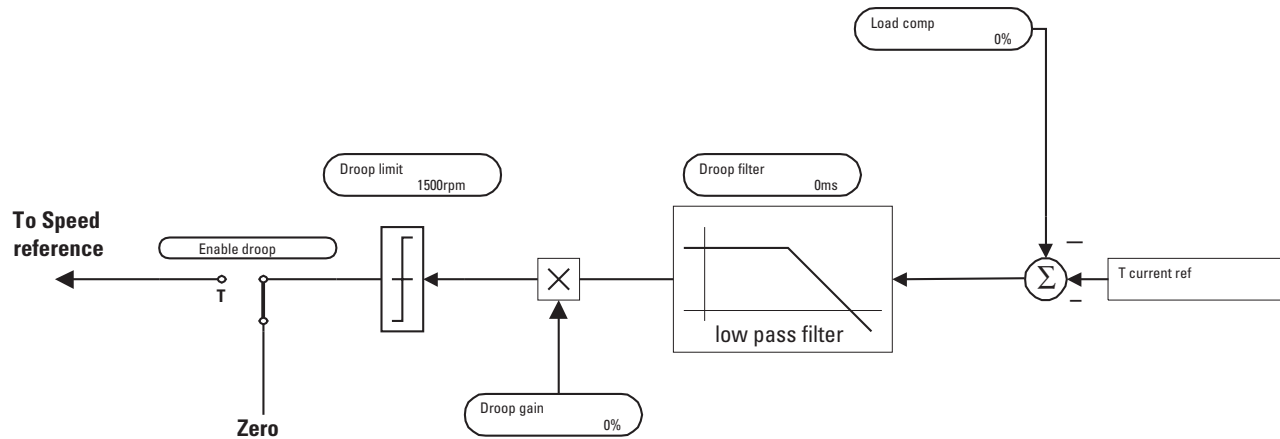


Figure 6.8.5.1: Droop compensation

The Droop function is used when current balancing between two drives is required. A typical situation may occur when two motors are mechanically coupled and have to run at the same speed. If, because of different characteristics within the two speed regulators, one motor runs at a higher speed, it will be overloaded and the second motor will not have the same load. The Droop function avoids this by adding a component in the speed reference of the second drive, which is proportional to the actual load difference of the drives. The effect is to balance the current of the two motors.

Droop gain

This is defined as a percentage of the ratio between **Speed base value** and the difference of **Load comp** - **T current ref**. This means that when the difference between **Load comp** - **T current ref** is 100% and **Droop gain** = 100%, the speed reference correction signal is equal to **Speed base value**.

Droop filter

Filter time constant.

Load comp

Load compensation signal. It is typically equal to the “master” drive current, but it can also be provided by an external control (PLC, etc.). The parameter can be assigned to a programmable analog input and it is defined as a percentage of I_{dn} .

Enable droop

Enabled Droop function enabled.

Disabled Droop function disabled.

Droop limit

It defines the speed range in which the droop function is active. The value entered is based on the factor function.

(For more detail see figure 6.8.1 Speed regulator)

6.8.6. Inertia/Loss comp

SPEED REGULAT	
	Inertia/Loss cp
	Inertia
	Friction
	Torque const
	Inertia c filter

Ga0543

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Inertia [Kg*m*m]	1014	0.001	999,999	S	
Friction [N*m]	1015	0.000	99,999	S	
Torque const [N*m/A]	1013	0.01	99.99	S	
Inertia c filter [ms]	1012	0	1000	0	

Ga6146

S = depending on the drive size

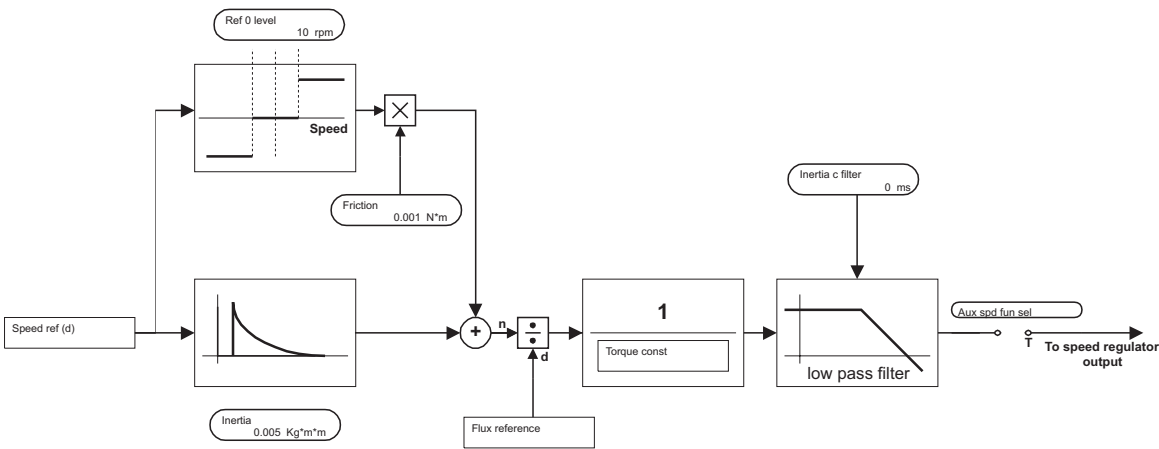


Figure 6.8.6.1: Inertia/Loss compensation

The speed regulator feed forward term that allows increase of the response to a speed reference change. These parameters are calculated during the Speed self tune (DRIVE PARAMETER\Motor parameter\Self tuning\Self-tune 3) but they can also be manually set by the user.

This function is mutually exclusive with the Speed up function. Selection must be done via the **Aux spd fun sel** [1016] parameter. (SPEED REGULAT menu). See section 6.8.1, Speed regulator.

This function does not apply to “V/f control” regulation mode.

- Inertia

Total Inertia value at the motor shaft in Kg*m² identified during the speed self tune procedure. (1 Kg*m² = 23.73 lb*ft²)
- Friction

Friction value (or Loss compensation) in N*m identified during the speed self tune procedure. (1 N*m = 0.738 lb*ft)

Torque const

Total torque constant value, internally computed that defines the Nm to Amps conversion when the motor operates within the specified **Base voltage** and **Base frequency** range. To take field weakening into account, this value must be scaled using the value of **Flux reference [500]**.

Inertia c filter

1st order low pass filter time constant. The filter reduces the noise that may effect the operation of the speed differentiation in the Inertia compensation block.

Inertia/Friction: default value

Drive size	Inertia [Kg*m*m]	Friction [N*m]
6KAVI43F75	0.0018	0.001
6KAVI43001	0.0035	
6KAVI43002	0.0048	
6KAVI43003	0.005	
6KAVI43005	0.011	
6KAVI43007	0.023	
6KAVI43010	0.028	
6KAVI43015	0.05	
6KAVI43020	0.07	
6KAVI43025	0.15	
6KAVI43030	0.24	
6KAVI43040	0.44	
6KAVI43050	0.52	
6KAVI43060	0.79	
6KAVI43075	1.4	
6KAVI43100	1.6	
6KAVI43125	2.2	
6KAVI43150	2.7	
6KAVI43200	3.2	

Ga6147ai

[1013]

Torque const is an internal value which is computed as a function of motor plate data when **Take motor par** is used.

6.9. Current Regulation

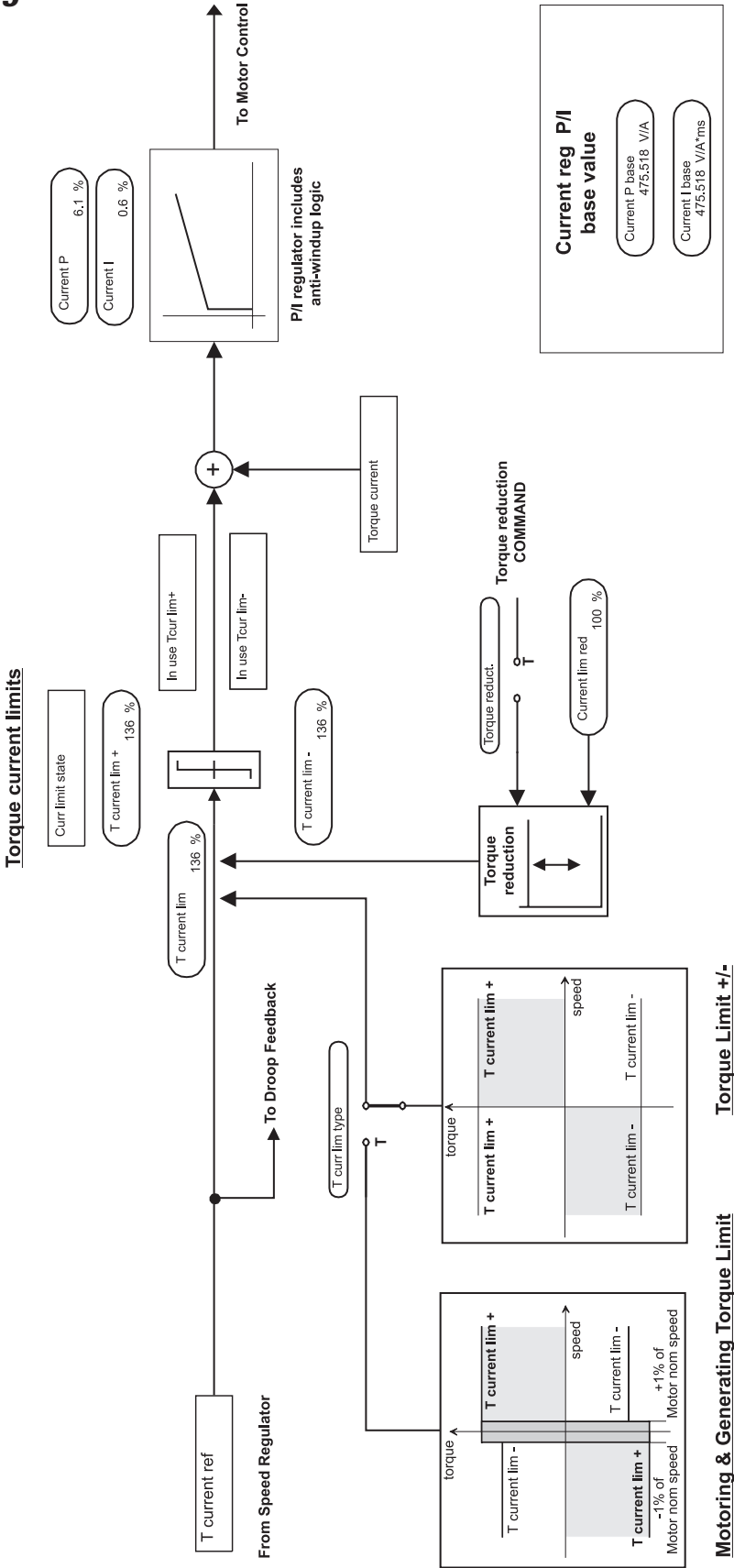


Figure 6.9.1: Torque current regulator

CURRENT REGULAT					
Zero torque					
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Torque current	350	S	S		**
Flux current	351	S	S		**
F current ref	352	S	S		**
Zero torque	353	0	1	Not Active	*
Active					
Not Active				(1)	

GA6155g

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

S= Dependent on the drive size.

The user defines the full load current of the motor via the **Full load curr** (FLC) parameter in the CONFIGURATION menu. This is at the same time the output current of the drive when **T current ref** = 100 %. The drive calculates the value $I_{\mu_{WORK}}$ of magnetizing current required by using **Base voltage** and **Base frequency** and the defined motor data for operation in the base speed range. The F Current ref parameter approximately equals $I_{\mu_{WORK}}$ during steady state operation. The active motor current in this operating condition is called “Full load torque current” and it is computed as:

$$Flt\ 100mF = \sqrt{(FLC)^2 - (I_{\mu_{WORK}})^2}$$

fA021

The **Torque current reference** and **Torque current limit** values are based on **Flt 100mF**. Note that Flt 100mF is an external parameter and is not accessible to the user.

Quantities based on **Flt 100mF** represent torque quantities in the base speed range (scaling by the flux percentage is required in the field weakening range).

Percentage quantities based on FLC refer to total inverter output current. Overload control typically deals with these quantities.

The current regulator consists of two control loops:

- a control loop for the active current “Torque current” (Abbr.: T current)
- a control loop for the reactive current “Flux current” (Abbr.: F current)

They use the same P and I gains. See the regulation block diagram in section 9, “Block Diagrams”.

Torque Current	Active current of the motor (actual value). This value can be assigned to a programmable analog output.
Flux Current	Reactive current of the motor (actual value). This value is only available via the serial interface.
F current ref	Reference value for the flux current (generated internally). This value can be assigned to a programmable analog output.
Zero torque	This parameter can be used to set the reference value for the reactive, current T current ref , to zero so that the drive has no torque.
Not Active (H)	T current ref not set to zero
Active (L)	T current ref set to zero. The drive has no torque.

6.10. Flux Regulation

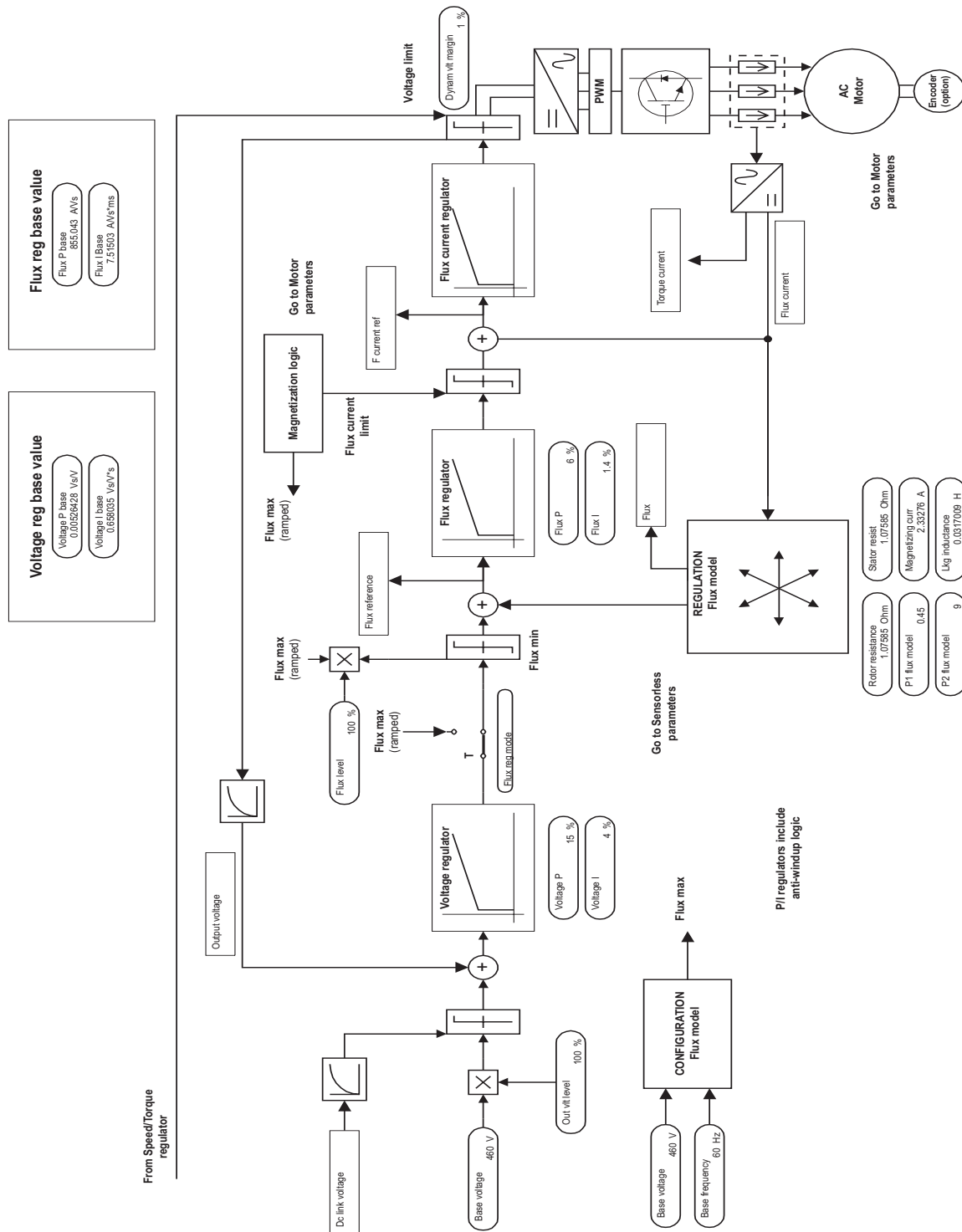


Figure 6.10.1: Motor control

FLUX REGULATION

Flux reg mode
Flux reference
Flux
Out vlt level

GA0551g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux reg mode	469	0	1	Volt. control	
Constant current					
Voltage control				(1)	
Flux reference	500	0.0	100.0	-	*
Flux	234	0.00	100.00	-	*
Out vlt level	921	0.0	100.0	100.0	**

GA6151g

* This parameter can be assigned to one of the programmable Analog output

** This parameter can be assigned to one of the programmable Analog output and Analog Input

The AV-300i Drive contains the “flux control” regulator (working flux) and the “Voltage control” regulator. The magnetization curve (P1 flux model [176] and P2 flux model [692] parameters) is automatically defined through the Self tuning procedure.

Via the **Flux level** [467] parameter (Limit\Flux Limit) it is possible to set the working flux value and via the Out vlt level [921] it is possible to set the motor output voltage.

Flux reg mode Operating mode selection of the Flux regulator

Constant current With this selection, the motor flux is automatically set and controlled according to the setting of **Base voltage** and **Base frequency**. It uses the voltage available on the DC link and the output frequency of the inverter.

This function must be used when it is necessary to have external control of the motor flux (for example through the DGF card or through an analog input).

Voltage control With this selection the regulator tries to maintain the flux value constant for the working range of the motor. This will be independent of the output frequency and the DC Link voltage.

Flux reference Flux reference, given as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Flux Flux feedback, given as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Out vlt level With this parameter, it is possible to modify the voltage corresponding to the defluxing setpoint of the motor.

Out vlt level is defined as a percentage of **Base voltage**.

Out vlt level is used only when **Flux reg mode** = **Voltage control**

Using **Out vlt level** and **Flux level** (LIMIT/Flux limit) parameters it is possible to modify the flux characteristic, as described in the following examples:

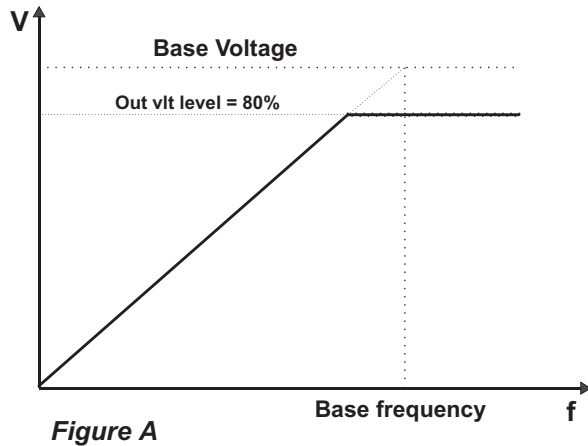


Figure A

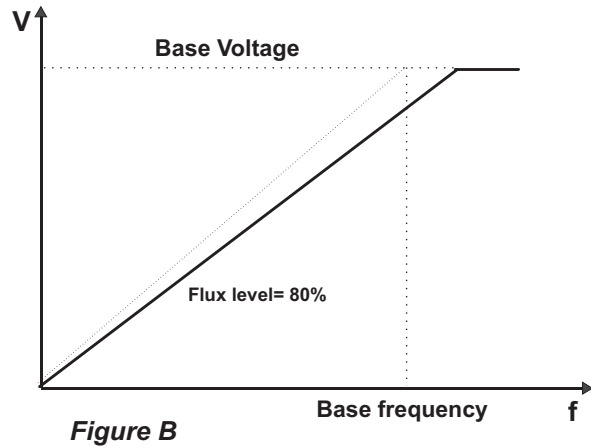


Figure B

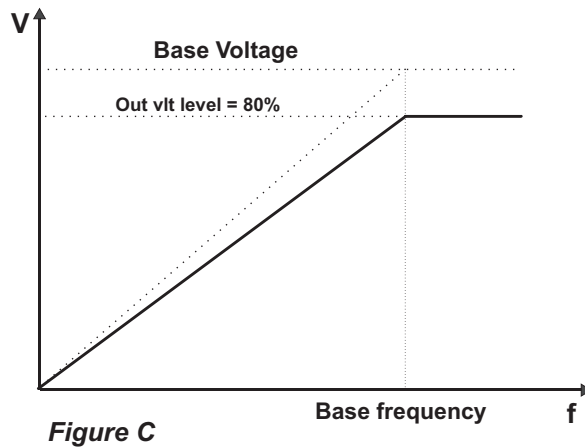


Figure C

Figure A: Out vlt level = 80%

The motor flux is defined by **Base voltage** and **Base frequency** up to the 80% of the **Base voltage** (constant flux). Past this setpoint the motor will be under-fluxed.

Figure B: Flux level = 80%

The motor voltage is reduced to 80% of the ratio defined by **Base voltage** and **Base frequency**. In this way the voltage value corresponding to the **Base voltage** setting, is reached at a frequency value higher than **Base frequency**.

Figure C:

The motor is defined by the 80% of the ratio **Base voltage** and **Base frequency**.

The motor flux value will be constant but reduced at 80% of the flux value defined by the **Base voltage** and **Base frequency** ratio. It will be up to the frequency value identified by the intersection of the straight lines shown as **Out vlt level = 80%** and **Flux level = 80%**

Past this setpoint the flux will decrease inversely proportional to the output frequency of the drive.

6.11. Reg Parameters

REG PARAMETERS	
	Pecent values
	Speed regulator
	Speed P
	Speed I
	Current reg
	Current P
	Current I
	Dead time comp
	Voltage comp lim
	Comp slope
	Flux regulator
	Flux P
	Flux I
	Voltage regulator
	Voltage P
	Voltage I
	Base values
	Speed regulator
	Speed P base
	Speed I base
	Current reg
	Current P base
	Current I base
	Flux regulator
	Flux P base
	Flux I base
	Voltage regulator
	Voltage P base
	Voltage I base
	In use values
	Speed P in use
	Speed I in use

GA0591g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed P [%]	87	0.00	100.00	S	
Speed I [%]	88	0.00	100.00	S	
Current P [%]	89	0.00	100.00	S	
Current I [%]	90	0.00	100.00	S	
Flux P [%]	91	0.00	100.00	S	
Flux I [%]	92	0.00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage I [%]	902	0.00	100.00	4.00	
Speed P base [A/rpm]	93	0.001	99.999	S	
Speed I base [A/rpm·ms]	94	0.001	99.999	S	
Current P base [V/A]	95	0.1	9999.9	S	
Current I base [V/A·ms]	96	0.1	9999.9	S	
Flux P base [A/Vs]	97	0.1	9999.9	S	
Flux I base [A/Vs·ms]	98	0.01	999.99	S	
Voltage P base [Vs/V]	1023	0.00001	9.99999	S	
Voltage I base [Vs/V·s]	903	0.00001	9.99999	S	
Speed P in use [%]	99	0.00	100.00	S	
Speed I in use [%]	100	0.00	100.00	S	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Comp slope [V/A]	645	0.1	50.0	13.0	

Ga6160

S = Dependent on the size of the drive

Speed P	Proportional gain K_p^* of the speed regulator expressed as a percentage of Speed P base .
Speed I	Integral gain K_i^* of the speed regulator expressed as a percentage of Speed I base .
Current P	Proportional gain K_p^* of the current regulator, expressed as a percentage of Current P base .
Current I	Integral gain K_i^* of the current regulator, expressed as a percentage of Current I base .
Flux P	Proportional gain K_p^* of the flux regulator expressed as percentage of Flux P base .
Flux I	Integral gain K_i^* of the flux regulator expressed as a percentage of Flux I base .
Voltage P	Proportional gain K_p of the voltage regulator expressed as a percentage Voltage P base
Voltage I	Integral gain K_i of the voltage regulator expressed as a percentage Voltage I base
Speed P base	Base value for Proportional gain K_{p0} of the speed regulator in A/rpm (base value).
Speed I base	Base value for Integral gain K_{i0} of the speed regulator in A/rpm·ms
Current P base	Base value for Proportional gain K_{p0} of the current regulator in V/A
Current I base	Base value for Integral gain K_{i0} of the current regulator in V/A·ms
Flux P base	Base value for Proportional gain K_{p0} of the flux regulator in A/Vs
Flux I base	Base value for Integral gain K_{i0} of the flux regulator in A/Vs·ms
Voltage P base	Base value for Proportional gain K_{p0} of the voltage regulator in Vs / s
Voltage I base	Base value for Integral gain K_{i0} of the voltage regulator in Vs / V x s
Speed P in use	Indication of the actual proportional gain of the speed regulator as a percentage of Speed P base
Speed I in use	Indication of the actual integral gain as a percentage of Speed I base

These parameters are used for **Sensorless** control:

Dead time comp	Distortion compensation of the output voltage due to lock times
Voltage comp lim	Value of the voltage compensation
Comp slope	Compensation gradient value

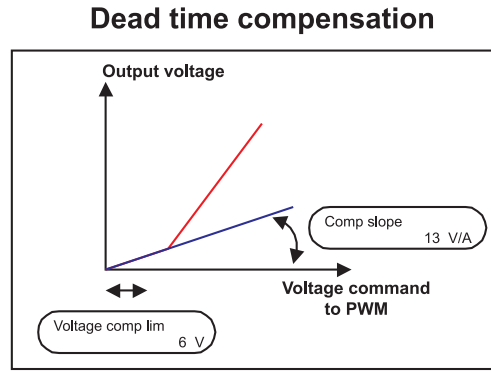


Figure 6.11.1: Reg parameters for sensorless

Note!

Current, flux and voltage regulators can be tuned with the self tuning procedure (see section 5.4.3 Self tuning). If this fails, manual tuning procedures are possible for current and flux regulators (manual changes to the voltage regulator should not be performed).

The speed regulator has to be manually tuned.

The maximum value for the regulator parameters is defined by the base values. The settings possible depend on the size of the drive.

The user can optimize the performance of the regulator by changing the percentage values marked with *.

The resulting gains for the regulator are calculated as follows:

$$K_p = K_{p0} \times K_p^* / 100 \%$$

$$K_i = K_{i0} \times K_i^* / 100 \%$$

Example of the speed regulator gains:

$$\text{Speed P base} = 12 \text{ A/rpm} (= K_{p0})$$

$$\text{Speed P} = 70 \% (= K_p^*)$$

$$\text{Proportional gain } K_p = 12 \cdot 70 \% / 100 \% = 8.4 \text{ A/rpm}$$

The base values are also the basis for setting the “adaptive speed regulator.”

When the “adaptive speed regulator” is enabled (**Enable spd adap** = Enabled), the **Speed P** and **Speed I** parameters have no effect. They still retain their value, however, and are effective again when the “Adaptive speed regulator” is disabled.

The **Speed P in use** and **Speed I in use** parameters indicate the actual gains for the speed regulator. This also applies when the “Adaptive speed regulator” is active.

6.12 Configuration

6.12.1. Operating mode selection

CONFIGURATION	
	Main commands
	Control mode

GA0610g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Main commands	252	0	1	Digital	
Terminals				(1)	
Digital	253	0	1	Local	
Local				(0)	
Bus					

GA6165ai

Main commands

Defines the use of **Enable drive** and **Start** drive commands.

Terminals Commands are exclusively assigned via terminals 12 (Enable) and 13 (Start); active voltage level is required.

Digital In this configuration **Enable drive** and **Start/Stop** drive commands are active through **Enable drive** and **Start/Stop** parameters (BASIC MENU).

If the motor is stopped by removing the **Start** signal from terminal 13, to restart is necessary to restore the active voltage level on terminal 13 and re-apply the start command using the "Start" button on the keypad or the **Start/Stop** parameter on the menu.

Changing the mode from Digital to Terminals with the enable or run signals applied will prompt the message "**Change input**", indicating wrong operation.

Note!

In case of Main commands = Digital, the described commands can be assigned through:

- Terminal or RS485, when **Control mode** parameter = Local
- Field Bus, when **Control mode** parameter = Bus

Control mode Defines whether the digital channel is the keypad/RS485 or a bus system (Option).

Local The digital channel is the key pad or the RS485 serial interface

Bus The digital channel is a bus system (Option)

The following tables show the operating modes possible.

Parameter		Actuation of: Enable drive Start Fast stop	Control mode selection	Failure reset	Save parameters
Input commands	Control mode				
Terminals	Local	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Digital	Local	Terminals and Keypad/RS485	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Terminals	Bus	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus
Digital	Bus	Terminals and Bus	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus

GA6170g

Parameter		Write Access Restrictions		
Input commands	Control mode	Terminals	Keypad/RS485	Bus
Terminals	Local	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Digital	Local	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Terminals	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os
Digital	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os

GA6175g

* Access via the keypad or the RS485 serial interface is protected in this configuration by password level 1

Write access from Bus through process data channel is not affected by control mode description.

6.12.2. Speed base value, Full load current

CONFIGURATION					
	Speed base value				
	Full load curr				
GA0611g					

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed base value [FF]	45	1	16383	1500	
Full load curr [A]	179	0.1	999.0	S	

GA6180g

S= Dependent on the size of the drive

GA6180g

Speed base value

The **Speed base value** is defined in the units specified by the factor function. It is the base value for all speed parameters (reference values, adaptive speed regulation etc.) Changing this parameter is only possible when the drive is disabled (**Enable drive** = Disabled). The **Speed base value** is normally the maximum speed. However, the maximum range for speed is $\pm 200\%$ of the speed base value.

Full load curr

The **Full load curr** (FLC) parameter is defined as A_{RMS} and by default it is equal to I_{CONT} . It depends on the Derating factor (see section 2.4.1, "Permissible environmental conditions"). The FLC is used to calculate the corresponding active current (see section 6.9, "Current regulation"), taking into account the motor parameters entered. 100mF corresponds to 100 % of the current limit. The settings for the current limit and the overload function are based on **Flt 100mF**.

6.12.3. Regulation mode

CONFIGURATION					
		Regulation mode			
GA0612g					
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Regulation mode (Sensorless\Self-tuning\ Field oriented\V/f control)	321	0	3	V/f control (3)	

GA6185ai

Regulation Mode

This parameter defines the regulation mode of the Drive.

Sensorless

The drive operates in a sensorless control mode. An encoder is not necessary for motor speed feedback. The speed and position of the motor shaft are estimated by a control algorithm.

Self-tuning

Automatic commissioning (see section 5.3.3, "Self-tuning")

Field oriented

The drive operates with a field oriented vector regulator. Either a sinusoidal encoder or a digital encoder are required for motor speed feedback.

V/f control

The drive operates without vector control. A predefined voltage/frequency characteristic curve is used instead.

6.12.4. Magnetizing boost current, Magnetizing ramp time

CONFIGURATION	
	Magn ramp time
	Magn boost curr

GA0613g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Magn ramp time [s]	675	0.01	5.00	1.00	
Magn boost curr [%]	413	10	136	30	

GA6190g

Magn ramp time

Ramp time for the F current ref at initial magnetization. It may be used to slow down the magnetization transient and avoid shaft rotation due to parasitic torques. These torques are the result of stator and rotor slot alignment.

Magn boost curr

In some applications it may be necessary to speed up the magnetizing of the motor and create the opposite effect of the **Magn ramp time** parameter. This option is provided by the **Magn boost curr** parameter. Higher values will lead to shorter magnetization times. The parameter is defined as a percentage of the **Full load curr** and represents a temporary value of the flux current limit for the initial magnetization. After magnetization the nominal limit $\pm 1.2 \times I_{\mu}$ is restored.

6.12.5. Configuration of the OK relay (Terminals 80,82)

CONFIGURATION	
	OK relay func

GA0620g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ok relay func Drive Healthy Ready to start	412	0	1	Drive Healthy (0)	

GA6195g

Ok relay func

This parameter defines the conditions that the relay contacts will close.

Drive Healthy The contacts close when the drive is supplied with voltage and there are no failure alarms.

Ready to start The contacts close when the following conditions are fulfilled:

The drive has a voltage supply

There are no failure alarms present

The drive is enabled with **Enable drive**

The magnetizing procedure has been completed. (Drive is ready to deliver torque)

6.12.6. Encoder type selection

CONFIGURATION	
	Motor spd fbk
	Speed fbk sel
	Encoder 1 type
	Encoder 1 pulses
	Encoder 2 pulses
	Refresh enc 1
	Refresh enc 2
	Enable ind store

Ga0631

Parameter	N.	Value			Standard configuration
		min	max	Factory	
Speed fbk sel Encoder 1 Encoder 2	414	0	1	Encoder 1 (1)	*
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Enc 1 supply vlt 5.41V 5.68V 5.91V 6.18V	1146	0	3	5.41V	
Encoder 2 pulses	169	600	9999	1024	
Encoder repeat	1054	0	1	Encoder 1 (1)	
Refresh enc 1 Enabled Disabled	649	0	1	Disabled (0)	
Refresh enc 2 Enabled Disabled	652	0	1	Disabled (0)	
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	0	1	-	**
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	0	1	-	**
Enable ind store Disabled Enabled	911	0	1	Disabled (0)	
Ind store ctrl	912	0	65535	0	
Index storing	913	0	$2^{32}-1$	-	

Ga6200ai

* This function can be assigned to one of the programmable digital inputs.

** This function can be assigned to one of the programmable digital outputs.

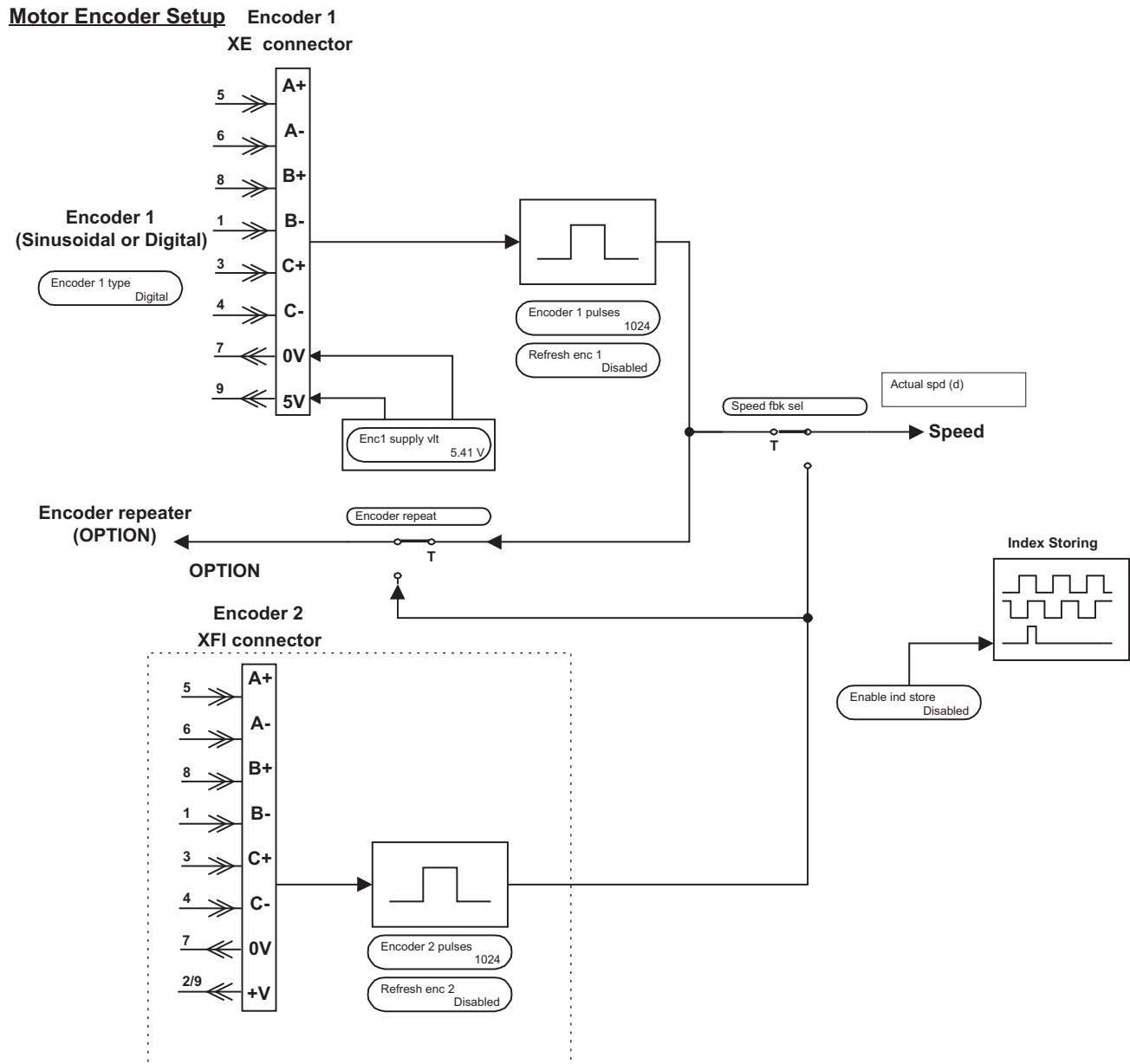


Figure 6.12.6.1: Speed Feedback

Note! Encoders are required in the “Field oriented” regulation mode , for both speed and torque. The required encoder specifications are defined in section 3.4.2, “Encoders”.

Speed fbk sel	Selects which encoder input is to be used for speed feedback.
Encoder 1	The encoder is connected to XE (Default).
Encoder 2	The digital encoder is connected to optional card EXP-F2E.
Encoder 1 type	Defines the encoder type on connector XE.
Sinusoidal	Sinusoidal encoder
Digital	Digital encoder
Encoder 1 pulses	Number of pulses per revolution for the encoder on connector XE.

Encoder 2 pulses	Number of pulses per revolution for the digital encoder on optional card EXP-F2E.				
Refresh enc 1	Monitors the connection status of the encoder connected to the XE connector. It will produce a “speed feedback loss” alarm if the connection is lost.				
Encoder 1 state	Provides the status of the encoder 1 connection. The parameter can be programmed on a digital output.				
Refresh enc 2	Monitors the connection status of the encoder connected to the optional EXP-F2E card. It will produce a “speed feedback loss” alarm if the connection is lost.				
Encoder 2 state	Provides the status of the digital encoder 2 connection. The parameter can be programmed on a digital output.				
Enc1 supply vlt	This parameter programs the voltage supply to encoder 1. This is provided because of possible voltage drop in the wiring to the encoder. Four voltages are available by means of the parameter “Enc1 supply vlt.” The four ranges are: V0 = 5.41V, V1 = 5.68V, V2 = 5.91V, V3 = 6.18V				
Encoder repeat	External processing of the encoder data can be carried out by using the optional card EXP-F2E. The selection of which encoder data to be repeated is set by the parameter Encoder repeat. <table> <tr> <td>Encoder 1</td><td>Repetition of the encoder 1 pulses</td></tr> <tr> <td>Encoder 2</td><td>Repetition of the encoder 2 pulses</td></tr> </table>	Encoder 1	Repetition of the encoder 1 pulses	Encoder 2	Repetition of the encoder 2 pulses
Encoder 1	Repetition of the encoder 1 pulses				
Encoder 2	Repetition of the encoder 2 pulses				

Note:

Encoder 1: standard hardware

Encoder 2: optional hardware

For further information about the encoder signal management, please refer to the instruction manual for the optional card EXP-F2E

Following parameters determine the drive absolute zero point and positioning control:

Enable ind store	This parameter enables the reading of the encoder index signal that could be used in a system for implementation of position control. <table> <tr> <td>Enabled</td><td>This setting enables reading of the encoder index.</td></tr> <tr> <td>Disabled</td><td>This setting disables reading of the encoder index</td></tr> </table>	Enabled	This setting enables reading of the encoder index.	Disabled	This setting disables reading of the encoder index
Enabled	This setting enables reading of the encoder index.				
Disabled	This setting disables reading of the encoder index				
Ind store ctrl	Control register for the encoder index and qualifying signal (*).				
Index storing	Status register and function data.				

Note!

Programmable digital input 4 (terminal 39) can be used as the encoder index qualifier.

Ind store ctrl parameter [912]

No. bit	Name	Description	Access (Read/Write)	Default
0-1	-	Not used	-	-
2	POLNLT	It indicates the encoder index edge polarity: 0=rising edge 1=falling edge	R/W	0
3	-	Not used	-	-
4-5	ENNQUAL	It indicates the qualifier level that activates the encoder index reading: =0=Switched off =1=Switched off =2=Through signal = 0 =3=Through signal = 1	W	0
6	Target Enc Num	It points out for which encoder the values of this parameter are reported. =0, operations requested on the Encoder 1 =1, operations requested on the Encoder 2	R/W	0
7	-	Not used		
8-9	ENNLT	Control function of the encoder index reading =0=Switched off, function disabled =1=Once, enables the reading of the first index signal edge only. =2=Continuous, enables the reading of the index signal.	R/W	0

Index storing parameter [913]

No. bit	Name	Description	Access (Read/Write)	Default
0	Source Enc Num	It indicates to which encoder the values in this register are referred to: =0, register data are referred to the encoder 1 =1, register data are referred to the encoder 2	R	0
1	MP_IN	Actual Qualifier level value: =0, qualifier input level is low =1, qualifier input level is high	R	0
2-3	STATNLT	Status of the acquisition function: =0=Switched off =1=Once, storing is not executed yet =2=Once, storing is already executed =3=Continuous	R	0
16-31	CNTNLT	Position counter value corresponding to the index. Value is only valid when STATNLT is equal to 2 or 3	R	0

para002

6.12.7. Mains voltage, Ambient temp, Continuous current, Software version

CONFIGURATION					
		Drive type			
					Mains voltage
					Ambient temp
					Continuous curr
					Software version
Ga0632					
Parameter	No.	Value			Standard configuration
		min	max	Factory	
Mains voltage (230V/400V/460V)	333	S	2	460V (2)	
Ambient temp 104°-122°F (40°C/50°C)	332	0	1	104°F (40°C) (1)	
Continuous curr	802	S	S	S	
Software version	331				

S= Dependent on the size of the drive

Ga6205ai

S= Dependent on the size of the drive

Ga6205ai

Mains voltage Rated value of the line voltage (e.g. 460 V). The undervoltage trip function is based on this value (see section 2.3.2, “AC Input/Output Connections” for detail on the Derating factor).

Note!

230 V Line voltage selection is disabled if **PL stop enable [1083]** parameter is set to an active value (1 or 2).

230V Line voltage selection is not available on sizes 3F75 to 3020. When 230V Main voltage is set, **Pwr loss stop** function is disabled.

Ambient temp Calibration for ambient temperature. Load current is specified on the nameplate of the inverter. See example.

40°C The drive is able to take the current continuously at an ambient temperature of up to 40°C.

50°C The drive is able to take the current continuously at an ambient temperature of up to 50°C.

(See section 2.3.1, “Permissible environmental conditions” for detail of derating factor).

Continuous curr Drive continuous output current factoring in parameters such as line voltage, switching frequency and ambient temperature setting.

This parameter is automatically overwritten by the control system as follows:

$$I_{\text{CONT}} = I_{2N} \times K_V \times K_T \times K_F$$

The “K” derating factors are shown in section 2.3.2. The **Full load Current** parameter (CONFIGURATION menu) is automatically set by the system to the same **Continuous curr** value.

Software version Display of the revision number of the operating system.

6.12.8. Dimension factor, face value factor

CONFIGURATION	
	Dimension fact
	Dim factor num
	Dim factor den
	Dim factor text
	Face value fact
	Face value num
	Face value den

GA0650g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	$+2^{31-1}$	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

Ga6210

The factor function consists of two components: the dimension factor and the face value factor. Both factors are defined as fractions.

The dimension factor is used to specify the drive speed in units related to the machine, e.g. kg/h or m/min.

The face value factor is used to increase the resolution.

See the calculation examples given below.

Dim factor num Numerator of the dimension factor

Dim factor den Denominator of the dimension factor

Dim factor text Units of the dimension factor (5 characters). This text is shown in the keypad display for reference.

Possible characters: / % & + , - . 0...9 : < = > ? A...Z [] a...z

Face value num Numerator of the face value factor

Face value den Denominator of the face value factor

The reference value given multiplied by the dimension factor and the face value factor defines the motor speed in rpm.

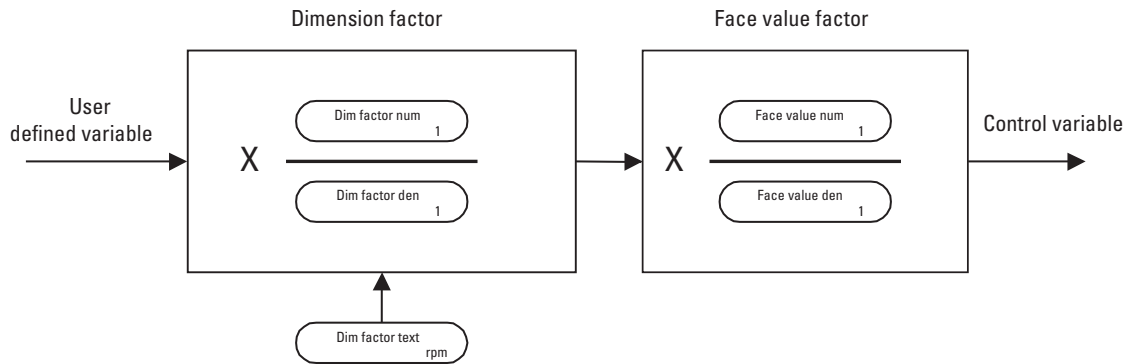


Figure 6.12.8.1: Calculation using dimension and face value factors

Example 1: calculation of dimension factor

The drive speed is given in m/s. The conversion ratio is 0.01 m per revolution of the motor
(Note: face value factor = 1)

The dimension factor is calculated as follows:

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (m/s)}}$$

f022

0.01 m corresponds to 1 revolution of the motor shaft

0.01 m/min corresponds to 1/min

0.01 m / 60 s corresponds to 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \cdot \frac{60\text{s}}{0.01\text{m}} \cdot \frac{6000}{1} \cdot \frac{1}{\text{min}} \cdot \frac{\text{s}}{\text{m}}$$

f023

Dim factor num	6000
Dim factor den	1
Dim factor text	"m/s" (meters per second)

Example 2: calculation of dimension factor

The reference value for a bottling plant is given in bottles per minute. One revolution of the drive corresponds to the filling of 0.75 bottles. This corresponds to a dimension factor of 4/3. The speed limits and ramp function are also given in bottles per minute.

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (here: Bottles / min)}}$$

f024

3/4 bottles correspond to 1 revolution of the motor shaft

3/4 bottles / minute = 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \cdot \frac{4 \text{ min}}{3 \text{ Bottles}} = \frac{4}{3} \cdot \frac{1}{\text{min}} \cdot \frac{\text{min}}{\text{Bottles}}$$

f025

Dim factor num	4
Dim factor den	3
Dim factor text	"B/min" (Bottles per minute)

Example of face value factor calculation:

Normally the reference value has a resolution of 1 rpm. In order to fully exploit the available resolution, the face value factor is used. The maximum internal resolution is 0.25 rpm

The motor speed range required is, for example, 0 ... 1500 rpm. A more accurate resolution (i.e. 1/4 revolution) can be obtained by setting the face value factor to 1/4.

The value 4000 is entered in order to select 1000 rpm This is then multiplied with the face value factor to give the value 1000 rpm.

Face value num 1

Face value den 4

6.12.9. Programmable alarms

CONFIGURATION	
	Prog alarms
	Undervoltage
	Latch
	OK relay open
	Restart time
	N of attempts
	Overvoltage
	Latch
	OK relay Open
	Heatsink sensor
	Activity
	Latch
	OK relay open
	Heatsink ot
	OK relay open
	Intake air ot
	Activity
	Latch
	OK relay open
	Regulation ot
	Activity
	Latch
	OK relay open
	Module overtemp
	OK relay open
	Overtemp motor
	Activity
	Latch
	OK relay open
	External Fault
	Activity
	Latch
	OK relay open
	Overcurrent
	Latch
	OK relay open
	Output stages
	Latch
	OK relay open
	Opt2 failure
	Activity
	OK relay open
	Bus loss
	Activity
	Latch
	OK relay open
	Hold off time
	Restart time
	Hw opt 1 failure
	Activity
	OK relay open
	Enable seq err
	Activity
	Latch
	OK relay open
	BU overload
	Activity
	OK relay open

Alarm	No.	Factory			Restart time, No. of attempts	Standard
		Activity	Latch	Open ok relay		
Overcurrent	2300h	Disable drive	ON	ON		Dig. outp. 8*
Overvoltage	3210h	Disable drive	ON	ON		Dig. outp. 6*
Undervoltage	3220h	Disable drive	ON	ON	1000 ms, 0	Dig. outp.7*
Heatsink sensor	4210h	Disable drive	ON	ON		*
Heatsink ot	4211h	Disable drive	ON	ON		*
Regulation ot	4212h	Disable drive	ON	ON		*
Module overtemp	4213h	Disable drive	ON	ON		*
Intake air ot	4214h	Disable drive	ON	ON		*
Overtemp motor	4310h	Disable drive	ON	ON		*
Failure supply**	5100h	Disable drive	ON	ON		
Curr Fbk Loss	5210h	Disable drive	ON	ON		*
Output stages	5410h	Disable drive	ON	ON		*
DSP error**	6110h	Disable drive	ON	ON		
Interrupt error**	6120h	Disable drive	ON	ON		
BU Overload	7110h	Disable drive	ON	ON		*
Speed fbk loss***	7301h	Disable drive	ON	ON		*
Opt2	7400h	Disable drive	ON	ON	8 ms	*
Hw Opt 1 failure	7510h	Disable drive	ON	ON		*
Bus loss	8110h	Disable drive	ON	ON		*
External fault	9000h	Disable drive	ON	ON		*
Enable seq err	9009h	Disable drive	ON	ON		*

GA6215ai

* This function can be assigned to one of the programmable digital outputs.

** The response of the drive cannot be configured for these alarms. The assignment of an alarm to a digital output is not allowed.

*** This alarm can be disabled, but the response of the drive can not be predicted.

If the serial interface or bus system is used, the alarms can be evaluated via the **Malfunction Code** parameter.

The AV-300i Drives contain extensive monitoring functions. The effect of possible alarms (drive faults) on the behavior of the drive is defined in the PROG ALARMS submenu as follows:

- Saving of alarm status
- How the drive is to react to the alarm
- External indication is provided by the “OK” relay, whose contacts are wired to regulator terminal boards 80 and 82. Conditions that will trip this relay are defined by the “OK” relay function parameter in the CONFIGURATION menu.
- Automatic restart
- Failure reset

For some alarms, the response of the drive can be configured independently. All alarms can also be assigned to a programmable digital output as shown in the above table.

Activity	Warning	An alarm does not cause the drive to fault. A warning indication can be sent via a digital output. If the Latch= ON the drive will remain in the faulted condition until the alarm is cleared and a manual reset is employed.
	Disable drive	An alarm causes the immediate disabling of the drive. The motor coasts to a stop.
	Quick stop	When an alarm occurs, the drive decels to a stop according to the ramp set in the RAMP / QUICK STOP menu. The drive is then disabled.

Normal stop	When an alarm occurs, the drive decels to a stop according to the linear time ramp. The drive is then disabled.
Curr lim stop	When this alarm occurs, the Drive brakes with the maximum possible current until stopped. When stopped the drive is disabled.
Ignore	The alarm message is displayed on the keypad, with no other action being taken. The message can be cleared via the Reset (Escape) function.

Not all alarms can initiate a controlled stop of the drive. The matrix for the "Activity" function is given below.

Allarme	Warning	Disable drive	Quick stop	Normal stop	Curr lim stop	Ignore
Overcurrent	-	X	-	-	-	-
Overvoltage	-	X	-	-	-	-
Undervoltage	-	X	-	-	-	-
Heatsink sensor	X	X	X	X	X	-
Heatsink ot	-	X	-	-	-	-
Regulation ot	X	-	-	-	-	X
Module overtemp	-	X	-	-	-	-
Intake air ot	X	X	X	X	X	-
Overtemp motor	X	X	X	X	X	-
Failure supply	-	X	-	-	-	-
Curr fbk Loss	-	X	-	-	-	-
Output stages	-	X	-	-	-	-
DSP error	-	X	-	-	-	-
Interrupt error	-	X	-	-	-	-
BU Overload	X	X	X	X	X	-
Speed fbk loss	-	X	-	-	-	-
Opt2	-	X	X	X	X	-
Hw Opt 1 failure	X	X	X	X	X	-
Bus loss	X	X	X	X	X	-
External fault	X	X	X	X	X	-
Enable seq err	-	X	-	-	-	X

ga6220ai

Latch	ON	The alarm is stored. The programmed actions (e.g. opening the OK relay) are enabled. This fault status is retained even if the condition is cleared. A Reset command must be given before a restart can occur.
	OFF	In case of an alarm, the drive is disabled and the programmed functions are enabled. The alarm is not saved. When the failure is restored, the alarm is automatically reset and the Drive tries to restart.
OK relay open	ON	An alarm causes the opening of the contacts between terminals 80 and 82.
	OFF	In case of an alarm, the contacts between terminals 80 and 82 do not open.
Hold off time	Delay time between the alarm detection and the alarm activation. If an alarm condition occurs the alarm remains OFF for the Hold off time. When this time has elapsed, the alarm is activated.	
Restart time	If Latch=OFF, this parameter defines the time before a restart can be attempted. If the fault has not been cleared, the alarm is stored and a restart cannot be tried.	
No of attempts	Number of start attempts after an alarm. The number of start attempts are counted, when the defined number has been reached, the "No more attempts" message is displayed. The fault must then be reset manually and then the drive restarted. If the number of attempts	

required for a restart is below the defined number, the counter for the start attempts is reset to zero after 5 minutes and will start counting from zero if another alarms occurs.

Note!

If a fault occurs, it is indicated in the display of the keypad. If "Latch" = ON is selected, a Reset command is necessary. This can be also done by pressing the "Shift/Escape" keys on the keypad. If a second error occurs before the first one is reset, the text "Multiple failures" will appear in the display. In this case, a reset is only possible via Failure reset parameter in the SPEC FUNCTIONS menu, or through a digital input that has been programmed as "Failure reset".

LIST OF PROGRAMMABLE ALARMS (REFER TO ABOVE TABLE)

Undervoltage	Undervoltage on the DC Link. The Undervoltage alarm occurs if there is an undervoltage in the DC Link when the drive is enabled (Enable drive = Enabled). The power section is disabled immediately to prevent the DC Link from discharging. If the alarm is not saved (Latch = OFF), the drive will try to restart as soon as the link voltage rises up to the undervoltage threshold. If this does not happen within the restart time, the alarm is then latched. The number of restart attempts is limited. If the "Auto Capture" function is turned on, the drive matches the ramp output to the motor speed before a restart is attempted. This avoids step changes in speed and high currents in the motor. After an undervoltage fault, the precharge resistor is inserted so that charging of the DC link can be controlled after voltage is restored. The precharge resistor is not inserted if conditions for restart are met.
Overvoltage	Overvoltage on the DC Link. If the fault is not saved (Latch = OFF), the drive will try to restart once the overvoltage has been removed. If the "Auto Capture" function is turned on the drive matches the ramp output to the motor speed before a restart is attempted. This avoids step changes in speed and high currents in the motor.
Heatsink sensor	Heatsink temperature of the drive is too high. This alarm activity is programmable and initiates 10 seconds after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output immediately after being detected.
Heatsink ot	(For sizes 30 HP and higher) Heatsink temperature of the drive is too high (possible heatsink sensor malfunctioning). This always initiates a shutdown of the drive 1s after the failure has been detected (Activity=Disable drive). If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.
Regulation ot	Temperature of the regulator card too high. This always initiates the a drive shutdown 10s after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output immediately after being detected.
Module overtemp	(For drives size from 1 HP up to 20 HP) Temperature of the IGBT module is too high. This always initiates a shutdown of the drive immediately after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output immediately after being detected.

Intake air ot	(For sizes 30 Hp and higher) Temperature of the cooling air is too high. This always initiates a shutdown of the drive 10s after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output immediately after being detected.
Overtemp motor	Motor overtemperature (connection for the motor thermistor: terminals 78/79)
External Fault	External customer fault
Overcurrent	Overcurrent (short-circuit / ground fault) The drive is always faulted (Activity = Disable drive) when an overcurrent is detected in order to protect the power section. If the fault is not latched, the drive will automatically try to restart if no other overcurrent alarms occurred within the last 30 seconds. If overcurrents have occurred in the last 30 seconds, the alarm is saved and no automatic restarts are possible.
Output stages	Alarm caused by a short-circuit on the inverter output bridge or on the brake unit.
Opt2 failure	Failure on the "Option 2" card.
Bus loss	Failure in the connection to the field bus (only with an option bus interface card).
Hw opt 1 failure	Failure on the "Option 1" card.
Enable seq err	Wrong enable sequence. The correct sequence is as follows:

Case a:

Main commands = Terminal

- 1 - Regulation board power-up: Enable drive (term.12) in any state.
- 2 - Drive initialization. Max duration time: 5 s.
- 3 - End of drive initialization. The Enable drive terminal (12) is Low (0V).
- 4 - Delay time during which the Enable drive terminal must be Low (0V): 1s.
- 5 - Drive enabling. Terminal 12 is High (+24V).

If at the end of the drive initialization (step 3) or during the 1s delay time, the Enable drive terminal (term. 12) is High (+24V) a fault is detected.

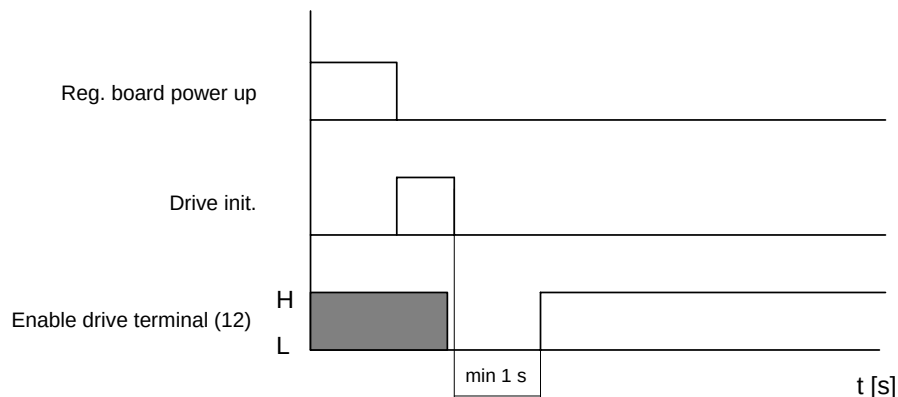


Fig. 6.12.9.1 : Drive enabling sequence: Main commands = Terminals

Case b:

Main command = Digital

- 1 - Regulation board powerup: Enable terminal (term.12) in any state.
- 2 - Drive initialization. Max duration time: 5 s.
- 3 - End of drive initialization.
- 4 - Delay time during which the Enable drive terminal must be Low (0V) and Enable drive [314] = Disable: 1s. During this time the Process data channels initialization occurs.
- 5 - Drive enabling. Terminal 12 is High (+24V) and **Enable drive** [314] = Enable (1).

If at the end of the drive initialization (step 3) or during the 1s delay time, the Enable drive terminal (term. 12) is High (+24V) and **Enable drive** [314] = Disable a fault is detected.

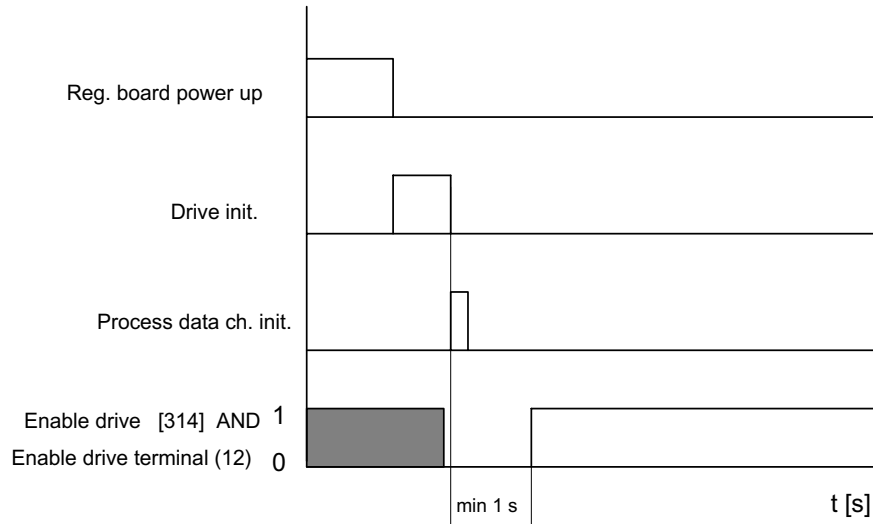


Fig. 6.12.9.2 : Drive enabling sequence: **Main command** = Digital

In case of fault the reset sequence is as follows:

Case a:

Latch = ON

- 1 - Set Enable drive terminal (term. 12) = Low (0V)
- 2 - Set **Enable drive** [314] = Disable
- 3 - If **Main commands** = Terminals, set Start/Stop terminal = Low (0V)
- 4 - Apply the reset command, and the drive will work normally.

Case b **Latch** = OFF

- 1 - Set Enable drive terminal (term. 12) = Low (0V) and **Enable drive** [314] = Disable for at least 30 ms. The failure will be automatically reset.

BU overload

Protection for the internal or external braking resistance. The duty cycle exceeds the limits specified (internal - user defined)

Note!

In case of an alarm, the behavior of the OK Relay can be affected only if OK relay funct = Drive Healthy. If the configuration of the OK relay funct = Ready to start, the OK relay will be dropped out.

LIST OF NON-PROGRAMMABLE ALARMS

The reaction of the drive for a non-programmable alarm is to fault the drive, latch the alarm condition, open the “OK” relay, and not allow a restart.

The following are non-programmable alarms:

Failure supply Failure in the power supply.

DSP error Program error of the processor

Interrupt error Unused interrupt error has occurred

Speed fbk loss Failure in speed feedback:

In order to detect an encoder 1 alarm, (connector XE) set the **Refresh encoder 1** parameter (MENU CONFIGURATION\Drive type) to ENABLED.

The jumper S17, on the main control card, selects the channel C (marker pulse) reading. It has to be correctly set in order to detect the encoder loss.

S17 ON : channel C (index) reading=ON

S17 OFF: channel C (index) reading=OFF

Curr fbk loss Failure in the connection between the regulator card and the TA transformer (XTA Connector).

6.12.10. Address for bus operation

CONFIGURATION					
		Device address			
		GA0670g			
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Device address	319	0	127	0	

GA6225g

Device address Address under which the Drive can be accessed if it is networked via the RS485 interface.
(For connection see section 4.4, “Serial interface”)

6.12.11. Switching frequency

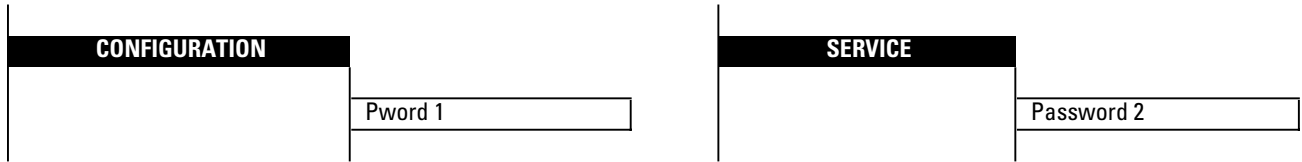
CONFIGURATION					
		Switching freq			
		GA0671g			
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Switching freq (4-8-16 KHz)	240	S	S	S	

GA6230g

S= Dependent on the size of the drive

The switching frequency is constant within the speed range and is dependent on the drive size. (See section 2.4.2, “AC Input/Output Connection” for details of derating factor).

6.12.12. Password



GA0680g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pword 1	85	00000	99999		
Password 2	86	-	-		

GA6235g

Passwords can be used by the customer to protect the parameters from unauthorized access. The following two levels are available.

Pword 1

Protects the parameters from unauthorized changes. The password can be freely defined by the user in the form of a 5-digit number.

Proceed as follows to activate **Pword 1**:

Select **Pword 1** in the CONFIGURATION menu

This indicates whether the Password is active (Enabled) or not (Disabled)

If it is disabled press ENTER and enter password (see section 5.1.4, "Changing/Saving Parameters/Password").

Press ENTER once more. The keypad indicates that the Password is active (Enabled).

The password must be saved so that it is valid when the power supply is switched off and on again. —> Use the "Save Parameters" command.

Proceed as follows to unlock the **Pword 1**:

Select **Pword 1** in the CONFIGURATION menu

The display indicates whether the password is active (Enabled) or not (Disabled)

If enabled, press ENTER and enter the password (see Commissioning)

Press ENTER again. The display now indicates that the password is not active (Disabled).

This configuration must be saved In order to keep the password Disabled even after the power supply is turned off and switched back on again. —> Use the "Save Parameters" command.

The message **Wrong password** appears if an incorrect password is entered.

If the drive shows the message **"EEPROM Error"** the password is deactivated. This takes place the first time the drive is switched on and after an upgrade of the Firmware.

If the password has been forgotten, contact the factory.

Password 2

Enables access to the Service menu. The password set by the manufacturer and consists of a 5-digit combination.

The Service menu of the drive is protected by **Password 2**. The user has free access to all parameters except for those in the SERVICE menu which is reserved for manufacture's service personnel.

Password 2 cannot be deactivated.

Password 2 allows access to the Service menu until a different menu is selected.

6.12.13. Qstp opt code

CONFIGURATION					
Qstp opt code					
GA0681g					
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Qstp opt code	713	-2	-1	Ramp stop (-1)	
Ramp stop					
DC braking curr					

GA6240g

Qstp opt code

Selection control for Operation of the **Quick stop** command

Ramp stop = -1 Drive is stopped with the ramp defined by **Qstp delta speed**,
Ostp delta time

DC braking curr = -2 Drive is stopped by an injection of DC current

6.12.14. Serial answer delay

CONFIGURATION					
Ser answer delay					
ga61114					
Parameter	No.	Value			Standard configuration
		min	max	factory	
Ser answer delay	408	0	900	0	

GA6231

Minimum delay setting between the reception of the last byte and the start of its answer.

This delay avoids conflict on the serial line when the RS485 interface is not preset for an automatic Tx/Rx communication.

The **Ser answer delay** parameter is specific for the standard serial line RS485.

E.g. : If on the master the Tx/Rx delay communication is 20ms max., the setting of **Ser answer delay** parameter will have to be higher than 20ms: 22ms.

6.13. I/O Config

Except for the terminal board points which have fixed functions (e.g. for Enable), the AV-300i Drive provides the capability of assigning programmable inputs/outputs to particular software functions. This can be done via the keypad, the serial interface, or any communication bus.

The programmable inputs/outputs are factory set to the most frequently required functions. However, these can be modified by the user to meet individual requirements.

The basic drive is provided with three analog inputs that are designed as differential inputs. If more digital inputs/outputs and/or analog outputs are required, I/O expansion cards are necessary. For more details about I/O expansion cards refer to the specific instruction manual covering these cards.

The following inputs / outputs are provided in the standard configuration:

- Basic drive:
- 3 Analog differential inputs
 - 2 Analog outputs with common reference point
 - 2 Digital outputs with common reference point, common voltage supply, and isolation
 - 4 Digital inputs with common reference point, and isolation

Note!

If parameters are assigned to particular I/O terminals, the parameter value (e.g. speed reference) can only be entered via that terminal and not via the keypad or bus.

6.13.1. Analog Outputs

I/O CONFIG	
Analog outputs	
Analog output 1	Select output 1 Scale output 1
Analog output 2	Select output 2 Scale output 2
Analog output 3	Select output 3 Scale output 3
Analog output 4	Select output 4 Scale output 4

GA0690g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select output 1	66	0	84	Actual speed	
Scale output 1	62	-10.000	10.000	1.000	
Select output 2	67	0	84	T current	
Scale output 2	63	-10.000	10.000	1.000	
Select output 3	68	0	84	Current U	*
Scale output 3	64	-10.000	10.000	1.000	
Select output 4	69	0	84	Motor current	*
Scale output 4	65	-10.000	10.000	1.000	

Ga6245ai

* These outputs can be used only when the optional I/O expansion cards are installed.

Select output XX

Selects the software parameter that can be programmed to an analog output. The following assignments are possible (the value in square brackets are selection codes for RS485 or BUS; superscript numbers refer to the scaling rules shown on the next page):

OFF[0]

Speed ref 1¹⁾ [1]

Speed ref 2¹⁾ [2]

Ramp ref 1¹⁾ [3]

Ramp ref 2¹⁾ [4]

Ramp ref¹⁾ [5]

Speed ref¹⁾ [6]

Ramp outp¹⁾ [7]

Actual speed¹⁾ [8]

T current ref 1²⁾ [9]

T current ref 2²⁾ [10]

T current ref²⁾ [11]

F current ref⁸⁾ [12]

Flux current⁸⁾ [13]

Torque current²⁾ [14]

Spd reg output²⁾ [15]

Motor current¹²⁾ [16]

Current U³⁾ [17]

Current V³⁾ [18]

Current W³⁾ [19]

Output voltage⁴⁾ [20]

Voltage U⁵⁾ [21]

Voltage V⁵⁾ [22]

DClink voltage⁶⁾ [23]

Analog input 1⁷⁾ [24]

Analog input 2⁷⁾ [25]

Analog input 3⁷⁾ [26]

Flux⁹⁾ [27]

Active power¹¹⁾ [28]

Torque¹⁰⁾ [29]

PL active limit²⁾ [88]

Rr adap output¹³⁾ [30]

Pad 0¹⁴⁾ [31]

Pad 1¹⁴⁾ [32]

Pad 4¹⁴⁾ [33]

Pad 5¹⁴⁾ [34]

Pad 6¹⁴⁾ [38]

Flux reference⁹⁾ [35]

PID output¹⁵⁾ [39]

Feed fwd power¹⁶⁾ [78]

Out vlt level¹⁹⁾ [79]

Flux level²⁰⁾ [80]

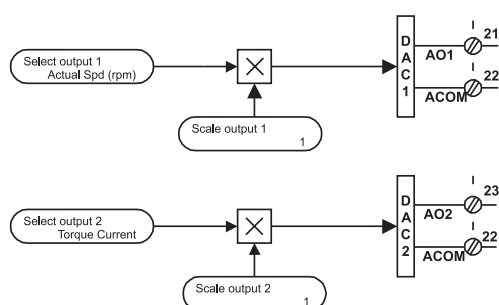
F act spd (rpm)¹⁾ [81]

F T curr (%)²⁾ [82]

Spd draw out (d)¹⁷⁾ [84]

PL next factor¹⁸⁾ [87]

Analog Outputs



Option card

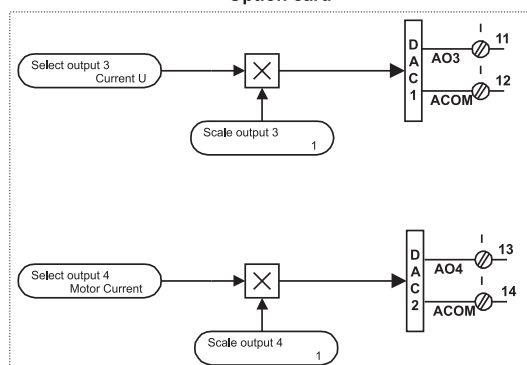


Figure 6.13.1.1: Standard Analog output and Option card blocks

Scale output XX

Scaling of the analog output is per the following guidelines:

- 1) **Speed Ref 1, Speed Ref 2, Ramp Ref 1, Ramp Ref 2, Ramp ref, Speed ref, Ramp outp, Actual Speed** and **F act spd** will equal 10V when the drive is at Rated **Speed base value**.
- 2) **T current ref 1, T current ref 2, T current ref, Torque current, Spd reg output, PL active limit** and **FT curr (%)** will equal 10V at the full load current (**FLT 100mF**)
- 3) **Current U, Current V, Current W** will be 10V when the AC output amps equals square root of $2 \times \text{Full load curr}$.
- 4) **Output voltage** will be 10V when the RMS of the fundamental output voltage equals the **Mains (line) voltage**.
- 5) **Voltage U** and **Voltage V** will be 10V when the output voltage is 500VAC
- 6) **DC Link voltage** will be 10V when the link is 1000V.
- 7) **Analog input 1, Analog input 2, and Analog input 3** will be 10V when the applied voltage to these inputs is 10V. See Figure 6.13.1.1
- 8) **F current ret** will be 10V when Magnetizing curr is at the rated value.
- 9) **Flux Reference** will be 10V when the flux is 2 volts/sec.
- 10) **Torque** will be 10V at rated torque of the motor.
- 11) **Active power** will be 10V at the rated power of the motor.
- 12) **Motor Current** will be 10V at **Full Load curr**.
- 13) **Rr adap output** will be 10V when the rotor resistance correction corresponds to the original rotor resistance parameter.
- 14) **PAD 0, PAD 1, PAD 4, PAD 5, and PAD 6** will be 10V when the pad value is 2047.
- 15) **PID output**, these values are described in Chapter 6.17.3, **PID Functions**.
- 16) **Feed fwd power** (used with RS 300 drive) will be 10V when the **Active power** = square root of $3 \times \text{Mains voltage} \times \text{Full load current}$.
- 17) **Spd draw out** will be 10V when the speed ratio = 20,000
- 18) **PL next factor** will be 10V when **PL next factor** = 10,000 or ratio = 1
- 19) **Out VLT Level** will be 10V when it is equal to the Base voltage.
- 20) **Flux Level** will be 10V at the rated flux level

Calculation example for calculating the scaling factor **Scale output xx**

Consider an analog display speed meter that has a full scale rating of 2V DC.

This means that at maximum speed 2 V is required at the analog output of the inverter. A scaling factor of .2 would be required. (Scaling factor = $2 \text{ V} / 10 \text{ V} = 0.200$).

6.13.2. Analog Inputs

I/O CONFIG.			
		Analog inputs	
		Analog input 1	
			Select input 1
			An in 1 target
			Input 1 type
			Input 1 sign
			Scale input 1
			Tune value inp 1
			Auto tune inp 1
			Input 1 filter
			Input 1 compare
			Input 1 cp error
			Input 1 cp delay
			Offset input 1
		Analog input 2	
			Select input 2
			An in 2 target
			Input 2 type
			Input 2 sign
			Scale input 2
			Tune value inp 2
			Auto tune inp 2
			Offset input 2
		Analog input 3	
			Select input 3
			An in 3 target
			Input 3 type
			Input 3 sign
			Scale input 3
			Tune value inp 3
			Auto tune inp 3
			Offset input 3

GA0700

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select input 1	70	0	28	Ramp ref 1	Terminals 1/2
An in 1 target	295	0	1	Assigned (0)	
Input 1 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	71	0	2	-10V...+10V (0)	
Input 1 sign Positive Negative	389	0	1	Positive (1)	
Input 1 sign+	-				*
Input 1 sign-	-				*
Scale input 1	72	-10.000	10.000	1.000	
Tune value inp 1	73	0.1	10.000	1.000	
Auto tune inp 1	259	0	65535		
Input 1 filter	792	0	1000	0	
Input 1 compare	1042	-10000	10000	0	
Input 1 cp error	1043	0	10000	0	
Input 1 cp delay [ms]	1044	0	65000	0	
Offset input 1	74	-32768	+32767	0	
Select input 2	75	0	28	OFF	Terminals 3/4
An in 2 target	296	0	1	Assigned (0)	
Input 2 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	76	0	2	-10V...+10V (0)	
Input 2 sign Positive Negative	390	0	1	Positive (1)	
Input 2 sign+	-			-	*
Input 2 sign-	-			-	*
Scale input 2	77	-10.000	10.000	1.000	
Tune value inp 2	78	0.1	10.000	1.000	
Auto tune inp 2	260	0	65535		
Offset input 2	79	-32768	+32767	0	
Select input 3	80	0	28	OFF	Terminals 5/6
An in 3 target	297	0	1	Assigned (0)	
Input 3 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	81	0	2	-10V...+10V (0)	
Input 3 sign Positive Negative	391	0	1	Positive (1)	
Input 3 sign+	-				*
Input 3 sign-	-				*
Scale input 3	82	-10.000	10.000	1.000	
Tune value inp 3	83	0.1	10.000	1.000	
Auto tune inp 3	261	0	65535		
Offset input 3	84	-32768	+32767	0	

Ga6250

* These parameters can be assigned to digital inputs. Both ...sign+ and ...sign- must be used for this function to work correctly. They must be used in an "either/or" configuration.

Select input XX

Selects the software parameters that can be programmed to an analog input. The following assignments are possible (the value in the square brackets are selection codes for RS485 or BUS; superscript numbers refer to the scaling rules shown on the next page):

OFF [0]	T current lim ²⁾ [9]	PI central V3 ⁴⁾ [22]
Jog reference ¹⁾ [1]	T current lim+ ²⁾ [10]	PID feedback ⁴⁾ [23]
Speed ref 1 ¹⁾ [2]	T current lim- ²⁾ [11]	V/f flux level [24]
Speed ref 2 ¹⁾ [3]	Pad 0 ³⁾ [12]	Flux level [25]
Ramp ref 1 ¹⁾ [4]	Pad 1 ³⁾ [13]	Out vlt level [26]
Ramp ref 2 ¹⁾ [5]	Pad 2 ³⁾ [14]	Speed ratio ⁵⁾ [28]
T current ref 1 ²⁾ [6]	Pad 3 ³⁾ [15]	
T current ref 2 ²⁾ [7]	Load comp [19]	
Adap reference [8]	PID offset 0 ⁴⁾ [21]	

Input XX type

Selection of input type (voltage or current input)

Jumpers on the regulator card of the AV-300i should be installed or removed according to the input signal used. The inputs are factory set for voltage signals.

Analog input	Input signal	
	-10V...+10V 0-10 V	0-20 mA 4-20 mA
Analog input 1	S8 = OFF	S8 = ON
Analog input 2	S9 = OFF	S9 = ON
Analog input 3	S10 = OFF	S10 = ON

ON = Jumper installed

OFF = Jumper not installed

GA6255ai

-10 V...+10 V	A voltage of +10 V max is connected to the analog input. If the signal is used as a speed reference, a polarity reversal can be used to reverse the rotation direction of the drive.
0-10V, 0-20mA	A voltage of +10 V max or a current signal of 0...20 mA is connected to the analog input. The signal must be positive. If the signal is used as a speed reference, the drive direction can be reversed via the Input XX sign + and Input XX sign - parameters.
4-20 mA	A current signal of 4...20 mA is connected to the analog input. The signal must be positive. If the signal is used as a speed reference the drive rotation can be reversed via the Input XX sign + and Input XX sign - parameters.

An in XX target

Assigns the analog input xx sampling. If **assigned** (by a digital input), the programmed parameter value on the analog input is allowed to pass through.

If **not assigned** (by a digital input), the programmed parameter takes the value preset (via keypad, RS485 or BUS network) in the "input variable" parameter and uses it. It ignores the actual input voltage on the terminal board. Exceptions are the "PAD" parameters, where the last value on the analog input is stored when "An in XX target = not assigned" is executed.

Input XX sign

Selection of rotation direction when operated via the serial interface or bus.

Input XX sign +

Selection of "Clockwise" rotation when operated via the terminal strip (by a digital input), and the reference value is given with one polarity.

High	Clockwise selected
Low	Clockwise not selected

Input XX sign -	Selection of “Counterclockwise” rotation when operated via the terminal strip (by a digital input), when the reference value is only given with one polarity. <table> <tr> <td>High</td><td>Counter-clockwise selected</td></tr> <tr> <td>Low</td><td>Counter-clockwise not selected</td></tr> </table> Both “Input XX \sign+” and “Input XXsign-” have to be programmed to digital inputs and then used in an “either/or” configuration..	High	Counter-clockwise selected	Low	Counter-clockwise not selected
High	Counter-clockwise selected				
Low	Counter-clockwise not selected				
Scale input XX	Scaling of the corresponding analog input (superscript numbers on page 6-90) 1) With a scaling factor of 1 and a Tune value inp XX = 1, then 10 V or 20 mA on the input correspond to the Speed base value. 2) With a scaling factor of 1 and a Tune value inp XX = 1, then 10 V or 20 mA on the input correspond to max possible Flt 100mF current. 3) With a scaling factor of 1, then 10 V or 20 mA in the input correspond to the Pad value of 2047. 4) The range values are described in chapter: 6.17.3 PID Function 5) With a scaling factor of 1.0 and Tune value inp XX=1, then 10V or 20 mA correspond to Speed ratio = 20000				
Tune value inp XX	Fine tuning of the input when the max. signal does not exactly match the full scale rated value. See below example.				
Auto tune inp XX	Automatic fine tuning of the input. If this command is given, Tune value inp XX is automatically calibrated so that with the max input signal present, the full scale value such as the Speed base value is achieved. Two conditions are necessary for automatic fine tuning: 1. Input voltage must be greater than 1V or input current greater than 2 mA. 2. The input signal must have positive polarity although the calculated value is used for both polarities. Note: The automatically calculated value can, if necessary, be modified manually via the Tune value inp XX parameter.				
Offset inp XX	If the analog signal has an offset or if the variable assigned to the input shows a non-zero value, this can be compensated via the Offset inp XX.				

The AV-300i Drive is factory set so that the analog values defined as 0-10 V, 0-20 mA and 4-20 mA signals are always interpreted as positive values. In order to reverse the polarity, the parameters **Input XX sign +** and **Input XX sign -** must be configured on digital inputs. These inputs are used as “either/or” logic.

With field bus operation (Option), the Input XX sign parameter specifies the polarity of an analog input.

If a parameter is already internally assigned (e.g. if Speed ref 1 is automatically connected with the ramp output when the ramp is enabled), it will no longer appear in the list of parameters that can be assigned to an analog input.

The **Input XX sign +** and **Input sign -** parameters cannot be addressed via the serial interface.

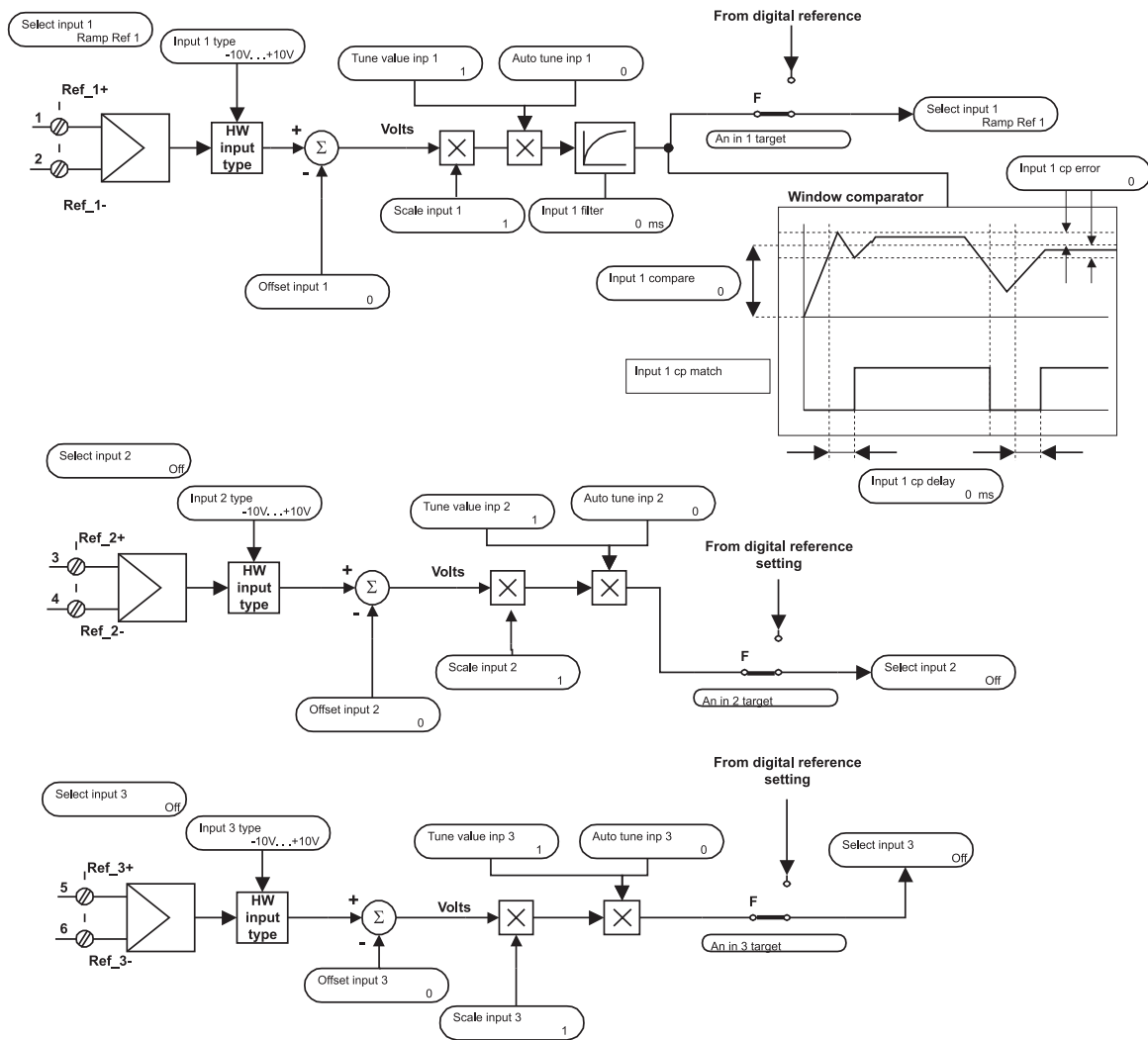


Figure 6.13.2.1: Analog input

Example 1:

The speed reference value of a drive is defined with an external voltage of max. 5 V. The value corresponds to the maximum possible speed of the drive (defined with Speed base value).

Scaling factor 2 is entered as the Scale input XX parameter ($10\text{V}/5\text{V} = 2$)

Example 2:

An external analog reference value is only 9.8 V max instead of 10 V.

Set the Tune value inp XX parameter to 1.020 ($10\text{ V}/9.8\text{ V}$).

The same result would have been obtained via the **Auto tune inp XX** function. The maximum analog voltage (in this case 9.8 V) would have to be present at the analog input terminal board with a positive polarity. The drive will adjust the “Tune value” automatically when the ENTER key is pressed.

Analog Input 1 window comparator

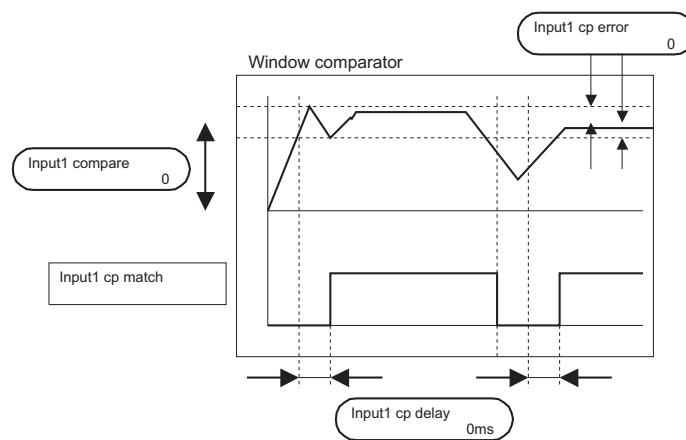


Figure 6.13.2.2: Window comparator

This function compares a signal against the value on analog input 1.

Input 1 compare	Sets the level for the comparator.
Input 1 cp error	Defines a tolerance window around Input 1 compare .
Input 1 cp delay	Delay time setting in milliseconds for the transition of Input 1 cp match from low to high.
Input 1 cp match	Signalling output of the video comparator. It can be read through a Field Bus LAN or digital output.
High	Analog input 1 value is within the comparator window.
Low	Analog input 1 value is out the comparator window.

Note!

How to calculate **Input 1 compare** and **Input 1 cp error** parameters:

Input 1 compare = (Compare value) x 10,000 / (Full range value)

Input 1 error = (Tolerance half window) x 10,000 / (Full range value)

Example 1:

Program analog input 1 to **Ramp ref 1**

Speed base value equal to 1500 [RPM]

10Volt or 20 mA on analog input 1 (Ramp ref 1=Speed base value).

The application requires a signal at 700 [RPM] via a digital output, with a tolerance window equal to 100 [RPM]

Input 1 cp match assigned to a programmable digital output.

Input 1 compare = $700/1500 \times 10,000 = 4667$

Input 1 cp error = $100/1500 \times 10,000 = 666$

Example 2:

Program analog input 1 to **Ramp ref 1**

Speed base value equal to 1500 [RPM]

10Volt or 20 mA on **Analog input 1 (Ramp ref 1=Speed base value)**.

The application requires a signal at -700 [RPM] via LAN, with a tolerance window equal to ± 100 [RPM]

Input 1 compare = $-700/1500 \times 10,000 = -4667$

Input 1 cp error = $100/1500 \times 10,000 = 666$

Example 3:

Program analog input 1 to **Pad 0**

10Volt or 20 mA on **Analog input 1** corresponds to 2047 on Pad 0.

The application requires a signal at 700 [count] via a digital output, with a tolerance window equal to ± 50 [count]

Input 1 cp match assigned to a programmable digital output

Input 1 compare = $700/2047 \times 10,000 = 3420$

Input 1 cp error = $50/2047 \times 10,000 = 244$

Example 4:

Program analog input 1 to **PID feedback**

10Volt or 20 mA on **Analog input 1** corresponds to 10,000 on **PID feedback**.

The application requires a signal at 4000 [count] via a digital output, with a tolerance band equal to ± 1000 [count]

Input 1 set thr assigned to a programmable digital output

Input 1 thr = $4000/10,000 \times 10,000 = 4000$

Input 1 cp error = $1000/10,000 \times 10,000 = 1000$

Example 5:

Program input 1 to **T current lim**

10Volt or 20 mA on **Analog input 1** corresponds to 100% on **T current Lim**.

The application requires a signal at 50 [%] via a digital output, with a tolerance band equal to ± 2 [%]

Input 1 cp match assigned to a programmable digital output

Input 1 compare = $50/100 \times 10,000 = 5000$

Input 1 cp error = $2/100 \times 10,000 = 200$

6.13.3. Digital Outputs

I/O CONFIG	
Digital outputs	Digital output 1
	Digital output 2
	Digital output 3
	Digital output 4
	Digital output 5
	Digital output 6
	Digital output 7
	Digital output 8
	Relay 2

GA0710g

GA0710g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital output 1	145	0	49	Ramp+	
Digital output 2	146	0	49	Ramp-	
Digital output 3	147	0	49	Spd threshold	
Digital output 4	148	0	49	Overld available	
Digital output 5	149	0	49	Curr limit state	
Digital output 6	150	0	49	Overvoltage	
Digital output 7	151	0	49	Undervoltage	
Digital output 8	152	0	49	Overcurrent	
Relay 2	629	0	49	Speed zero thr	

Ga6260

Option card

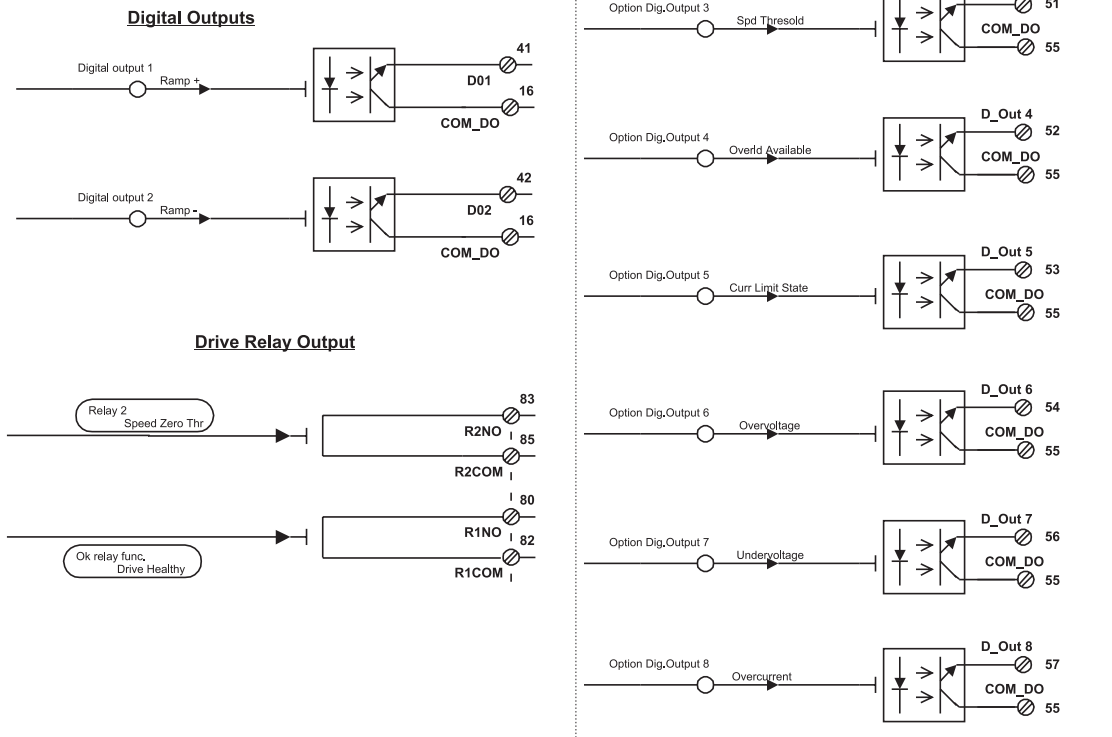


Figure 6.13.3.1: Digital Outputs and Option card

Digital output XX

Selects the parameter that can be assigned to a digital output. The following assignments are possible: (The numbers in the brackets are selection codes for RS 485 or Bus).

OFF [0]	Overtemp mot [15]	BU overload [36]
Speed zero thr [1]	External fault [16]	Diameter calc st [38]
Spd threshold [2]	Failure supply [17]	Mot setup state [46]
Set speed [3]	Pad A bit [18]	Input 1 cp match [49]
Curr limit state [4]	Pad B bit [19]	Overload 200% [51]
Drive ready [5]	Virt dig input [20]	PL stop active [52]
Overld available [6]	Speed fbk loss [25]	PL next active [53]
Reserved [7]	Bus loss [26]	PL time-out sig [54]
Ramp +[8]	Output stages [27]	Regulation ot [55]
Ramp -[9]	Hw opt1 failure [28]	Module overtemp [56]
Speed limited [10]	Opt2 failure [29]	Heatsink ot [57]
Undervoltage [11]	Encoder1 state [30]	Intake air ot [62]
Overvoltage [12]	Encoder2 state [31]	
Heatsink sensor [13]	Ovld mot state [32]	
Overcurrent [14]	Enable seq err [35]	

Relay 2 Selection of the parameters can be used to program “Relay 2”. Contacts from this relay are brought out to terminal boards points 83 and 85. (Open relay contact = Alarm, closed relay contact = No alarm).

6.13.4. Digital Inputs

I/O CONFIG	
	Digital inputs
	Digital input 1
	Digital input 2
	Digital input 3
	Digital input 4
	Digital input 5
	Digital input 6
	Digital input 7
	Digital input 8

GA0720g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital input 1	137	0	62	OFF	
Digital input 2	138	0	62	OFF	
Digital input 3	139	0	62	OFF	
Digital input 4	140	0	62	OFF	
Digital input 5	141	0	62	OFF	
Digital input 6	142	0	62	OFF	
Digital input 7	143	0	62	OFF	
Digital input 8	144	0	62	OFF	

Ga6265

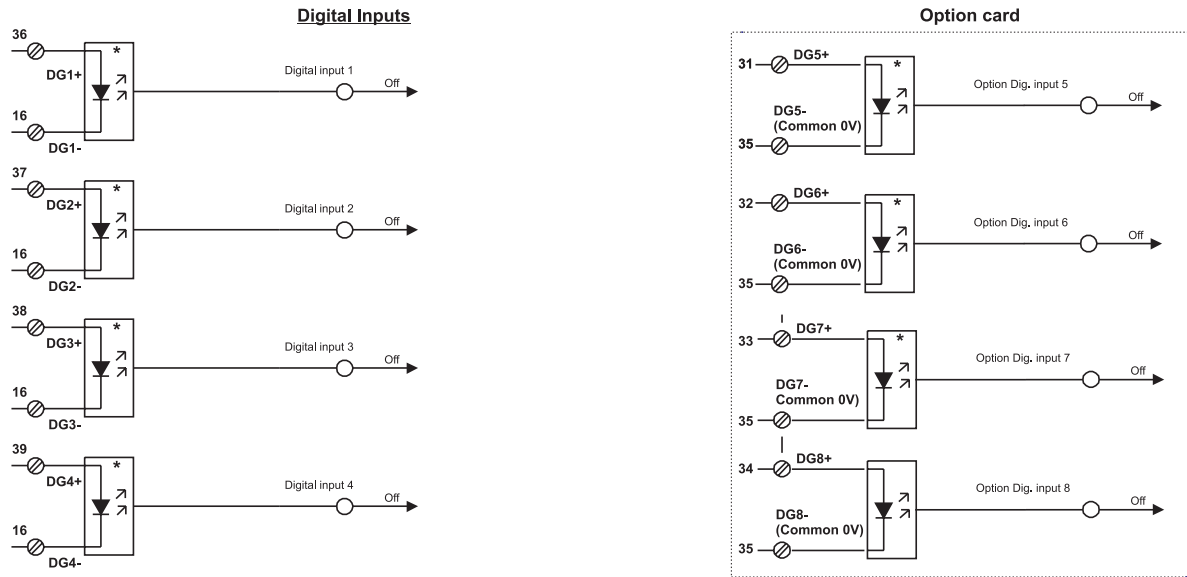


Figure 6.13.4.1: Digital Input and Option card

Digital input XX

Selects the parameter that can be assigned to a digital input. The following assignments are possible: (The numbers in brackets are selection codes for RS 485 or Bus, superscript numbers are defined below).

OFF [0]

Motor pot reset [1]

Motor pot up [2]

Motor pot down [3]

Motor pot sign +[4]

Motor pot sign -[5]

Jog +[6]

Jog -[7]

Failure reset [8]

Torque reduct [9]

Ramp out = 0 [10]

Ramp in = 0 [11]

Freeze ramp [12]

Lock speed reg [13]

Lock speed I [14]

Auto capture [15]

Input 1 sign +¹[16]

Input 1 sign -¹[17]

Mot setup sel 0⁵ [62]

Input 2 sign +¹[18]

Input 2 sign -¹[19]

Input 3 sign +¹[20]

Input 3 sign -¹[21]

Zero torque [22]

Speed sel 0²[23]

Speed sel 1²[24]

Speed sel 2²[25]

Ramp sel 0³[26]

Ramp sel 1³[27]

Speed fbk sel [28]

PAD A bit 0 [32]

PAD A bit 1 [33]

PAD A bit 2 [34]

PAD A bit 3 [35]

PAD A bit 4 [36]

PAD A bit 5 [37]

PAD A bit 6 [38]

PL mains status [66]

PAD A bit 7 [39]

Fwd sign [44]

Rev sign [45]

An in 1 target [46]

An in 2 target [47]

An in 3 target [48]

Enable droop [49]

Forward sign [44]

Quick Stop [51]

Enable PI PID⁴ [52]

Enable PD PID⁴ [53]

PI int freeze⁴ [54]

PID offs. sel⁴ [55]

PI central vs0⁴ [56]

PI central vs1⁴ [57]

Diameter calc⁴ [58]

Lock zero pos [59]

Lock save eng [60]

PL time-out ack [67]

- 1) The **Input xx sign +** and **Input XX sign -** parameters must be used together.
- 2) The **Speed sel 0**, **Speed sel 1** and **Speed sel 2** parameters must be used together.
- 3) The **Ramp sel 0** and **Ramp sel 1** parameters must be used together.
- 4) See **PID Function** (chapter 6.17.3)
- 5) See **Motor setup function** (chapter 6.15.7)

6.13.5. Speed reference from encoder input (Tach follower function)

I/O CONFIG	
Encoder inputs	
	Select Enc 1
	Select Enc 2
	Encoder 1 type
	Encoder 1 pulses
	Encoder 2 pulses
	Refresh enc 1
	Refresh enc 2

Ga0725

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select enc 1	1020	0	5	OFF	
Select enc 2	1021	0-00	5	OFF	
Encoder 1 type	415	0	1	Digital	
Sinusoidal					
Digital				(1)	
Encoder 1 pulses	416	600	9999	1024	
Encoder 2 pulses	169	600	9999	1024	
Refresh enc 1	649	0	1	Disable	
Enabled					
Disabled				(0)	
Refresh enc 2	652	0	1	Disable	
Enabled					
Disabled				(0)	

Ga6266ai

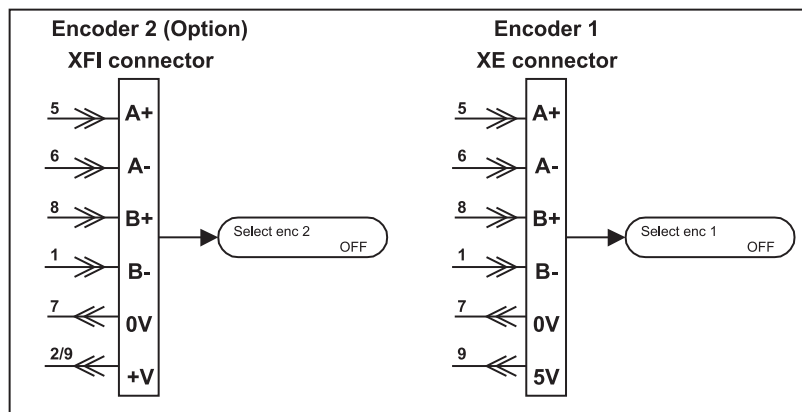


Figure 6.13.5.1: Tach follower

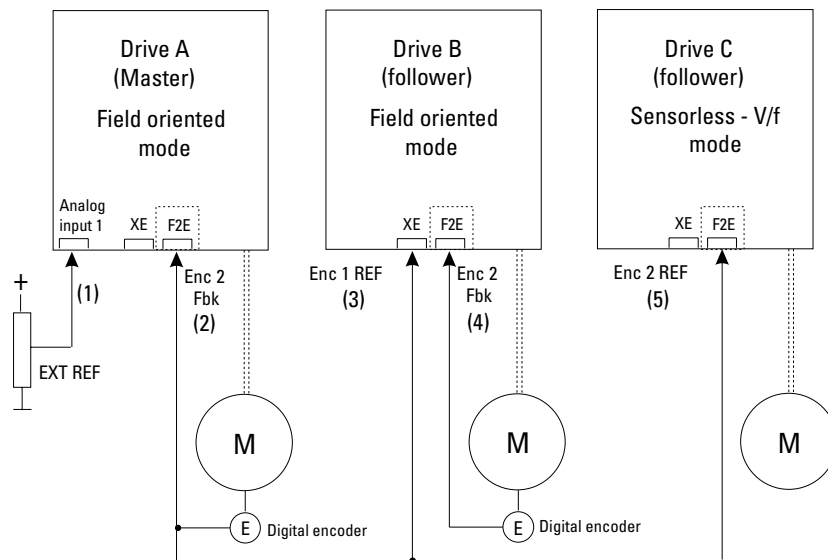
This function allows the use of encoder inputs as a speed reference. Compared to an analog input, these inputs have higher resolution and higher noise immunity.

If the encoder input (XE connector) is used for this purpose, it will be necessary to define the speed reference input that it will be used as (**Ramp ref 1**, **Speed ref 1**, etc.)

When an encoder is used as a speed reference, that the same encoder cannot be used as speed feedback. The same speed reference cannot be configured as an encoder input as well as an analog input.

Select enc 1	These parameters define which speed reference the encoder signal will be directed to.
Select enc 2	The OFF condition indicates that the encoder connector is not used as a speed reference and then could be used as speed feedback. (CONFIGURATION/Speed fbk sel menu). The speed reference destination must be done according to the speed regulator configuration (e.g. can not use Speed ref 1 with the ramp active).
Encoder 1 type	It defines the encoder type connected to the XE connector. Sinusoidal Sinusoidal encoder Digital Digital encoder
Encoder 1 pulses	Number of encoder pulses connected to the XE connector.
Encoder 2 pulses	Number of encoder pulses connected to the optional EXP-FZE card connector.
Refresh enc 1	Enables monitoring of the encoder 1 connection status, it initiates a feedback loss alarm
Refresh enc 2	Enables monitoring of the digital encoder 2 connection status, it initiates a speed feedback loss alarm

The figure 6.13.5.2 shows a typical use of this function.



(1)	Analog inputs/ Select input 1 = Ramp ref 1	(4)	Speedfbk sel = Encoder 2
(2)	Speed fbk sel = Encoder 2	(5)	Select enc 2 = Ramp ref 1
(3)	Select enc 1 = Ramp ref 1 Enc 1 Type = digital		

Fig. 6.13.5.2: Example of application of the encoder reference

The Drive A speed reference is provided by an external analog signal but it could be set from an internal digital sources (e.g. DGF optional card or field bus).

A configuration using an encoder as the line speed reference, is only possible when that speed reference source is provided by an additional encoder.

Use with different regulation mode settings:

The function “Tach follower” with **Regulation mode = Field oriented** can be used in accordance with the table below, if the “Motor setup” function is used (parameters **Select enc 1** and **Select enc 2** must be set to OFF).

The table below shows the possible configurations of the drive for the simultaneous use of the functions “Tach follower” and “Motor setup”.

Regulation mode	Motor setup		Tach follower	
	Setup 0 Speed fbk sel	Setup 1 Speed fbk sel	Select enc 1	Select enc 2
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

Ga6267

⁽¹⁾ It requires mechanical disconnect of the encoder signals. It is not recommended because of low noise immunity and possible loss of continuity in the shield connections.

⁽²⁾ Encoder feedback is not used in these cases. The **Spd fbk sel** parameter is blocked by **Select enc 1** and **Select enc 2** parameters.

6.14. Additional Speed Functions

6.14.1. Auto Capture

ADD SPEED FUNCT					
Auto capture					
GA0730g					
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Auto capture	388	0	1	OFF	*
ON					
OFF				(0)	

GA6270g

* This function can be assigned to one of the programmable digital inputs.

Auto capture	ON	When the drive is switched on, the speed of the motor is determined and the field orientation regulator is initialized accordingly. The drive then accels to the set reference speed.
	OFF	When the drive is switched on, it starts at zero frequency.

This function can only be used with REGULATION MODE = Field oriented or REGULATION MODE= V/f (see chapter 6.4.2.3.3).

Main uses:

- Starting a motor that is already running. (e.g. the case of pumps with flow present).
- Restart after a fault alarm.
- If the speed reference is defined via the ramp input, **Auto capture** will force the speed reference to match the motor speed.

Note!

If the Auto capture function is switched off, verify that the motor is not turning when the drive is started as this may cause an overvoltage or overcurrent trip.

6.14.2. Adaptive spd reg

ADD SPEED FUNCT	
Adaptive spd reg	
	Enable spd adap
	Select adap type
	Adap reference
	Adap speed 1
	Adap speed 2
	Adap joint 1
	Adap joint 2
	Adap P gain 1
	Adap I gain 1
	Adap P gain 2
	Adap I gain 2
	Adap P gain 3
	Adap I gain 3

GA0740g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd adap Enable Disable	181	0	1	Disabled (0)	
Select adap type Speed Adap reference	182	0	1	Speed (0)	
Adap reference [FF]	183	-32768	+32767	1000	*
Adap speed 1 [%]	184	0.0	200.0	20.3	
Adap speed 2 [%]	185	0.0	200.0	40.7	
Adap joint 1 [%]	186	0.0	200.0	6.1	
Adap joint 2 [%]	187	0.0	200.0	6.1	
Adap P gain 1 [%]	188	0.00	100.00	10.00	
Adap I gain 1 [%]	189	0.00	100.00	1.00	
Adap P gain 2 [%]	190	0.00	100.00	10.00	
Adap I gain 2 [%]	191	0.00	100.00	1.00	
Adap P gain 3 [%]	192	0.00	100.00	10.00	
Adap I gain 3 [%]	193	0.00	100.00	1.00	

GA6275g

*This function can be assigned to one of the programmable analog inputs.

The adaptive speed regulator function enables different speed gains dependent on the running speed or other selected variable (Adaptive Reference). This allows optimum operation of the speed regulator for the application.

Enable spd adap	Enabled	Adaptive speed regulation enabled.
	Disabled	Adaptive speed regulation is not enabled. The regulator operates with the parameters set in the REG PARAMETERS menu.
Select adap type	Speed	The regulator parameters are modified at a certain speed point.
	Adap reference	The regulator parameters are modified by the Adap reference parameter.
Adap reference	The variable that sets the point at which the speed regulator parameters are changed.	
Adap speed 1	Parameter set 1 is valid below this point, and parameter set 2 above it. The transition behavior between the values is defined by the Adap joint 1 parameter. The units are defined as percentage of the Speed base value .	
Adap speed 2	Parameter set 2 is valid below this point, and parameter set 3 above it. The transition behavior between the values is defined by Adap joint 2 . The units are defined as percentage of the Speed base value .	
Adap joint 1	Defines a range around Adap speed 1 in which there is a linear change in gain from parameter set 1 to parameter set 2. This prevents jumps in the response of the regulator. The units are defined as percentage of the Speed base value .	
Adap joint 2	Defines a range around Adap Speed 2 in which there is a linear change in gain from parameter set 2 to parameter set 3. This prevents jumps in the response of the regulator. The units are defined as percentage of the Speed base value .	
Adap P gain 1	Proportional gain for the range from zero to the Adap speed 1 speed point. Defined as a percentage of Speed P base .	
Adap I gain 1	Integral gain for the range from zero to the Adap speed 1 speed point. Defined as a	

	percentage of Speed I base .
Adap P gain 2	Proportional gain for the range from Adap speed 1 to Adap speed 2 . Defined as a percentage of Speed P base .
Adap I gain 2	Integral gain for the range from Adap speed 1 to Adap speed 2 . Defined as a percentage of Speed I base .
Adap P gain 3	Proportional gain for the range above Adap speed 2 . Defined as a percentage of Speed P base .
Adap I gain 3	Integral gain for the range above Adap speed 2 . Defined as a percentage of Speed I base .

In order to activate “Adaptive speed regulation”, the function must be enabled with the **Enable spd adap** parameter.

Normally the gain depends on the speed of the drive. It can, however, also vary according to another variable, defined by the **Adap reference** parameter. This variable must be selected with the **Select adap type** parameter.

The **Adap speed 1** and **Adap speed 2** parameters are used to define the three ranges that may have different gains.

A parameter set can be defined for each of these ranges, with each set containing an individually adjustable P and I component. The **Adap joint 1** and **Adap joint 2** parameters ensure a smooth transition between the different parameter sets. The ranges must be defined in such a way that **Adap joint 1** and **Adap joint 2** do not overlap.

When the Adaptive speed regulation is enabled (**Enable spd adap** = Enabled), the normal **Speed P** and **Speed I** parameters have no effect. Their values are retained, however, to be used when the “Adaptive speed regulation” is switched off.

When the drive is not enabled, the gain of the speed regulator is determined by the speed zero logic function. See section 6.14.4, “Speed zero logic”.

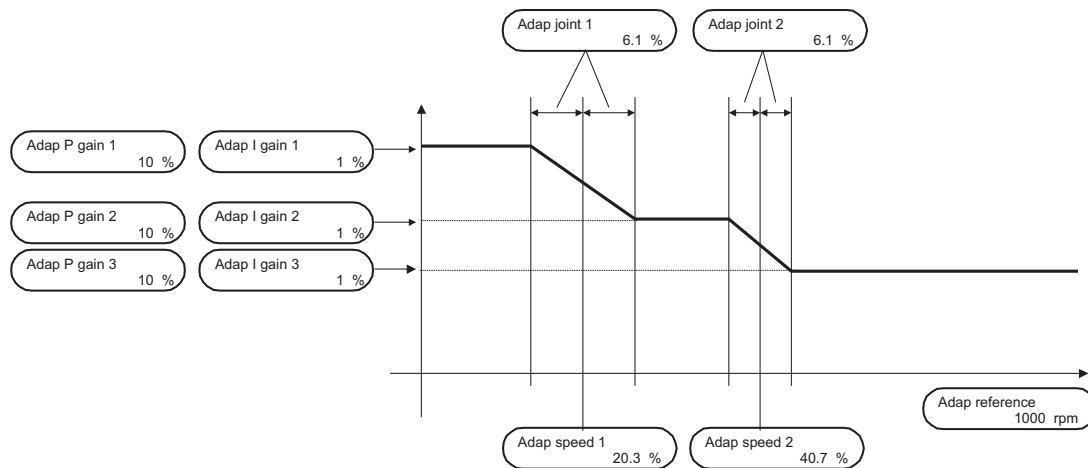
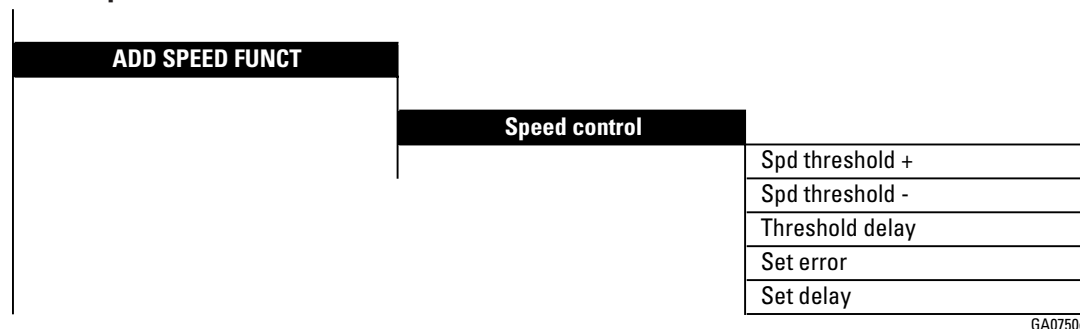


Figure 6.14.2.1: Adaptive speed regulation

6.14.3. Speed control



GA0750g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Spd threshold + [FF]	101	1	32767	1000	
Spd threshold - [FF]	102	1	32767	1000	
Threshold delay [ms]	103	1	65535	100	
Spd threshold	393	0	1	-	Digital output 3 *
Set error [FF]	104	1	32767	100	
Set delay [ms]	105	0	65535	100	
Set speed	394	0	1	-	*

GA6280g

*This function can be assigned to a programmable digital output.

Two speed control messages are provided:

- when an adjustable speed threshold is exceeded
- when the speed equals the set reference value

Spd threshold +	Switch point for the clockwise rotation of the drive. The units are defined by the factor function.
Spd threshold -	Switch point for the counter-clockwise rotation of the drive. The units are defined by the factor function.
Threshold delay	Setting of a delay time in milliseconds for the transition of Spd threshold
Spd threshold	Message "Speed exceeded" (via a programmable digital output, RS485 or BUS). High Speed not exceeded Low Speed exceeded
Set error	Defines a tolerance band around the speed reference in the units specified by the factor function.
Set delay	Setting of a delay time in milliseconds for the transition of set speed from low to high.
Set speed	Message "The speed corresponds to the reference value" (via a programmable digital output or RS485 or BUS). This may also be considered an "up-to-speed" function. High Speed is in the range $\pm$ "Set error" Low Speed is outside the range

The message "Speed corresponds to the reference value" refers to the total reference value **Speed ref** (or **Ramp Ref** value when the ramp is selected.)

With reference values below $\pm 1\%$ the signal is always Low!

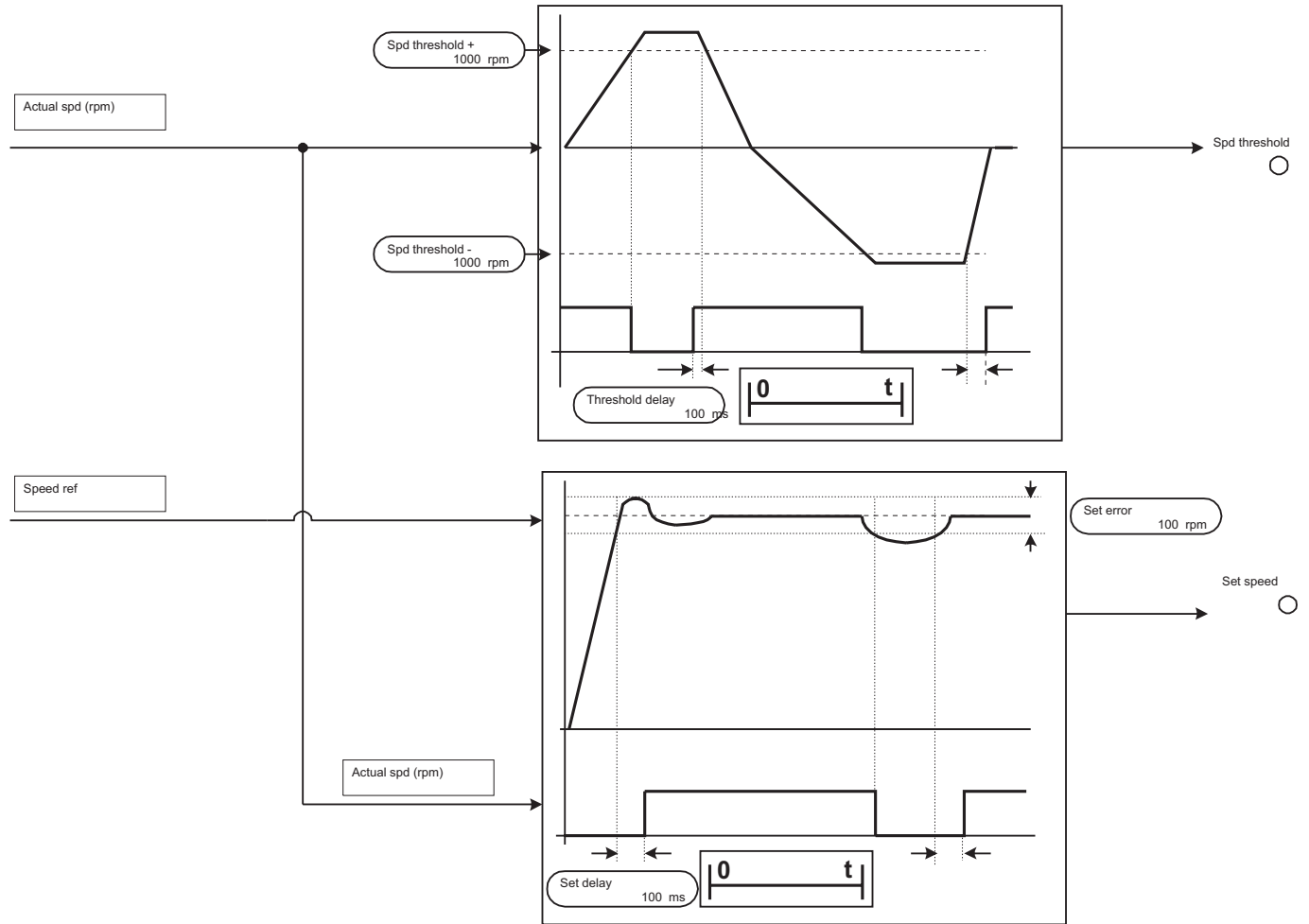


Figure 6.14.3.1: "Speed threshold" (above) and "Set speed" (below).

6.14.4. Speed zero

ADD SPEED FUNCT		Speed zero	
		Speed zero level	
		Speed zero delay	

GA0760g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed zero level [FF]	107	1	32767	10	-
Speed zero delay [ms]	108	0	65535	100	-
Speed zero thr	395	0	1	-	* Relay terminals 83/85

GA6285g

* This function can be assigned to a programmable digital output.

Speed zero level	Switch threshold for the zero speed level. The value applies to either direction of rotation, defined in the units specified by the factor function.
Speed zero delay	Definition of a delay time in milliseconds, for the transition of speed zero thr from high to low.
Speed zero thr	Message “Drive running” (via a programmable digital output or RS485 or BUS)
High	Drive running
Low	Drive not running

The LED “Zero speed” on the programmer or LED card is lit when the motor is not running.

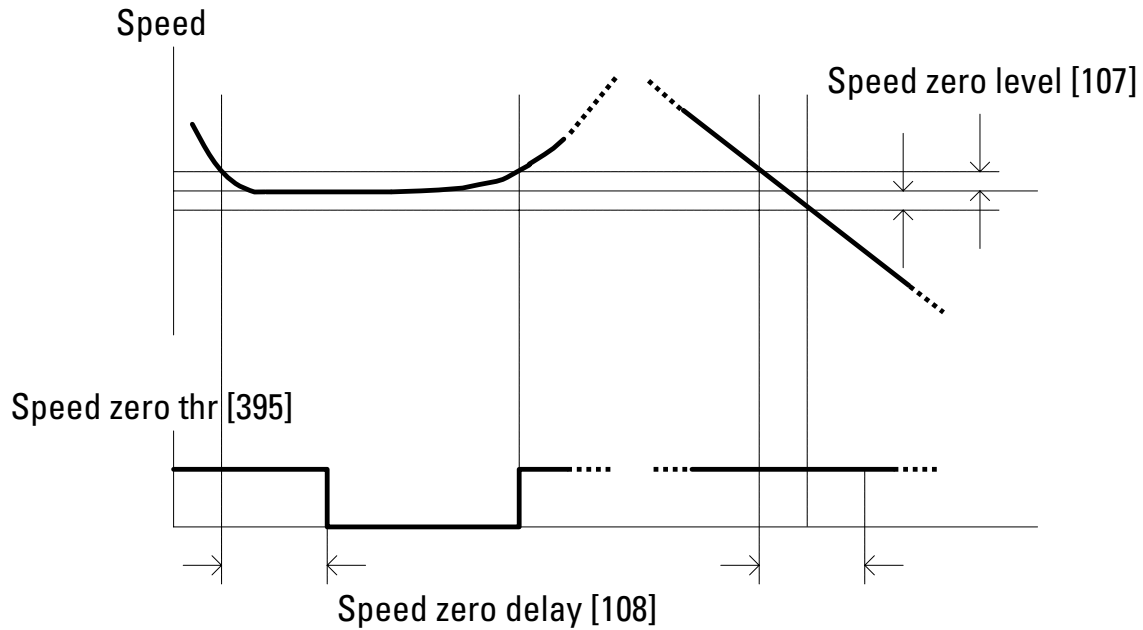


Figure 6.14.4.1: Speed zero

6.15. Functions

6.15.1. Motor potentiometer

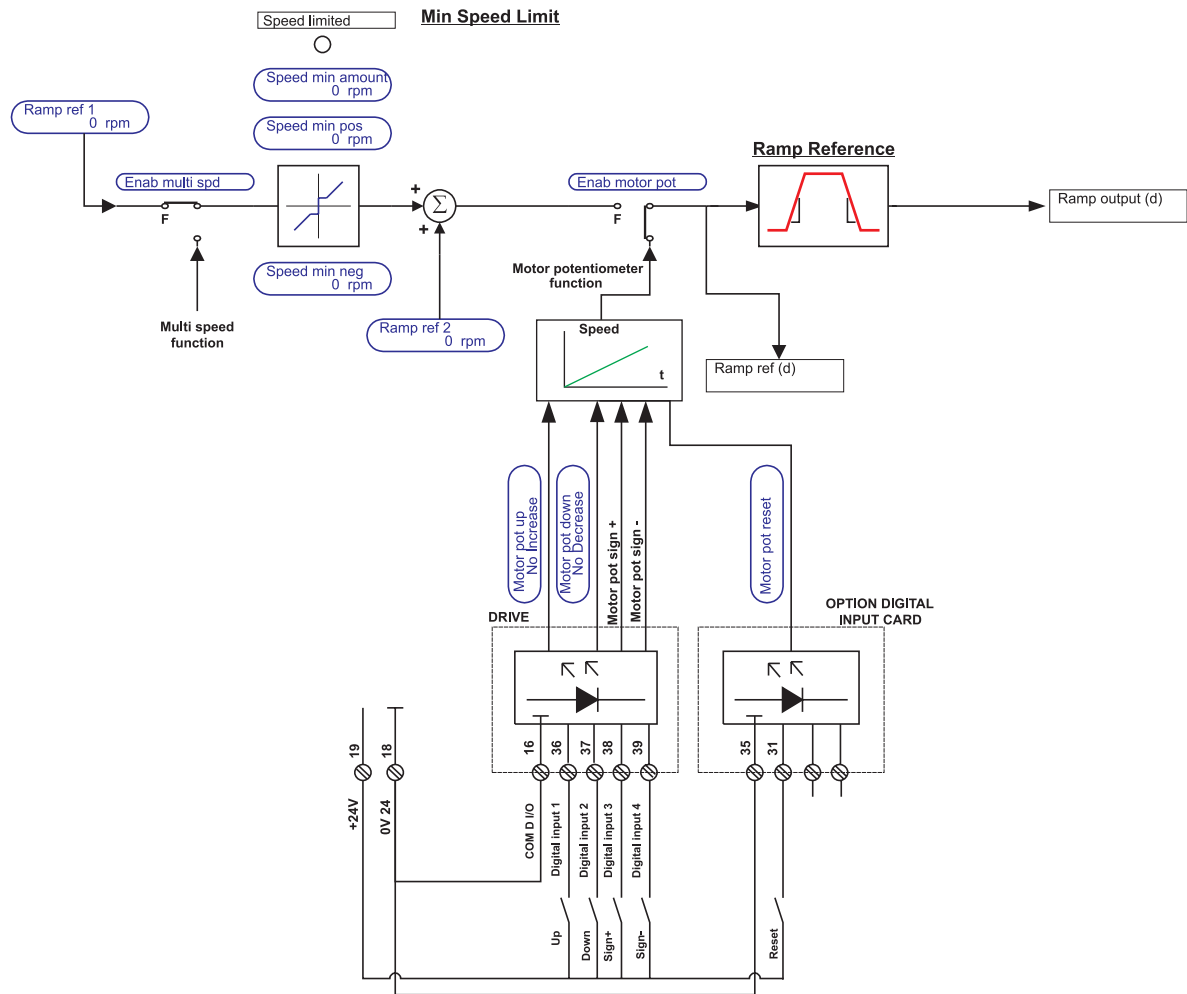
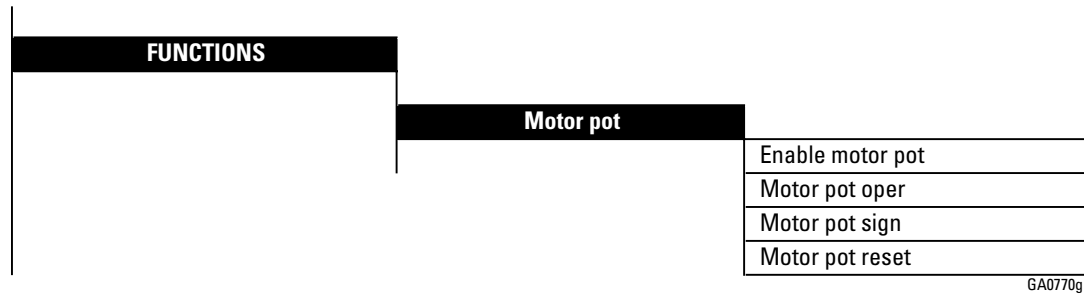


Figure 6.15.1.1: Example of the external activation of the motor potentiometer function.

The sign + and sign - signals can be omitted if only one rotation direction is required.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable motor pot	246	0	1	Enabled	
Enabled					
Disabled				(1)	
Motor pot oper	-				
Motor pot sign	248	0	1	Positive	
- / +				(1)	
Motor pot sign +	-				**
Motor pot sign -	-				**
Motor pot reset	249	0	65535	-	*
Motor pot up	396	0	1	No acceleration	
				(0)	
Motor pot down	397	0	1	No deceleration	
				(0)	

GA6290ai

* This function can be assigned to one of the programmable digital inputs.

** These parameters can only be accessed via a programmable digital input.

The motor potentiometer function allows the speed of the drive to be adjusted by pushbutton control. The speed is then changed according to the defined ramp time.

Enable motor pot	Enabled	The motor potentiometer function is enabled. The ramp receives its reference value from the motor potentiometer function.
	Disabled	The motor potentiometer function is disabled.
Motor pot oper	After entering this menu item on the keypad, pressing the “+” and “-” keys of the keypad causes the drive to accelerate or decelerate.	
	+ Accelerate	
	- Decelerate	
Motor pot sign	This parameter is only accessible via the keypad, the serial interface or bus. When the drive is operated via the terminal strip, the parameters Motor pot sign + and Motor pot sign - <u>must</u> be used.	
	Positive	“Clockwise” rotation selected
	Negative	“Counter-clockwise” rotation selected
Motor pot sign +	Selection of “Clockwise” rotation when the input is via the terminal strip. The Motor pot sign+ parameter is linked with the Motor pot sign - parameter via an XOR function. This means that the command (+24V) must be given only to one of the two terminals at a time.	
	High	“Clockwise” rotation selected
	Low	“Clockwise” rotation not selected
Motor pot sign -	Selection of the “Counter-clockwise” rotation when the input is via the terminal strip. The Motor pot sign - parameter is linked with the Motor pot sign + parameter via an XOR function: this means that the command (+24V) must be given only to one of the two terminals at a time.	
	High	“Counter-clockwise” rotation selected.
	Low	“Counter-clockwise” rotation not selected.
Motor pot reset	After the reset command is executed, and drive is switched off and on, the reference is set	

at zero. The Motor pot “up” command is required in order to accelerate the drive. If the Reset command is not executed, the drive will accelerate to the speed last selected when restarted.

The command is only possible with the drive disabled

Motor pot up

The drive is accelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

Motor pot down

The drive is decelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

When the motor potentiometer function is active (**Enable motor pot**), the current speed reference value is shown in the **Motor pot** submenu of the keypad.

When controlled via the keypad, the drive can be accelerated by pressing the “+” key and decelerated by pressing the “-” key. This corresponds to the commands **Motor pot up** and **Motor pot down**. The menu point **Motor pot oper** must be selected before the “+” & “-” key become operable.

The speed of the drive can be adjusted between 0 and 100 %.

The drive reduces the speed between 100 and 0 % by the **Motor pot down** command. If the command is given when the drive is already at a stop, it will not cause the drive to run reverse.

If the **Motor pot up** and **Motor pot down** commands are given at the same time, the speed reference value will not change. The last speed reference value is retained when the drive is disabled or if there is a fault. When the drive is restarted, it accelerates to this speed according to the ramp rate.

If the command **Motor pot reset** is given with the drive switched off, the speed reference value is deleted, and the drive starts at zero speed.

If the status of the **Motor pot sign** command is changed while the drive is running, the drive will reverse according to the ramp times specified.

When using the motor potentiometer function, the ramp must be enabled and the **Start** command must be present.

6.15.2. Jog function

FUNCTIONS	
	Jog function
	Enable jog
	Jog operation
	Jog selection
	Jog reference

GA0780g

GA0780g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable jog (Enable/disable)	244	0	1	Enabled (1)	-
Jog operation	-				
Jog selection (Speed input/Ramp input)	375	0	1	Speed input (0)	
Jog reference [FF]	266	0	32767	100	**
Jog+	398	0	1	No jog+	*
Jog-	399	0	1	No jog-	*

GA6295ai

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

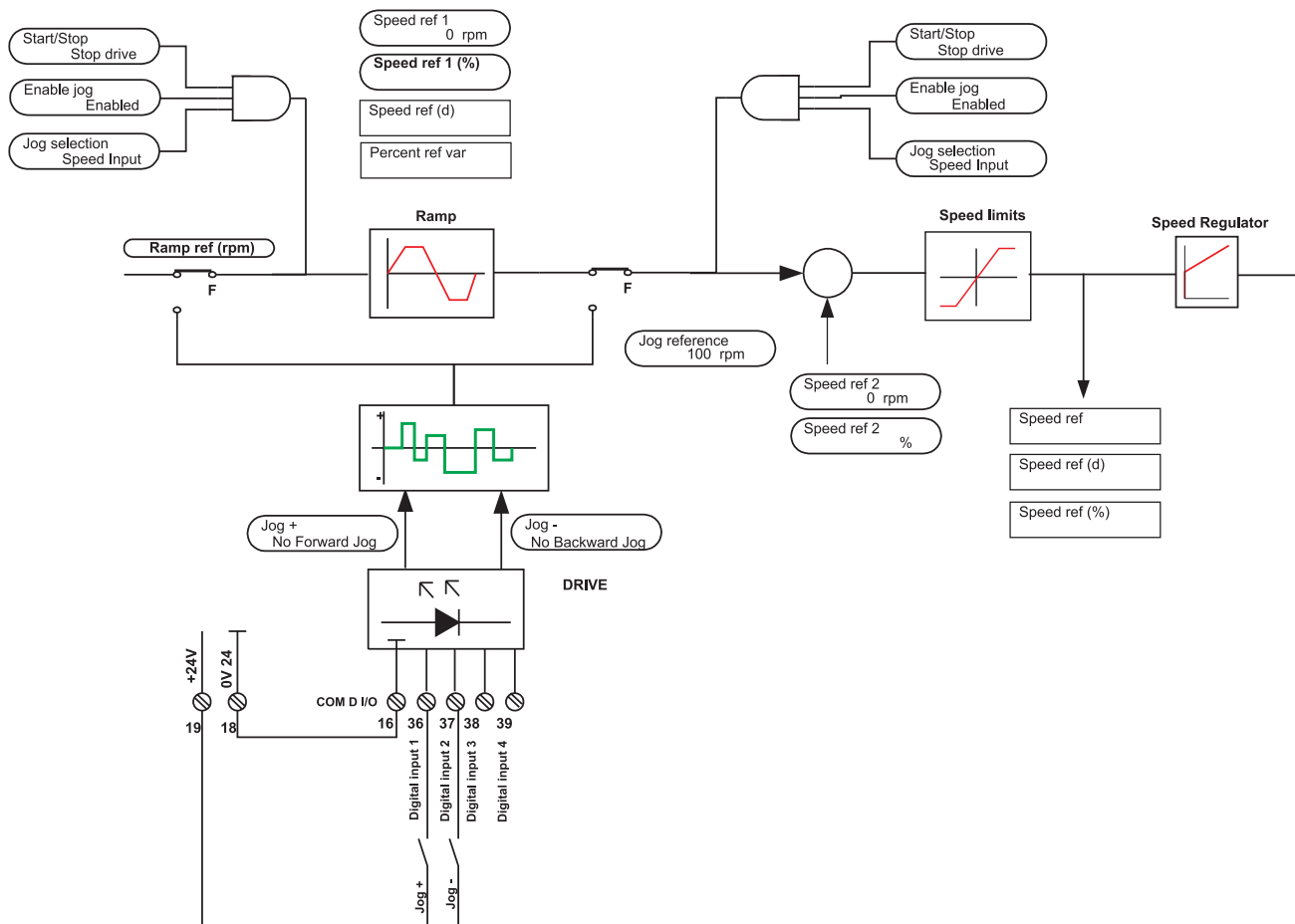


Figure 6.15.2.1: Example of external activation of the Jog function

Selection is possible only if the drive is disabled

Enable jog	Enabled	Jog mode is enabled
	Disabled	Jog mode is disabled

Jog operation Pressing the “+” and “-” keys (on keypad) enables the drive to run forward or reverse.

- + Jog clockwise rotation
- Jog counter-clockwise rotation

Jog selection	This parameter determines if the jog reference goes through the ramp circuit or directly to the speed regulator.

Speed input	The jog reference is directly fed to the speed regulator. The ramp is not active.

Ramp input The jog reference is fed to the ramp input block.

Jog reference	Reference value for jog mode. Defined by dimension in the factor function.

Jog + High Jog with clockwise rotation of the drive.

Low Disabled

Jog - High Jog with counter-clockwise rotation of the drive.

Low Disabled

Note:

The following signals are required to be high for Jog mode:

- **Jog +** and **Jog -**
- **Enable drive**
- **Fast Stop**
- **External fault**

The jog speed corresponds to the value defined with the **Jog reference** parameter.

The jog function can only be activated by the **Jog +** or **Jog -** command. There can be no **Start** command present and the actual speed of the drive must be zero.

If the **Start** command is given in addition to the **Jog +** or **Jog -** command, Jog mode will be aborted and the drive will react to the **Start** command.

When controlled via the keypad the “+” and “-” keys can be used through the **Jog function** menu.

The **Speed ref 2** input to the speed regulator is still active during jog operation.

6.15.3. Multi speed fct

FUNCTIONS	
	Multi speed fct
	Enable multi spd
	Multi speed sel
	Multi speed 1
	Multi speed 2
	Multi speed 3
	Multi speed 4
	Multi speed 5
	Multi speed 6
	Multi speed 7

GA0790g

The Multi speed function allows up to seven internally preset reference values to be called up via a set of three digital input signals

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable multi spd (Enable/Disable)	153	0	1	Disabled (0)	
Multi speed sel	208	0	7	0	
Multi speed 1	154	-32768	+32767	0	
Multi speed 2	155	-32768	+32767	0	
Multi speed 3	156	-32768	+32767	0	
Multi speed 4	157	-32768	+32767	0	
Multi speed 5	158	-32768	+32767	0	
Multi speed 6	159	-32768	+32767	0	
Multi speed 7	160	-32768	+32767	0	
Speed sel 0	400	0	1	Low	Digital input 5 *
Speed sel 1	401	0	1	Low	Digital input 6 *
Speed sel 2	402	0	1	Low	Digital input 7 *

GA6300g

* This function can be assigned to one of the programmable digital inputs.

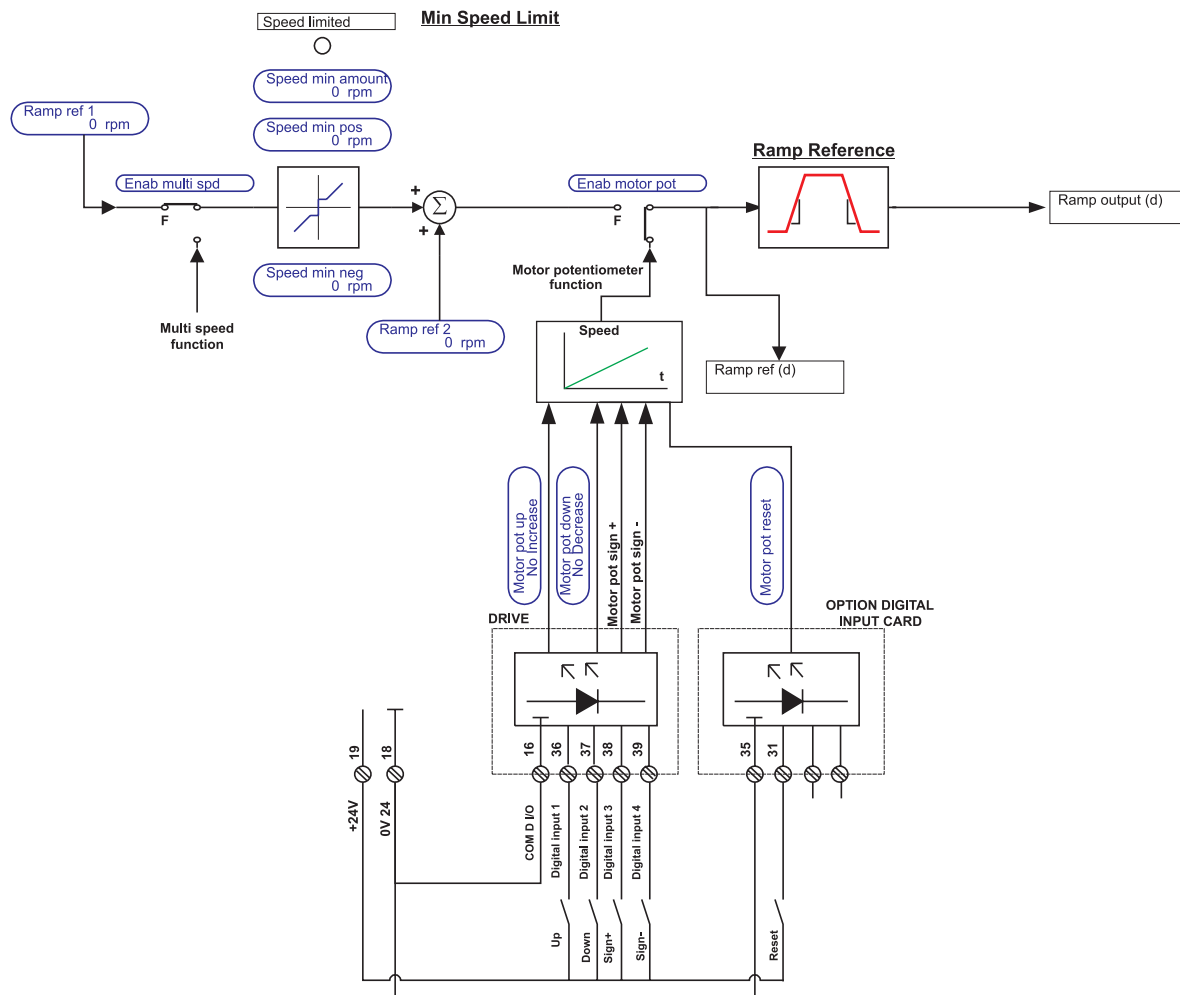


Figure 6.15.3.1: Selection of different reference values via terminal strip

Enab multi spd	Enabled - Multi speed function is enabled Disabled - Multi speed function is disabled
Multi speed 1	Reference value 1 for Multi speed function. Defined in the units specified by the factor function.
Multi speed 2	Reference value 2 for Multi speed function. Defined in the units specified by the factor function.
Multi speed 3	Reference value 3 for Multi speed function. Defined in the units specified by the factor function.
Multi speed 4	Reference value 4 for Multi speed function. Defined in the units specified by the factor function.
Multi speed 5	Reference value 5 for Multi speed function. Defined in the units specified by the factor function.
Multi speed 6	Reference value 6 for Multi speed function. Defined in the units specified by the factor function.

Multi speed 7	Reference value 7 for Multi speed function. Defined in the units specified by the factor function.
Speed sel 0	Digital input that selects which Multispeed value to use. See table 6.15.3.1. Parameter can only be used in conjunction with Speed sel 1 and Speed sel 2 High Speed sel 0 selected Low Speed sel 0 not selected
Speed sel 1	Digital input that selects which Multispeed value to use. See table 6.15.3.1. Parameter can only be used in conjunction with Speed sel 0 and Speed sel 2 High Speed sel 1 selected Low Speed sel 1 not selected
Speed sel 2	Digital input that selects which Multispeed value to use. See table 6.15.3.1. Parameter can only be used in conjunction with Speed sel 0 and Speed sel 1 . High Speed sel 2 selected Low Speed sel 2 not selected
Multi speed sel	It is the word representation of the three parameters Speed sel1 (bit 0), Speed sel2 (bit1) and Speed sel 2 (bit2). Used to change the speed selection by changing only one parameter instead of three. This allows different speed selection via serial line or Bus.

The table and graph below shows the interaction between the selection and the corresponding reference value.

Speed sel 0 bit 0 not selected	Speed sel 1 bit 1 not selected	Speed sel 2 bit 2 not selected	REFERENCE
0	0	0	Ramp ref 1 0 rpm + Ramp ref 2 0 rpm
1	0	0	Multi speed 1 0 rpm
0	1	0	Multi speed 2 0 rpm
1	1	0	Multi speed 3 0 rpm
0	0	1	Multi speed 4 0 rpm
1	0	1	Multi speed 5 0 rpm
0	1	1	Multi speed 6 0 rpm
1	1	1	Multi speed 7 0 rpm

Enab multi spd
Disabled

Multi speed sel
0

Ramp ref (d)

Table: 6.15.3.1: Multispeed selection

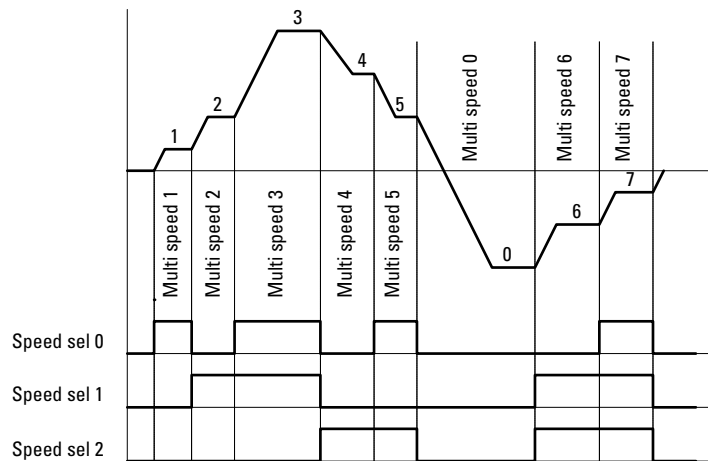


Figure 6.15.3.2: Multi speed function

The **Multi speed function** must be enabled by the **Enab multi spd** parameter.

The reference value required is selected with the **Speed sel 0**, **Speed sel 1** and **Speed sel 2** signals. When the selection is carried out via the terminal strip, all three signals must always be assigned to digital inputs even if only reference values 1 and 2 are required. The selection of the reference values is carried out via the keypad, serial interface, digital input, RS485 or BUS.

The reference values are signed so that they can be defined for either direction of rotation.

When the Multi speed function is enabled, **Multi speed 0** is defined as the addition of the reference values **Ramp ref 1** and **Ramp ref 2**.

6.15.4. Multi ramp fct

FUNCTIONS			
	Multi ramp fct	Enable multi ramp	
		Multi ramp sel	
	Ramp 0	Acceleration 0	
		Acc delta speed 0	
		Acc delta time 0	
		S acc t const 0	
		Deceleration 0	
		Dec delta speed 0	
		Dec delta time 0	
		S dec t const 0	
		Ramp 1	
		Acceleration 1	
		Acc delta speed 1	
		Acc delta time 1	
		S acc t const 1	
		Deceleration 1	
		Dec delta speed 1	
		Dec delta time 1	
		S dec t const 1	
	Ramp 2	Acceleration 2	
		Acc delta speed 2	
		Acc delta time 2	
		S acc t const 2	
		Deceleration 2	
		Dec delta speed 2	
		Dec delta time 2	
		S dec t const 2	
	Ramp 3	Acceleration 3	
		Acc delta speed 3	
		Acc delta time 3	
		S acc t const 3	
		Deceleration 3	
		Dec delta speed 3	
		Dec delta time 3	
		S dec t const 3	

GA0801g

The Multi ramp function enables up to four different ramps to be selected. The acceleration and deceleration times can also be defined independently. The ramps are selected via digital signals.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enab multi rmp (Enable/Disable)	243	0	1	Disabled (0)	—
Multi ramp sel	202	0	3	0	—
Acc delta speed 0 [FF]	659	0	232 -1	100	—
Acc delta time 0 [s]	660	0	65535	1	—
S acc t const 0 [ms]	665	100	3000	500	—
Dec delta speed 0 [FF]	661	0	232 -1	100	—
Dec delta time 0 [s]	662	0	65535	1	—
S dec t const 0 [ms]	666	100	3000	500	—
Acc delta speed1 [FF]	23	0	232 -1	100	—
Acc delta time 1 [s]	24	0	65535	1	—
S acc t const 1 [ms]	667	100	3000	500	—
Dec delta speed 1 [FF]	31	0	232 -1	100	—
Dec delta time 1 [s]	32	0	65535	1	—
S dec t const 1 [ms]	668	100	3000	500	—
Acc delta speed 2 [FF]	25	0	232 -1	100	—
Acc delta time 2 [s]	26	0	65535	1	—
S acc t const 2 [ms]	669	100	3000	500	—
Dec delta speed 2 [FF]	33	0	232 -1	100	—
Dec delta time 2 [s]	34	0	65535	1	—
S dec t const 2 [ms]	670	100	3000	500	—
Acc delta speed 3 [FF]	27	0	232 -1	100	—
Acc delta time 3 [s]	28	0	65535	1	—
S acc t const 3 [ms]	671	100	3000	500	—
Dec delta speed 3 [FF]	35	0	232 -1	100	—
Dec delta time 3 [s]	36	0	65535	1	—
S dec t const 3 [ms]	672	100	3000	500	—
Ramp sel 0	403	—	—	Low	*
Ramp sel 1	404	—	—	Low	*

GA6310g

* This function can be assigned to one of the programmable digital inputs.

Enab multi rmp	Enabled The Multi ramp function is enabled Disabled The Multi ramp function is disabled
Multi ramp sel	It is the word representation of the two parameters Ramp sel 0 (bit0) and Ramp sel 1 (bit1) used to change the ramp selection. This allows selection of different ramps via the serial line or Bus.
Acc delta speed 0	With Acc delta time 0 it defines the acceleration ramp 0. The units are specified in the factor function.
Acc delta time 0	With Acc delta speed 0 it defines the acceleration ramp 0. Units are in seconds.
S acc t const 0	Defines the acceleration curve for the S-shape ramp 0. Units are in milliseconds.
Dec delta speed 0	With Dec delta time 0 it defines the deceleration ramp 0. Units are defined by the factor function.
Dec delta time 0	With Acc delta speed 0 it defines the acceleration ramp 0. Units are in seconds.
S dec t const 0	Defines the deceleration curve for S-shape ramp 0. Units are in milliseconds.
Acc delta speed1	With Acc delta time 1 it defines the acceleration ramp 1. The units are specified by the factor function.

Acc delta time 1	With Acc delta speed 1 it defines the acceleration ramp 1. Units are in seconds.
S acc t const 1	Defines the acceleration curve for S-shape ramp 1. Units are in milliseconds.
Dec delta speed1	With Dec delta time 1 it defines the deceleration ramp 1. The units are specified in the factor function.
Dec delta time 1	With Dec delta speed 1 it defines the deceleration ramp 1. Units are in seconds.
S dec t const 1	Defines the deceleration curve for S-shape ramp 1. Units are in milliseconds.
Acc delta speed2	With Acc delta time 2 it defines the acceleration ramp 2. The units are specified in the factor function.
Acc delta time 2	With Acc delta speed 2 it defines the acceleration ramp 2. Units are in seconds.
S acc t const 2	Defines the acceleration curve for S-shape ramp 2. Units are in milliseconds.
Dec delta speed2	With Dec delta time 2 it defines the deceleration ramp 2. The units are specified in the factor function.
Dec delta time 2	With Dec delta speed 2 it defines the deceleration ramp 2. Units are in seconds.
S dec t const 2	Defines the deceleration curve for S-shape ramp 2. Defined in milliseconds.
Acc delta speed3	With Acc delta time 3 it defines the acceleration ramp 3. The units are specified in the factor function.
Acc delta time 3	With Acc delta speed 3 it defines the acceleration ramp 3. Units are in seconds.
S acc t const 3	Defines the acceleration curve for S-shape ramp 3. Units are in milliseconds.
Dec delta speed 3	With Dec delta time 3 it defines the deceleration ramp 3. The units are specified in the factor function.
Dec delta time 3	With Dec delta speed 3 it defines the deceleration ramp 3. Units are in seconds.
S dec t const 3	Defines the deceleration curve for S-shape ramp 3. Units are in milliseconds.
Ramp sel 0	Digital input that selects which ramp to use. See Table 6.15.4.1. Parameter can only be used in conjunction with Ramp sel 1. High "Ramp sel 0" is selected Low "Ramp sel 0" is not selected
Ramp sel 1	Digital input that selects which ramp to use. See Table 6.15.4.1. Parameter can only be used in conjunction with Ramp sel 0. High "Ramp sel 1" is selected Low "Ramp sel 1" is not selected

The table and graph below shows the interaction between the selection and the corresponding reference value.

	Ramp sel 0	Ramp sel 1
Ramp 0	Low	Low
Ramp 1	High	Low
Ramp 2	Low	High
Ramp 3	High	High

GA6315g

Table 6.15.4.1: Ramp selection

The **Multiramp function** must be enabled by the **Enab multi rmp** parameter.

The ramp required is selected via the **Ramp sel 0** and **Ramp sel 1** signals. When the selection is made via the terminal strip, only one digital input may be high, at a time. This configuration enables only one ramp time to be selected.

Another ramp can be selected at any time. If this happens during an acceleration or deceleration phase, the reference value will then follow the new ramp.

The ramp parameters can be defined via the keypad or the serial interface.

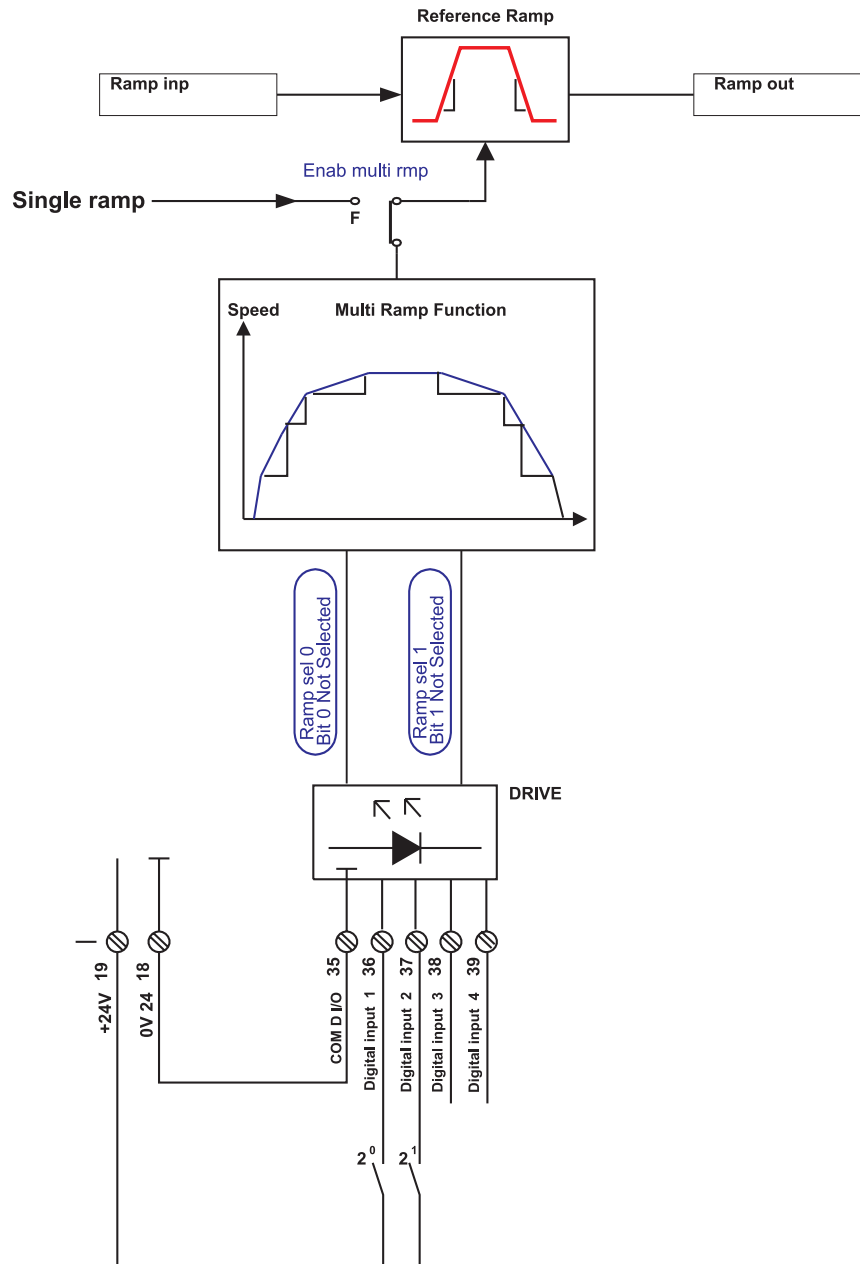


Figure 6.15.4.1: Selection of different ramps via the terminal strip

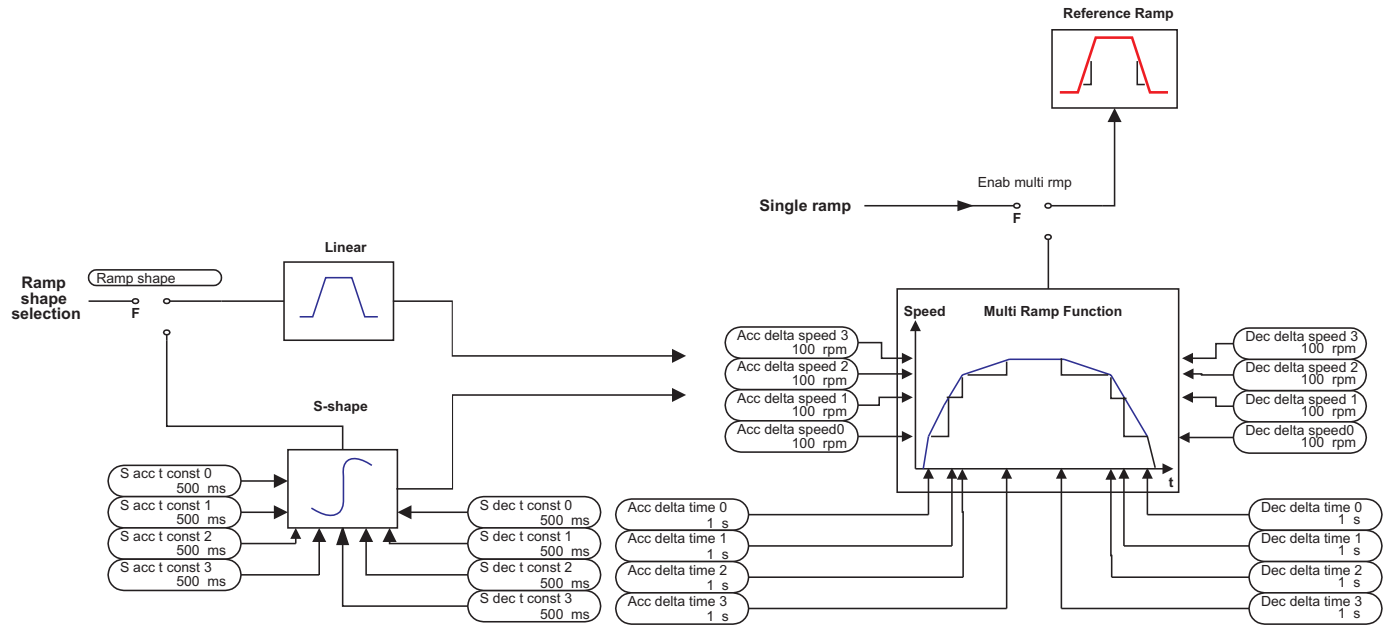


Figure 6.15.4.2: Multi ramp selection via signals

6.15.5. Stop control

Stop control	
	Stop mode
	Spd 0 trip delay
	Jog stop control

ai6155

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Stop mode	626	0	3	1 (Stop = Speed 0)	
OFF Stop & speed Fast stp & spd Fs/stp & spd					
Spd 0 trip delay [ms]	627	0	40000	0	
Jog stop control	630	0	1	OFF (0)	
ON OFF					

ai61551

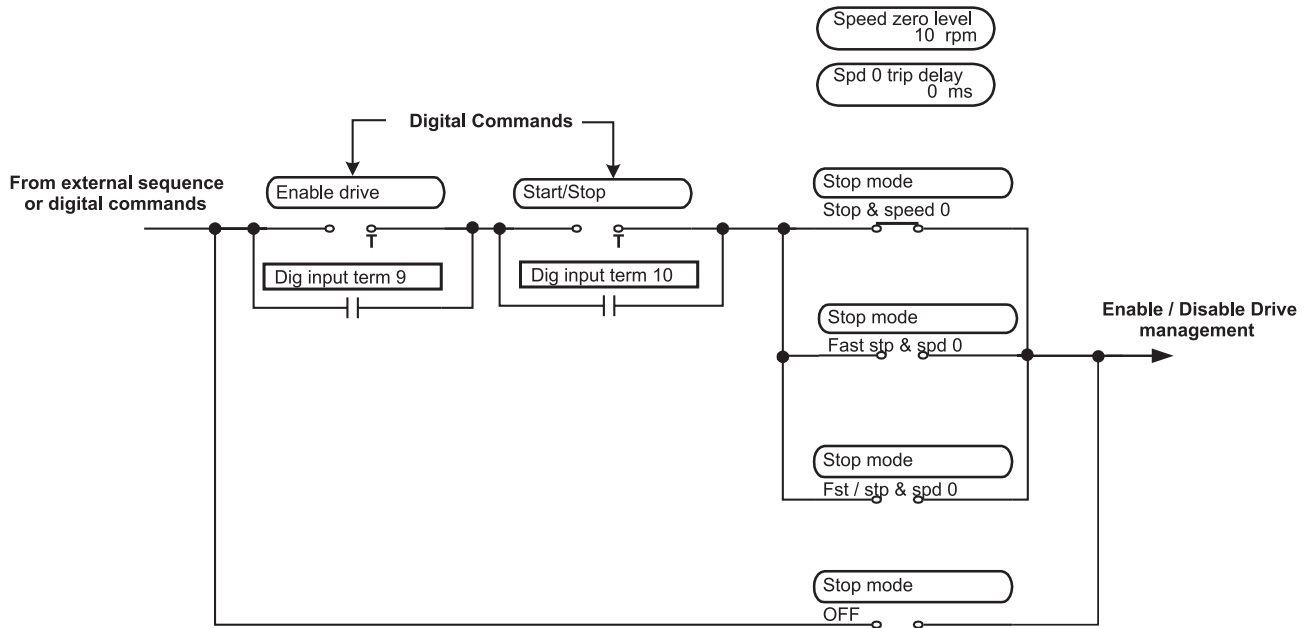


Figure 6.15.5.1 Start / stop management

This function is intended to help the system engineer coordinate the output voltage of the inverter with the reference.

Basically the Stop or Fast Stop command mode (**Stop mode** setting) defines the way the drive will stop and start. In the default mode (Stop & Speed 0, Main commands = Digital), the drive receives the start and run command by pressing the START button on the keypad (terminals 12 and 13 must be high).

When the STOP button is pressed, the motor decelerates to zero speed. When zero speed is reached the drive is completely disabled once the **Spd 0 trip** delay has elapsed.

Different ways to sequence the motor Stop are possible by the **Stop mode** parameter.

Stop mode OFF The function is disabled.

With “Mains Command = Digital” and terminal board points 12 and 13 high the following occurs:

Press START button: “Enable” and “Start” must occur independently and then the drive runs the motor.

Press STOP button: The motor is stopped and the drive remains enabled.

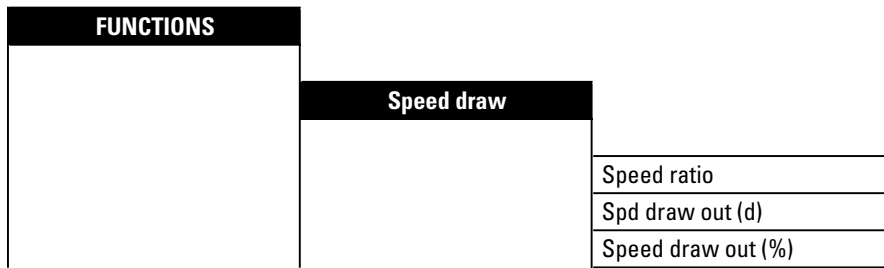
With Terminal commands: (“mains command = terminal”), the enable/disable and start / stop commands are as follow:

Stop&Speed 0 Although the enable command is necessary it does not energize the drive itself. When the Start command is given the drive is “enabled” and put into the “run” mode simultaneously. Once the start command is removed & zero (Speed 0 Level) is reached, the drive is disabled after the time span set **by the Spd 0 trip delay**.

Fast stp&Spd 0. The start sequence is the same as “Stop & Speed 0” (see above). Once the “Fast Stop” command is removed & zero speed (Speed 0 Level) is reached, the drive is disabled after the timespan set by the “Spd 0 trip delay” parameter. If the “start” command is removed and “fast stop” is not removed, the drive will come to a stop but remain enabled.

Fst / stp & Spd 0	The start sequence is the same as “Stop & Speed 0” mode. When either the stop or Fast Stop command is removed and the drive reaches zero speed (Speed 0 level) the drive is disabled after the timespan set by “Spd 0 trip”.
Spd 0 trip delay	Delay time in ms between the reaching zero speed (Speed 0 level) and the disabling of the drive.
Jog stop control	OFF The behavior programmed in Stop mode has no influence on the Jog mode ON The behavior programmed in Stop mode is active also on the Jog function

6.15.6. Speed Draw function



Ga0805g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ratio	1017	0	32767	10000	*
Spd draw out (d)	1018	-32768	32767	-	**
Spd draw out (%)	1019	-200	200	-	

Ga6316

* This parameter can be assigned to a programmable Analog Input

** This parameter can be assigned to a programmable Analog Output

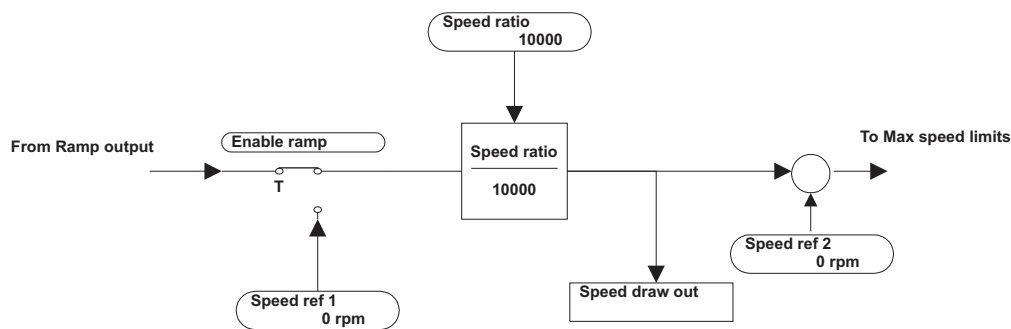


Figure 6.15.6.1 Speed draw block diagram

This function allows an adjustable **Speed ratio** to be applied to the main reference **Speed ref 1**.

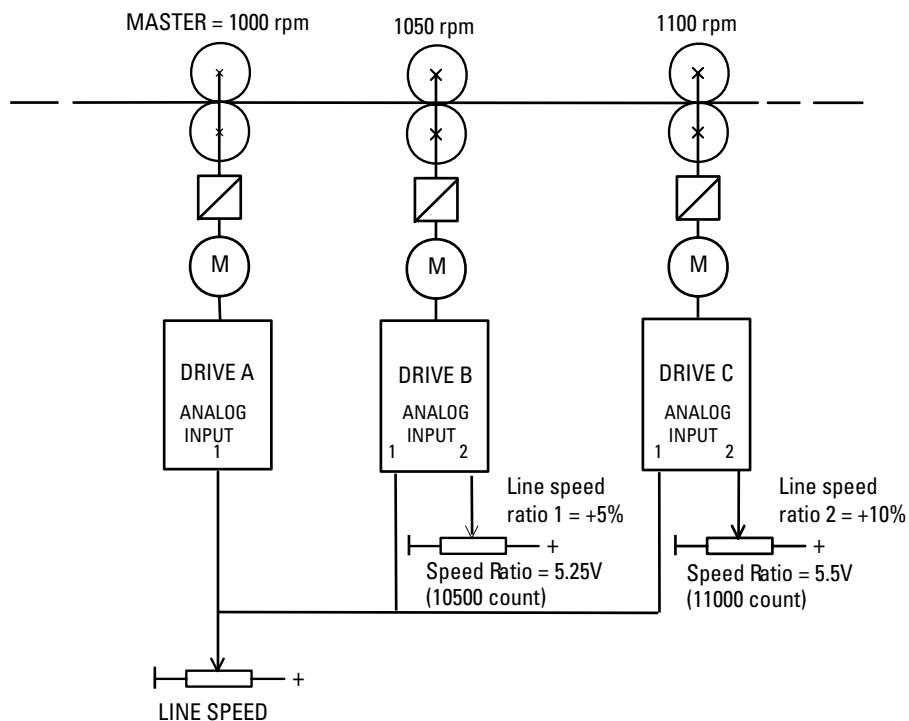
The Speed ratio range can be set between 0 and 32767 if set through a digital format. It can be set from 0 to 20000 (0 to +10V) if assigned via an analog input.

NOTE!

With a 5V analog input (10,000 counts) the draw is zero.

This function is useful in multidrive systems where draw between the motors is required (see example in figure 6.15.6.2). The resulting speed value can be read through the **Spd draw out** parameter via an analog output.

Speed ratio	This parameter determines the speed ratio value. This setting can be done in digital form, via LAN or through an analog input.
Spd draw out (d)	Speed value in the units specified by the factor function.
Spd draw out (%)	Speed value as a percentage of Speed base value .

EXAMPLE (RUBBER CALENDER)**Figure 6.15.6.2 Rubber calender example****Example Setting:**

DRIVE A (master)

Set **Analog input 1** = Ramp ref 1**DRIVE B**

Line speed + 5%

Set **Analog input 1** = Ramp ref 1Set **Analog input 2** = Speed ratioSet **Speed ratio** parameter = 10500**DRIVE C**

Line speed + 10%

Set **Analog input 1** = Ramp ref 1Set **Analog input 2** = Speed ratioSet **Speed ratio** parameter = 11000

6.15.7. Motor setup function

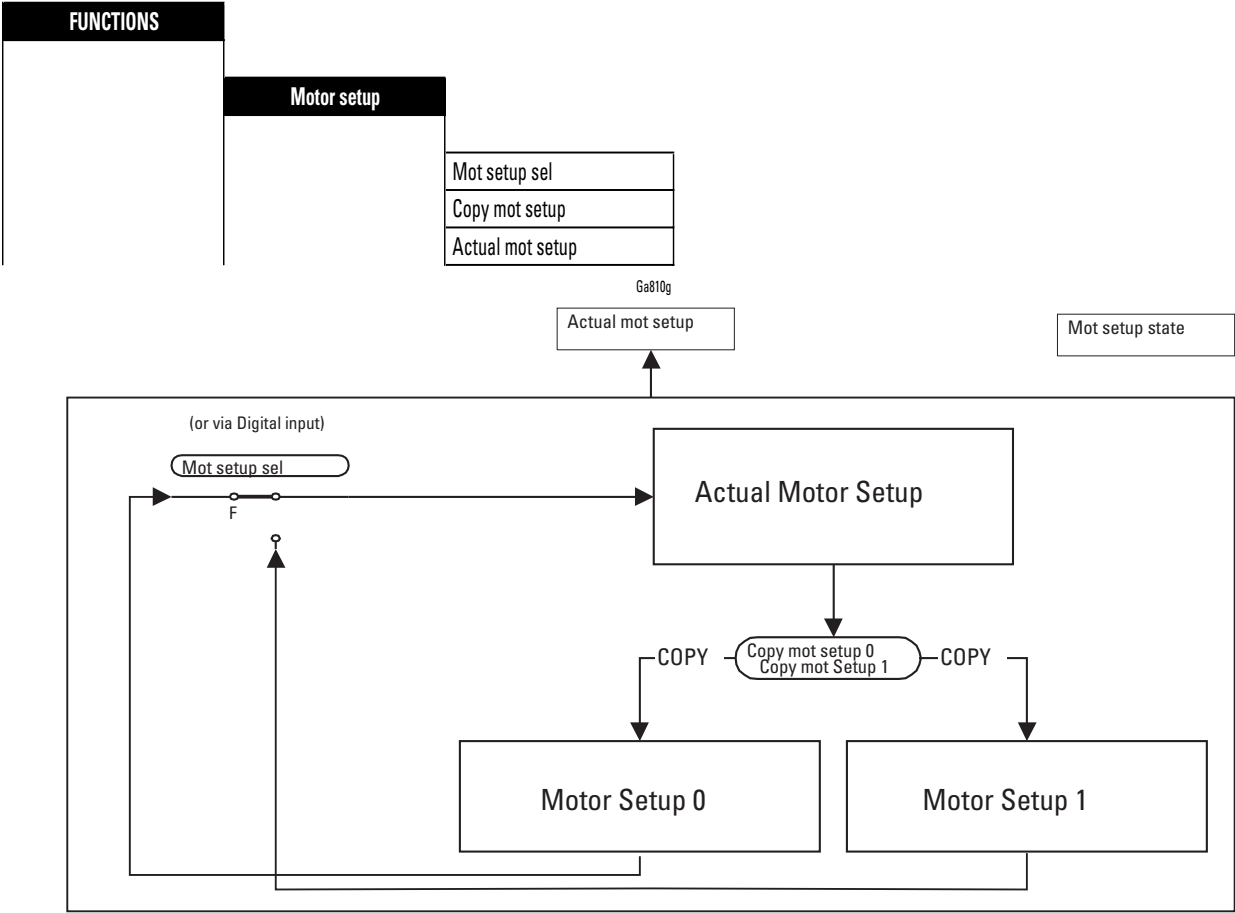


Figure 6.15.7.1: Dual motor setup

This function allows the selection of two different motor parameter sets as listed in table 6.15.7.1. This allows operation of the drive with two different motors.

To utilize this function it is necessary to perform the “parametrization” of both the motors. Groups of parameters for each motor are identified as **Setup 0** and **Setup1** and include motor parameters, type of regulation, speed loop gains etc.

Selection of the parameter group to be used, is performed through the **Mot setup sel** parameter, or through a digital input configured as **Mot setup sel 0**.

The operation can be performed only with the drive disabled (**Enable drive** parameter = Disable) and the procedure described below.

Mot setup sel	It selects the parameter group (Setup 0 or Setup 1).
Mot setup sel 0	(Not shown on the keypad) Selection through a digital input, of the “group of parameters” (Setup 0 or Setup 1) to be used. LOW Selection Setup 0 HIGH Selection Setup 1
Copy mot setup	This parameter defines into which “group of parameters” the first motor data (setup 0) or the second motor data (setup 1) will be stored.

Mot setup state	(Not shown on the keypad)
	It indicates the computing status of the function. This parameter can be assigned to a programmable digital output.
LOW	Data processing completed
HIGH	Data processing in progress
Actual mot setup	It indicates which parameter group is actually in use(Setup 0 or Setup 1)

- The “parameter set” loading and the switching of the two AC motors, can be performed only with the drive disabled (**Enable drive** = Disable).
- The “parameter set” loading needs data computing time of around 200 ms.
The Enable command is not active until the end of this computing time.
- It is also necessary that the Enable command not be applied until a minimum delay of 24 ms from the application of the **Mot Setupsel 0** command.
- The motor can be started after a minimum delay, which is the sum of the time intervals indicated above, plus magnetization time.
- The loading operation of the “parameter set” in **Setup 0** or **Setup 1** does not store them in permanent memory. It is necessary to execute a saving procedure via **Save parameters** (BASIC MENU or SPECIAL FUNCTION menu).
- At the drive initialization, the “parameter set” corresponding to the value of **Mot setup sel**, will be loaded.
If the selection is defined via digital input (**Mot setup sel 0**), the active “parameter set” will be the one selected by the digital input status.

Note!

This function can be performed independently by the regulation mode configuration (V/f – Sensorless vect –Field oriented mode).

Example of the “parameters set” procedure

- a) Enter Motor 1 nameplate data settings:
 - Nominal voltage
 - Nominal speed
 - Nom frequency
 - Nominal current
 - Cos phi
 - Base voltage
 - Base frequency
 - Take motor par
- b) Make the speed feedback selection (**Regulation mode** = Field oriented mode).
- c) Self tuning (Self tune 1, 2a or 2b, 3) with motor 1.
- d) Enter speed regulator settings for motor 1 (if **Self tune 3** not performed).
- e) Disable the drive (**Enable drive** = Disable).
- f) Using the **Copy mot setup** parameter, store the “parameter set” in **Setup 0**.
- g) Repeat steps a), b), c), d), e) for motor 2.

- h) Using the **Copy mot setup** parameter, store the “parameter set” in **Setup 1**.
- i) Permanently store via the **Save parameters** (BASIC MENU) command.

To execute a selection from **Setup 0** to **Setup 1** perform either of the following:

- *Manual sequence:*

- a) Disable the drive (**Enable drive** = Disable)
- b) Set the **Mot setup sel** parameter = **Setup 0** or (**Setup 1**)
- c) Enable the drive (**Enable drive** = Enable)

- *Selection from **Setup 0** to **Setup 1** through the digital input:*

- a) Disable the drive by maintaining the terminal 12 = LOW (0V)
- b) Set digital input **Mot setup sel 0** = HIGH (+24V)
- c) Wait at least 24 ms
- d) Enable the drive by supplying the terminal 12= HIGH (+24V)

Note!

Whatever modification of parameters is made to a “parameters set”, it will be lost at the next parameter selection unless a **Copy mot setup** command is applied. For permanent storage (with drive switched off), it is also necessary to execute **Save parameters** (BASIC MENU) command.

Below is a list of the parameters included in the “setup” of each motor.

Par. number	Parameter	Par. number	Parameter
161	Nominal voltage	645	Comp slope
162	Nominal speed	91	Flux P
163	Nom freq	92	Flux I
164	Nominal current	1022	Voltage P
748	Polepairs	902	Voltage I
371	Cos phi	646	Low speed factor
167	Base voltage	643	Sl's speed filter
168	Base frequency	647	Flux corr factor
165	Magnetiz curr	712	V/f shape
166	Rotor resistance	709	Vlt boost type
436	Stator resist	710	Manual boost
437	Lkg inductance	722	Slip comp type
87	Speed P	723	Manual slip comp
88	Speed I	725	Slip comp filter
89	Current P	727	Motor losses
90	Current I	321	Regulation mode
644	Voltage comp lim	414	Speed fbk sel

para001

Table 6.15.7.1 : Motor setup parameters list

Note:

If after storing the “parameter sets” other parameters are assigned that are not part of the “set”, the compatibility of the new parameters must be verified with each of the two “sets”.

For setup, it is suggested that the following sequence be followed to allow for individual motor setup to be done last:

1. The drive parameters entered .
2. Motor setup1 parameters entered.
3. Motor setup 2 parameters entered.

If **Speed reference** from an encoder input (**Tach follower**) is used with the **Motor setup** function, the following restrictions apply:

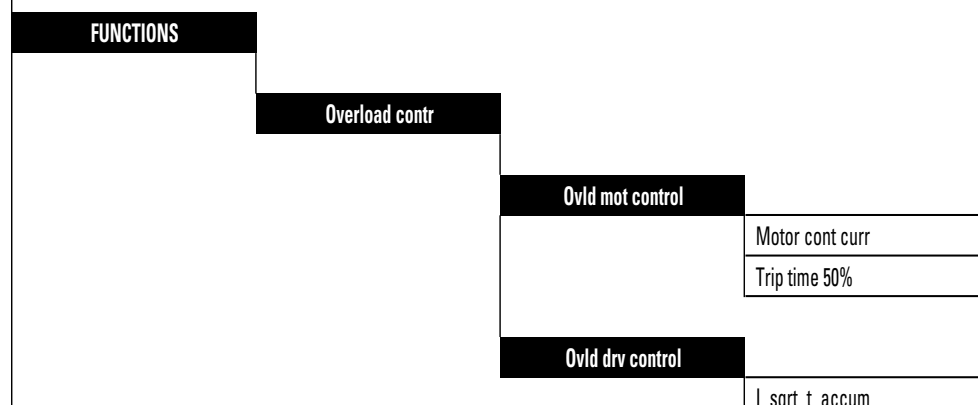
See table below.

Regulation mode	Motor setup		Tach follower	
	Setup 0 Speed fbk sel	Setup 1 Speed fbk sel	Select enc 1	Select enc 2
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

Ga6318

- (1) It requires the switching of the encoder signals. Because of continuity of the shields and low noise immunity, this approach is not suggested.
- (2) Encoder feedback is not used in these cases. The **Spd fbk sel** parameter is logically interlocked with **Select enc 1** and **Select enc 2** parameters and in both the setups it is necessary to assign it to both channels.

6.15.8. Overload control



The Overload control function provides integrator logic to independently protect the drive and the motor against thermal overload.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Motor cont curr [%]	656	50	100	100	
Trip time 50% [s]	657	0	120	60	
Ovld mot state Overload Not Overload	658	0	1		*
I_sqrt_t_accum	655	0	65535	0	
Overld available	406	0	1	-	Digital output 4 *
Overload 200%	1139	0	1	-	*

GA6320ai

* This parameter can be assigned to a programmable digital output.

FUNCTIONS

I²t protection in the drive overload function:

The I²t protection on the drive is calibrated in order to allow IEC 146 class 2 service (see section 2.3.4, “AC Output”).

The integrator performs according to the following formula:

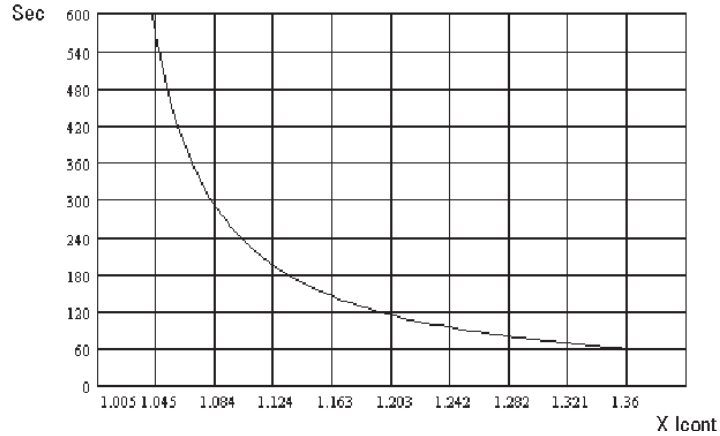
$$I\_sqrt\_t\_accum = (I^2 - I_{CONT}^2) dt$$

Where I_{CONT} = continuous current to be delivered to the drive (considering derating factors, see section 2.3.2. AC Input/Output Connection)

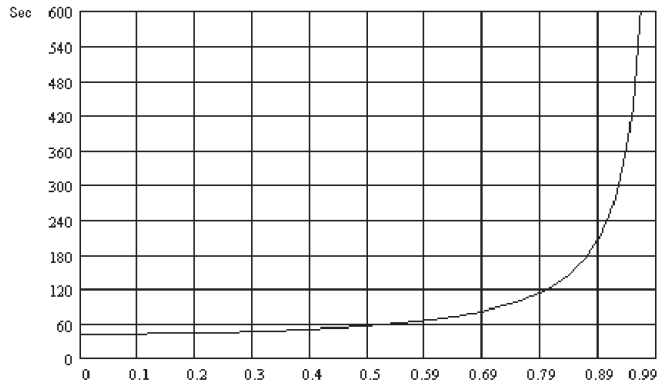
A restriction applies for the frequency range 0...3 Hz (see Note below) The threshold protection of the drive reduces the Torque current limit to the I_{CONT} value when the integrator exceeds the safety threshold. It is possible to set a warning signal to a digital output (**Overld available**). The warning signal is activated 10s before the current limit reduction is activated. Current limit is automatically restored when the elapse time is reset to zero.

I_sqrt_t_accum	Defines of the percent integration of Rms current. 100 % = trip level of the I ² t function (Value in internal units is 4000hex)
Overld available	Indicates whether an overload is possible. High Overload possible Low Overload not possible (current limit reduction is active)
Overload 200%	A short term overload of 200% (I ² t Rated output current as per IEC 146 Class 2) is available for 0.5s every 60s. The 200% overload status can be monitored on a digital output.

Overload time



Pause time



Note!

In the frequency range 0...3 Hz a faster I^2t function operates. It is calibrated to reduce the Torque current limit to I_{CONT} if a $1.36 \times I_{CONT}$ overload is applied for more than 2 seconds.

Current limit is restored either when this faster accumulator is reset to zero, or when the output frequency exceeds 3 Hz.

The activation of this protective function will be reported by a keypad message, registered in the failure register and monitored on a digital output (**Overld available** parameter).

The current limit depend on the value I_{CONT} ($I_{2N} \times$ Derating factor) that it is automatically selected dependent on ambient temperature, switching frequency and input voltage.

The ability of the drive to provide an overload is indicated by the status of the **Overld available** parameter.

Motor thermal protection

This function is an emulation of the protective thermal relay in the motor. This protection follows the characteristic I^2t behavior.

It is necessary to set the following parameters of this function:

Cont motor curr

Value in percent of “Nominal current” (motor rated current). It represents the current that can be delivered to the motor for continuous service.

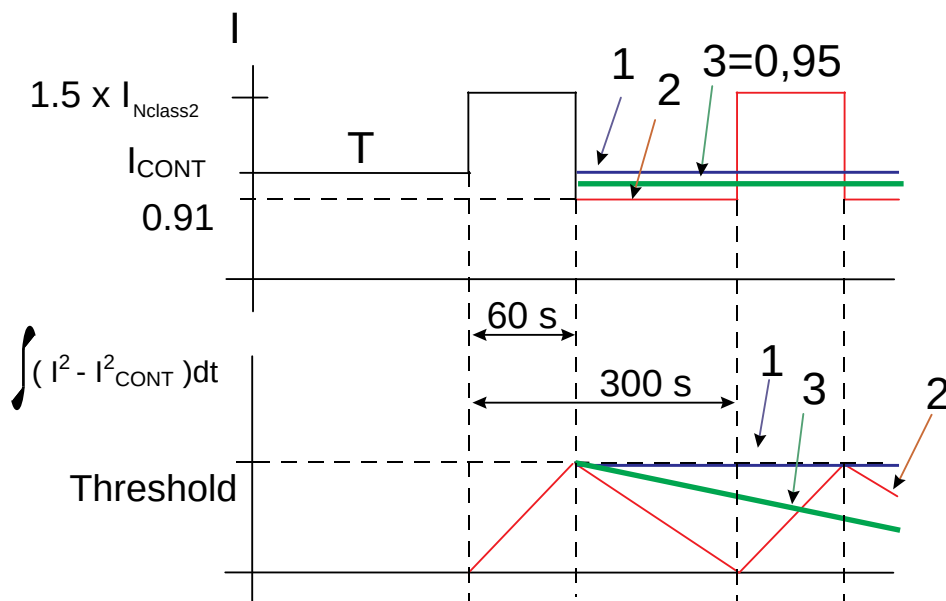
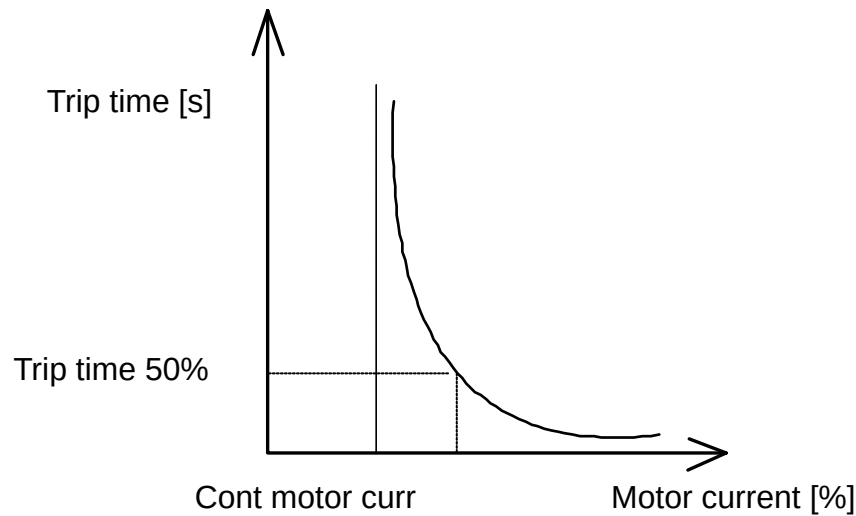
Trip time 50%

Value in seconds. It represents the time in which the protection ("Motor overload") operates if the motor current value is 50% more than "**Cont motor curr**". It is possible to assign this alarm to a programmable digital output (**Ovld mot state**, low = Alarm)

$$\text{Trip time [s]} = \frac{\text{Trip time 50\%} \times 1.25}{(\text{Motor current \%})^2 \div (\text{Cont motor curr \%})^2 - 1}$$

f026

According to the above definition, the tripping time will look as follows: (Percentage are referred to the motor rated current):

Examples

Example 1.

$$\frac{DI}{Dt} = 1 - 1 = 0$$

Example 2.

$$\frac{DI}{Dt} = 1 - (0.91)^2$$

Example 3.

$$\frac{DI}{Dt} = 1 - (0.95)^2$$

6.15.9. Braking unit function

FUNCTIONS					
Brake unit					
Enable BU					
BU ovid time					
BU duty cycle					
BU DC vlt					
ga0803ai					
Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable Bu	736	0	1	Disabled (1)	
Enable (0) Disable (1)					
BU ovid time [s]	740	0.10	50.00	S	
BU duty cycle [%]	741	1	75	S	
BU DC vlt [V]	801	0	2	1	
0 (230V) 1 (400V) 2 (460V)					

GA6321ai

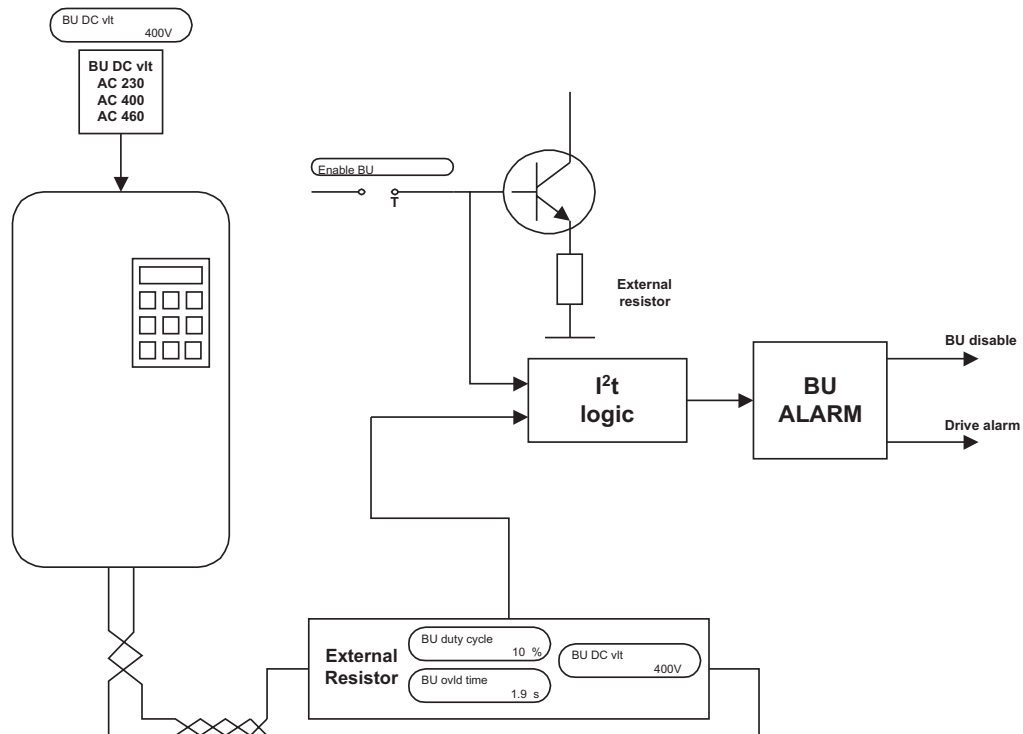


Figure 6.15.9.1: Brake unit function

Enable BU

It enables the internal brake unit as well as the protection for the braking resistor (internal or external). This parameter enables the digital output MCMD for command of external braking units and protection for their resistors.

NOTE !

The command for both internal and external BU depends on drive enable status (terminal 12 and **Enable drive [314]** parameters). For multi drive applications with common DC BUS the drive that controls the BU must always be enabled when the BU operation is required (net power flow is regenerative).

- BU ovlid time

Maximum time that the peak power (P_{PBR}) can be applied to the braking resistor.
Bu ovlid time = E_{BR} / P_{PBR} (see section 4.8.1)
- BU duty cycle

Maximum chopping duty cycle of the resistor, defined as:
BU duty cycle = $(P_{NBR} / P_{PBR}) \times 100$
- BU DC vlt

Value of the line voltage at which “**BU ovlid time**” and “**BU duty cycle**” must be referred.
Once defined, it is necessary to change “BU olvd time”, “BU duty cycle” or “BU DC vlt” if the inverter is connected to a different AC line. The software will automatically adapt these parameters to the new line voltage.
BU duty cycle is also automatically modified according to the istantaneous values of the DC link voltage. The recalculated values are not displayed the keypad or by the Toolbox.

For all sizes the management of the external braking unit and of the I^2t protection is done through MCMD digital output on the power card.

6.15.10. Powerloss stop function

FUNCTION	
	sto enable
	sto t limit
	sto acc
	sto dec
	sto dc re
	time o t
	sto ain
	sto ain
	sto acti e
	acti e limit
	ne t acti e
	ne t actor
	time o t si
	time o t ac
	mains stat s
	ai

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	0	2	0	
PL stop t limit [%]	1082	0	F	100	
PL stop acc [rpm/s]	1080	0	99999999	100	
PL stop dec [rpm/s]	1081	0	99999999	10000	
PL stop vdc ref [V]	1084	800	646	800	
PL time-out [s]	1087	0	65535	10	
PL stop P Gain [%]	1086	0.00	100.00	5.00	
PL stop I Gain [%]	1085	0.00	100.00	0.30	
PL stop active Not active Active	1088	0	1	Not active (0)	
PL active limit [%]	1089	-	-	-	
PL next active Not active Active	1090	0	1	Not active (0)	
PL next factor	1091	0	32767	10000	
PL time-out sig Not active Active	1093	0	1	Not active (0)	
PL time-out ack Not acknowledged Acknowledged	1094	0	1	Not acknowledged (0)	
PL mains status Not ok Ok	1092	0	1	Not ok (0)	

ai61511

NOTE!

The PL stop function is not available on the 230V AC system.

This function allows the controlled stop of a single or multiple drive / motor configuration in case of AC line power loss. The PL stop function is not available for 230VAC line voltage.

The DC link voltage is constantly monitored when the function is enabled.

The function can be enabled as a master (**Pwr loss stop f = Enable as Mst**) or as a slave (**Pwr loss stop f = Enable as Slv**), depending on the application requirements.

In a single drive / motor application the function must always be enabled as a master.

In multiple drive / motor applications, only one of the drives can be enabled as master, normally it is the main drive of the line and all the other drives have to be enabled as slaves.

When the DC link voltage drops under the power loss detection threshold, the power loss stop function is then activated. The power loss detection threshold is internally selected to be higher than the undervoltage level.

The drive then will automatically decel the motor to zero speed with a ramp defined by the parameter **PL stop dec**.

In this mode, the torque of the system is controlled by a dedicated PI regulator and with the limit set in the parameter **PL stop t limit**. The response of the PI regulator can be adjusted through the parameters **PL stop P gain** and **PL stop I gain**.

The DC link voltage is regulated to the value set by the parameter **PL stop vdc ref**. Its default setting is 5% less than the threshold of the braking unit.

In applications where the braking unit is used, the parameter **PL stop vdc ref** can be manually changed to a level higher than the braking threshold.

The function will use the advantages of the braking unit and in this way stop in a specified time. Current limit, defined by the parameter **PL stop t limit**, must be properly set so that the stopping time specifications can be met.

It is possible to monitor the power loss stop function on a digital output, programmed as PL stop active.

If the AC line is restored within the time set by the parameter **PL time out**, the motor, after having reached zero speed, will automatically accelerate to its original speed. The acceleration ramp time will be defined by **PL stop acc**. If the AC line is restored but, the **PL time out** elapses before the motor gets to zero speed, it will be necessary to give the drive a **PL time-out ack command** in order to restart and return to the original speed.

PL time out can be monitored on a digital output set as **PL time-out sig**.

During a power loss, it is possible to restart even before the motor reaches zero speed. The drive must be provided with a signal indicating that the AC line is restored. This signal must be programmed on a digital input as **PL mains status**. For example, such a signal can be provided from an RS-300 or CS-300 line converter. In a multiple drive / motor configuration where a co-ordinated stop is required, the master drive must have an analog output set as **PL next factor**. The **Enable Mst** and **Enable Slv** parameters must be set on the master and slave drives. The **PL next factor** range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via an analog output. This analog output has to be connected to an analog input of each slave drive (**PL stop enable = Enable as Slv**) programmed as **Speed ratio** (see chapter 6.15.6 Speed Draw Function). When the power loss is detected, the speed of the master decreases according to the computed ratio between **Speed ref** and the **Actual speed**. This ratio determines the reference for the slaves. Whether or not the motor is running at the speed controlled by the master can be monitored on a digital output of master drive programmed as **PL next active**. In a multiple motor configuration the performance of this function, can be achieved only with drives connected on a common DC bus.

PL stop enable	Enable as Mst	Setting of the drive as a master. This configuration is for single drive / motor or multiple drive / motor applications.
	Enable as Slv	Setting of the drive as a slave. This configuration is for multiple drive / motor applications.
PL stop acc	Acceleration and deceleration time when power loss stop function is active.	
PL stop dec	Sets the deceleration rate when the “power loss stop” function is active. It must be set so that no torque “bumps” are encountered when the “power loss stop” function is used. However, the ramp must be set fast enough to allow the function to actually operate.	
PL stop vdc ref	Sets the level of the DC link voltage during a power loss stop. If a braking unit is used then the parameter has to be set higher than the value of the braking unit ON threshold. This parameter must not to be set higher than the Overvoltage alarm threshold.	
PL time-out	Time within which an auto restart must be initiated.	
PL stop P gain	Proportional gain of the “power loss stop” function PI regulator.	
PL stop I gain	Integral gain of the “power loss stop” function PI regulator.	
PL stop active	Indication of the “power loss stop” function activity. The parameter can be monitored on a programmable digital output.	
PL active limit	Reading of the drive torque current during the “power loss stop” function activity. This parameter can be monitored on a programmable analog output.	
PL next active	It indicates that the slave motor speed is the same as the master motor speed. The parameter can be monitored on a programmable digital output.	
PL next factor	Ratio between Ramp ref or Speed ref and actual speed. It is the reference for the slave drives, and decreases linearly with the master drive speed. The parameter can be set on a programmable analog output.	
PL time-out sig	It indicates that PL time-out has elapsed. The parameter can be monitored on a programmable digital output.	
PL stop t limit	Setting of the torque current limit in use during the “power loss stop” function activity. The parameter has priority over the T curr lim when the function is active.	

PL time-out ack	The motor restart command after the AC line is restored and after the time set in PL time-out . The command can be provided via keypad, programmable digital input, serial line or Bus.
PL mains status	Indication to the drive that the AC line is restored. This will allow a restart of the motor before it reaches zero speed. The command can be provided via keypad, programmable digital input, serial line or Bus.

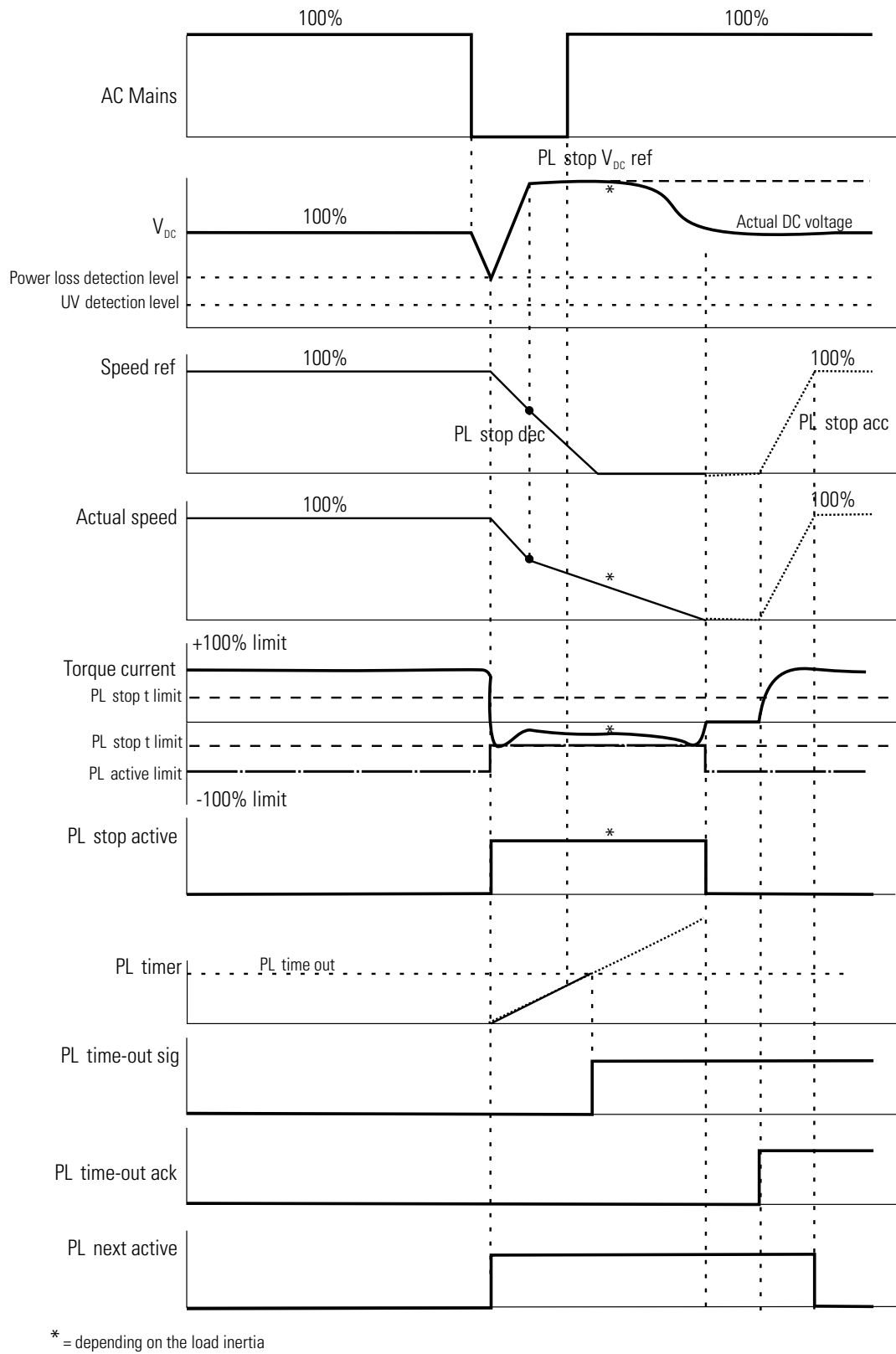


Figure 6.15.10.1: Power loss stop function. Drive stopped after PL time-out

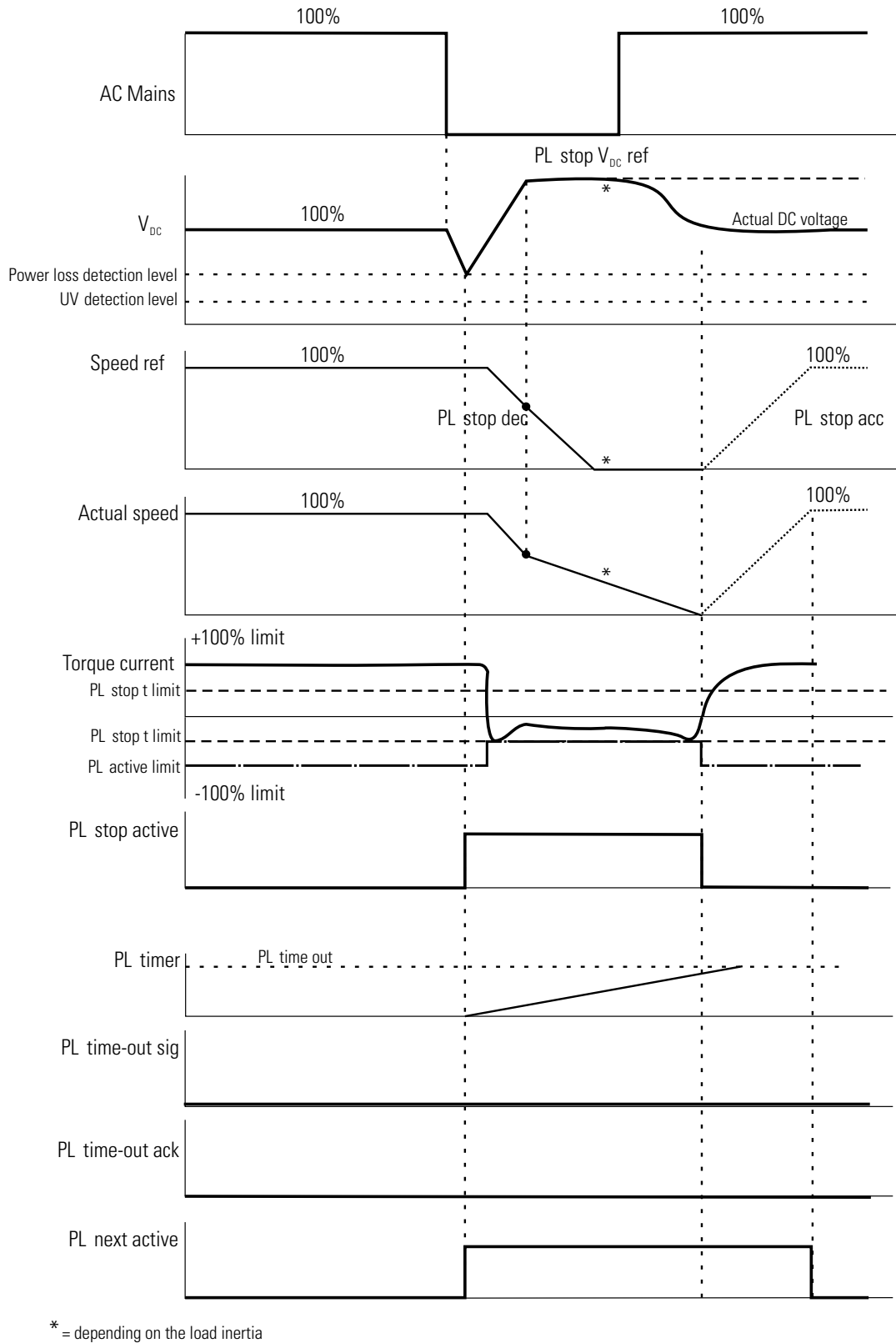


Figure 6.15.10.2: Power loss stop function. AC mains restored and drive stopped before PL time-out

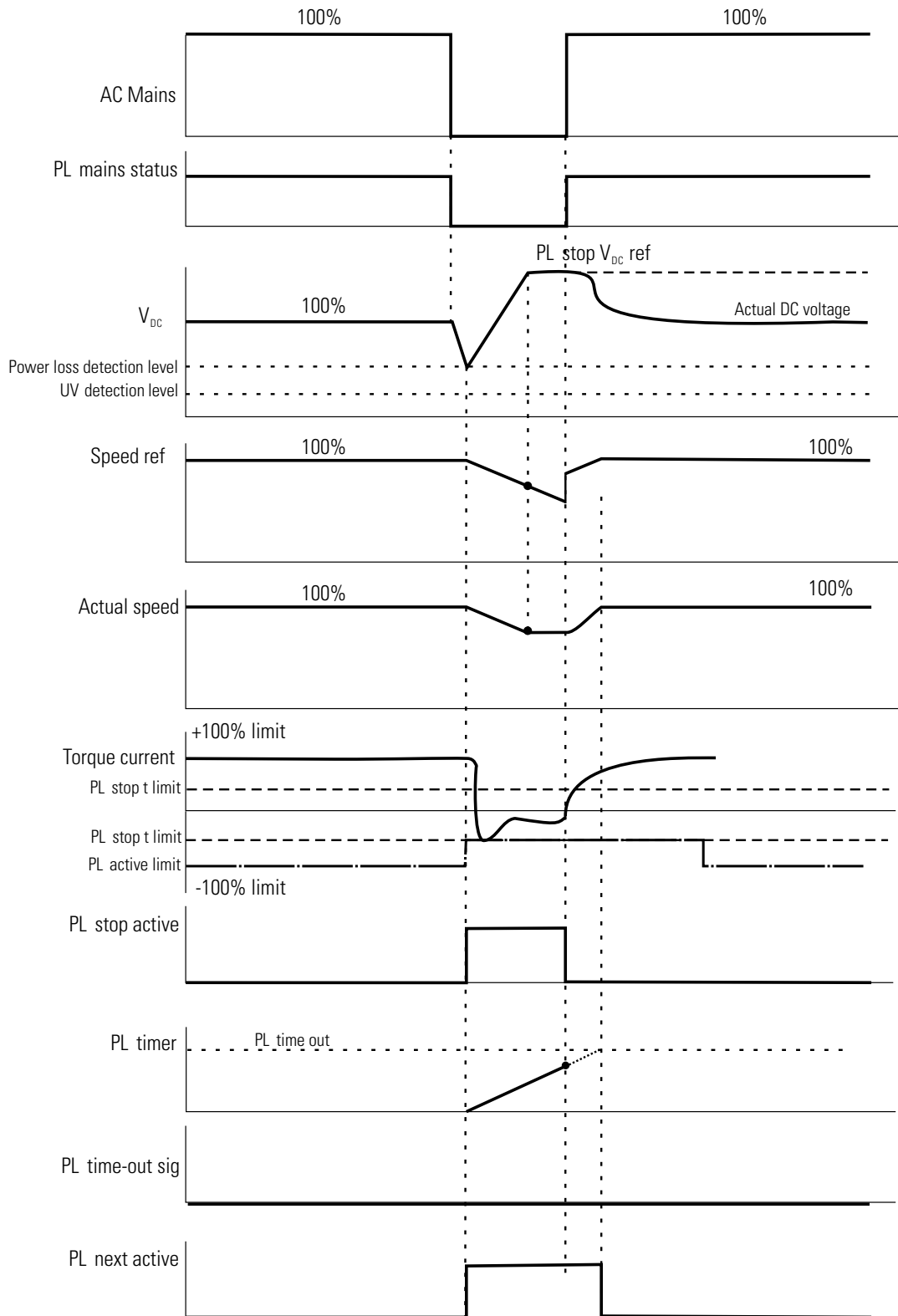


Figure 6.15.10.3: Power loss stop function. Operation with RS-300 / CS300 sources

6.16. Special Functions

6.16.1. Test generator

SPEC FUNCTIONS	
	Test generator
	Gen access
	Gen frequency
	Gen amplitude
	Gen offset

GA0830g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Gen access Not connected F current ref T current ref Flux ref Ramp ref	58	0	4	Not connected (0)	
Gen frequency [Hz]	59	0.1	62.5	1.0	
Gen amplitude [%]	60	0.00	200.00	0.00	
Gen offset [%]	61	-200.00	+200.00	0.00	

GA6325g

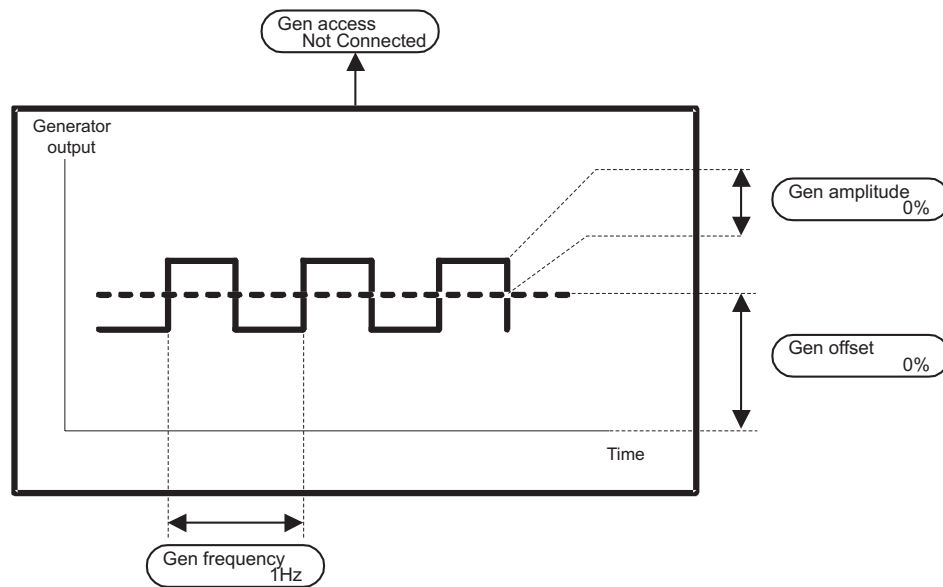


Figure 6.16.1.1: Test generator output

The test generator of the AV-300i Drive is used to manually tune the regulators. It consists of a square wave generator whose frequency, offset and amplitude can be independently set.

Gen access

Different reference parameters can be simulated by the test generator. The parameter then has the value of the generator output.

Not connected	No references being replaced by the generator
F current ref	The generator output defines the reference value of the flux current. 100 % corresponds to the Magnetizing current parameter.
T current ref	The output of the generator defines the reference value of torque current. 100 % corresponds to Flt 100mF current (see section 6.9, “Current Regulation”).
Flux ref	The output of the generator defines the flux reference value. 100 % corresponds to the rated flux based on the motor parameters.
Ramp ref	The output of the generator defines the ramp reference value. 100 % corresponds to the Speed base value .

Gen frequency	Output frequency of the generator in Hz.
Gen amplitude	Amplitude of the square-wave signal produced by the generator in percent.
Generator offset	Offset of the generator.

The generator output consists of the addition of **Gen amplitude** and **Generator offset**. The signal is limited internally to the maximum values.

Current: Limited to the max. permissible current for the drive.

Speed: Limited to the value set with **Speed max amount**.

6.16.2. Temperature compensation of the rotor resistance

SPEC FUNCTIONS	
	Enable rr adap

GA0831g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable rr adap	435	0	1	Disabled	
Enable					
Disable				(0)	

GA6330g

Enable rr adap	Enabled	The temperature compensation is enabled
	Disabled	The temperature compensation is disabled

The motor temperature changes in time because of motor losses.

This condition causes a change in the rotor resistance from cold to warm.

A motor power reduction can be caused by the change of rotor resistance from the value set in the “Motor parameter” menu. This effect is more sensitive for high power, high efficiency motors.

An automatic compensation function for the rotor resistance value is available via the **Enable rr adap** parameter.

On the basis of tests, the time constant and the limit value for the compensation are factory set. If these values are not suitable for your particular case, refer to your customer service center.

For calibration purposes, the compensation value can be set on an analog output by selecting the “Rr adap output” code. See section 5.3, “Start up”.

Failure register	The Failure register contains the last 10 failures that have occurred. It also contains information about the time of the failure based on the operating hours (Life time). This information can be accessed by pressing the Shift/Alarm keys on the keypad when a failure is indicated. If several failures occur in sequence, all the failures are stored in the failure register until a failure occurs that causes a latched fault of the drive (Latch = ON, see Programmable alarms). The content of the failure register can also be read out via the bus or the serial interface.
Failure reset	Reset of a failure. The failure reset can be initiated by pressing the Shift/Escape keys when the failure is shown in the display of the keypad. If, however, several failures occur in sequence, these can only be reset by selecting the Failure reset command through the ENT key on the keypad.
Failure reg del	Clears all faults in the failure register.

6.16.5. Signal adaptation (Links function)

The Link1 and Link 2 functions are two control sections operating independently from each other used for signal manipulation. With the Links, parameters can be:

- rectified
- limited
- multiplied by a factor
- divided by a factor
- provided with an offset.

SPEC FUNCTIONS	Links	Link 1	
			Source
			Destination
			Mul gain
			Div gain
			Input max
			Input min
			Input offset
			Output offset
			Input absolute
		Link 2	
			Source
			Destination
			Mul gain
			Div gain
			Input max
			Input min
			Input offset
			Output offset
			Input absolute

GA0860g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Source link 1	484	0	65535	0	—
Destination link 1	485	0	65535	0	—
Mul gain link 1	486	-10000	+10000	1	—
Div gain link 1	487	-10000	+10000	1	—
Input max link 1	488	-2^{31}	$+2^{31} - 1$	0	—
Input min link 1	489	-2^{31}	$+2^{31} - 1$	0	—
Input offset link 1	490	-2^{31}	$+2^{31} - 1$	0	—
Output offset link 1	491	-2^{31}	$+2^{31} - 1$	0	—
Inp absolute link 1 (ON/OFF)	492	0	1	OFF	—
Source link 2	553	0	65535	0	—
Destination link 2	554	0	65535	0	—
Mul gain link 2	555	-10000	+10000	1	—
Div gain link 2	556	-10000	+10000	1	—
Input max link 2	557	-2^{31}	$+2^{31} - 1$	0	—
Input min link 2	558	-2^{31}	$+2^{31} - 1$	0	—
Input offset link 2	559	-2^{31}	$+2^{31} - 1$	0	—
Output offset link 2	560	-2^{31}	$+2^{31} - 1$	0	—
Inp absolute link 2 (ON/OFF)	561	0	1	OFF	—

GA6345g

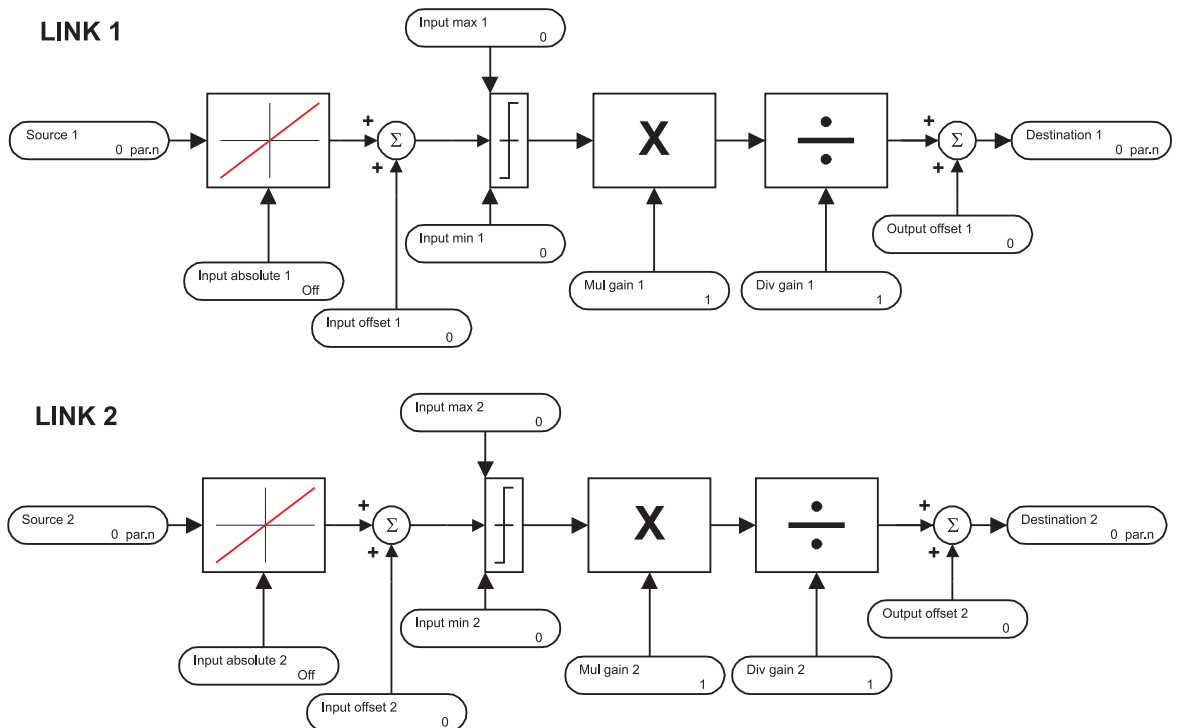


Figure 6.16.5.1: Structure of the signal adaptation

Source

Parameter number used as the input quantity. For example “8263” for **Ramp ref 1**, which is the sum of the parameter number (44) plus an offset (8192) which must always be used. Select the parameter number from the individual descriptions or the list of all parameters in section 10, “Parameter list”.

Destination	Parameter number, which determines the output location. Select the parameter number in the individual description column or in the list of all parameters in section 10, "Parameter lists". Again the offset number (8192) must be added to the destination parameter number.
Mul gain	Multiplication factor on the input quantity. Resolution: 5 digits.
Div gain	Division factor on the input quantity. Resolution: 5 digits.
Input max	Max. limit on the input number. Resolution: 5 digits.
Input min	Min. limit on the input number. Resolution: 5 digits.
Input offset	Offset to be added to the input number. Resolution: 5 digits.
Output offset	Offset to be added to the output number. Resolution: 5 digits.
Inp absolute	The input number can be absolved with this parameter.
	OFF The input quantity is processed with its sign.
	ON The input quantity is processed with a positive sign (absolute value). It is possible to obtain a polarity change with the signs of Mul gain or Div gain .

Note!

The links are executed with an approximate cycle time of 20 ms. They are not normally intended to be used for regulation but to access or connect to parameters otherwise not accessible. The use of Links involves CPU overhead that can slow down the keypad/display operation.

Note!

The following parameters cannot be used as a destination of a Link:

- All parameters with only "R" access code
- All parameters with "Z" access code
- All parameters with "C" access code
- All the following:

19 S shape t const	553 Link2 Source	726 Motor losses %
55 Control-Word	554 Link2 Destination	776 PI central v1
72 Scale input 1	636 Bus loss - Hold off time	777 PI central v2
73 Tune value inp 1	637 Bus loss - Restart time	778 PI central v3
77 Scale input 2	644 Voltage comp lim	784 PI bottom lim
78 Tune value inp 2	645 Comp slope	785 PI bottom lim85
85 Pword1	647 Flux corr factor	786 PID source
83 Tune value inp 3	649 Refresh enc 1	792 Input 1 filter [mS]
86 Pword2	652 Refresh enc 2	889 Dynamic vlt margin
165 Magnetizing curr	656 Motor cont curr	891 Lock zero pos
166 Rotor resistance	657 Trip time 50%	892 Zero pos gain
167 Base voltage	663 S acc t const	893 Spd src time
168 Base frequency	664 S dec t const	1012 Inertia c filter
176 P1 flux model	665 S acc t const 0	1013 Torque const
359 Undervoltage - Restart time	665 S dec t const 0	1014 Inertia
360 Undervoltage - N of attempts	666 S acc t const 1	1015 Friction
408 Ser answer del	668 S dec t const 1	1042 Input 1 compare
425 Enable OPT2	669 S acc t const 2	1043 Input 1 cp error
436 Stator resist	670 S dec t const 2	1044 Input 1 cp delay
437 Lkg inductance	672 S dec t const 3	1095 up to 1100 PDC in xx
444 Prop. filter	692 P2 flux model	1101 up to 1106 PDC out xx
467 Flux level	710 Manual boost	1107 up to 1122 Virt dig in xx
484 Link1 Source	717 DC braking curr	1123 up to 1138 Virt dig out xx
485 Link1 Destination	725 Slip comp filt	

code 001

6.16.6. Pads

The pads are used for the data exchange among the several components of a Bus system. They can be compared to the variables of a PLC. The figure 6.16.6.1 shows the overall structure of the system. With the help of pads it is possible for example to send information from a field Bus to an option card. All the pads can be written to and read. See the several access possibilities in section 10, "Parameter lists".

SPEC FUNCTIONS	
	Pad parameters
	Pad 0
	Pad 1
	Pad 2
	Pad 3
	Pad 4
	Pad 5
	Pad 6
	Pad 7
	Pad 8
	Pad 9
	Pad 10
	Pad 11
	Pad 12
	Pad 13
	Pad 14
	Pad 15
	Bitword pad A
	Bitword pad B

ga0870g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pad 0	503	-32768	+32767	0	* **
Pad 1	504	-32768	+32767	0	* **
Pad 2	505	-32768	+32767	0	*
Pad 3	506	-32768	+32767	0	*
Pad 4	507	-32768	+32767	0	**
Pad 5	508	-32768	+32767	0	**
Pad 6	509	-32768	+32767	0	**
Pad 7	510	-32768	+32767	0	-
Pad 8	511	-32768	+32767	0	-
Pad 9	512	-32768	+32767	0	-
Pad 10	513	-32768	+32767	0	-
Pad 11	514	-32768	+32767	0	-
Pad 12	515	-32768	+32767	0	-
Pad 13	516	-32768	+32767	0	-
Pad 14	517	-32768	+32767	0	-
Pad 15	518	-32768	+32767	0	-

GA6350a

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Bitword pad A	519	0	65535	0	*** ****
Pad A bit 0	520	0	1	0	*** ****
Pad A bit 1	521	0	1	0	*** ****
Pad A bit 2	522	0	1	0	*** ****
Pad A bit 3	523	0	1	0	*** ****
Pad A bit 4	524	0	1	0	*** ****
Pad A bit 5	525	0	1	0	*** ****
Pad A bit 6	526	0	1	0	*** ****
Pad A bit 7	527	0	1	0	*** ****
Pad A bit 8	528	0	1	0	****
Pad A bit 9	529	0	1	0	****
Pad A bit 10	530	0	1	0	****
Pad A bit 11	531	0	1	0	****
Pad A bit 12	532	0	1	0	****
Pad A bit 13	533	0	1	0	****
Pad A bit 14	534	0	1	0	****
Pad A bit 15	535	0	1	0	****
Bitword pad B	536	0	65535	0	****
Pad B bit 0	537	0	1	0	****
Pad B bit 1	538	0	1	0	****
Pad B bit 2	539	0	1	0	****
Pad B bit 3	540	0	1	0	****
Pad B bit 4	541	0	1	0	****
Pad B bit 5	542	0	1	0	****
Pad B bit 6	543	0	1	0	****
Pad B bit 7	544	0	1	0	****
Pad B bit 8	545	0	1	0	****
Pad B bit 9	546	0	1	0	****
Pad B bit 10	547	0	1	0	****
Pad B bit 11	548	0	1	0	****
Pad B bit 12	549	0	1	0	****
Pad B bit 13	550	0	1	0	****
Pad B bit 14	551	0	1	0	****
Pad B bit 15	552	0	1	0	****

GA6350b

* These parameters can be set on a programmable analog input.

** These parameters can be set on a programmable analog output.

*** These parameters can be set on a programmable digital input.

**** These parameters can be set on a programmable digital output.

Pad 0...15 General variables, 16 Bit. The Pads 0...3 can be set via analog inputs. The values of the Pads 0, 1, 4, 5 and 6 can be set on analog outputs.

Bitword pad A (B) Bitmap of the parameters Pad A (B) bit 0 up to Pad A (B) bit 15. With a parameter it is possible to read or write all the Bits inside a Word.

Example:

Pad A bit 0	0		
Pad A bit 1	1	= 2 ¹	=2
Pad A bit 2	0		
Pad A bit 3	0		
Pad A bit 4	0		
Pad A bit 5	1	= 2 ⁵	= 32
Pad A bit 6	1	= 2 ⁶	= 64
Pad A bit 7	0		
Pad A bit 8	0		
Pad A bit 9	0		
Pad A bit 10	1	= 2 ¹⁰	= 1024
Pad A bit 11	0		
Pad A bit 12	1	= 2 ¹²	= 4096
Pad A bit 13	0		
Pad A bit 14	0		
Pad A bit 15	0		

Bitword pad A = 2 + 32 + 64 + 1024 + 4096 = 5218

Pad A (B) bit 0...15 Bit variables. The single Bits can be read or written. With the **Bitword pad A (B)** it is possible to process a Word. See the example. From the Pad A it is possible to read the Bits 0.....7 of a digital input. On a digital output it is possible to write all the Bits.

Note!

When setting the PADs bit to digital I/O, the following rules apply:

1- Assigning PAD A or B bit to Digital Output will cause the state of the digital output (N) to be controlled by PAD A or B bit (N-1). N is the number of the digital outputs being used.

2- Relay 2 (terminals 83,85) can be driven by means of PAD A or B bit 14.

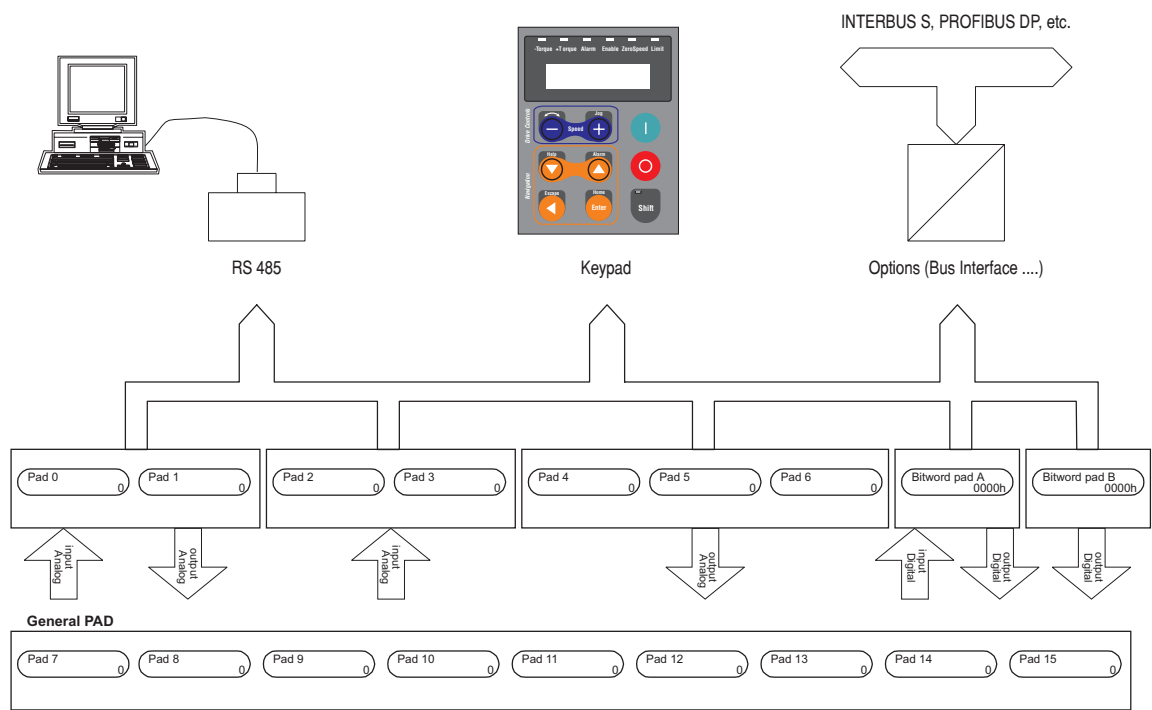


Figure 6.16.6.1: Bus pads

6.16.7. DC braking

SPEC FUNCTIONS		DC braking	
		DC braking mode	
		Brk time @ stop	
		DC braking curr	
		DC braking delay	

GA0871g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
DC Braking mode	904	0	1	0	
Brk time @ stop [ms]	905	0	30000	1000	
DC braking curr [%]	717	0	100	50	
DC braking delay [ms]	716	0	65535	500	

GA6355g

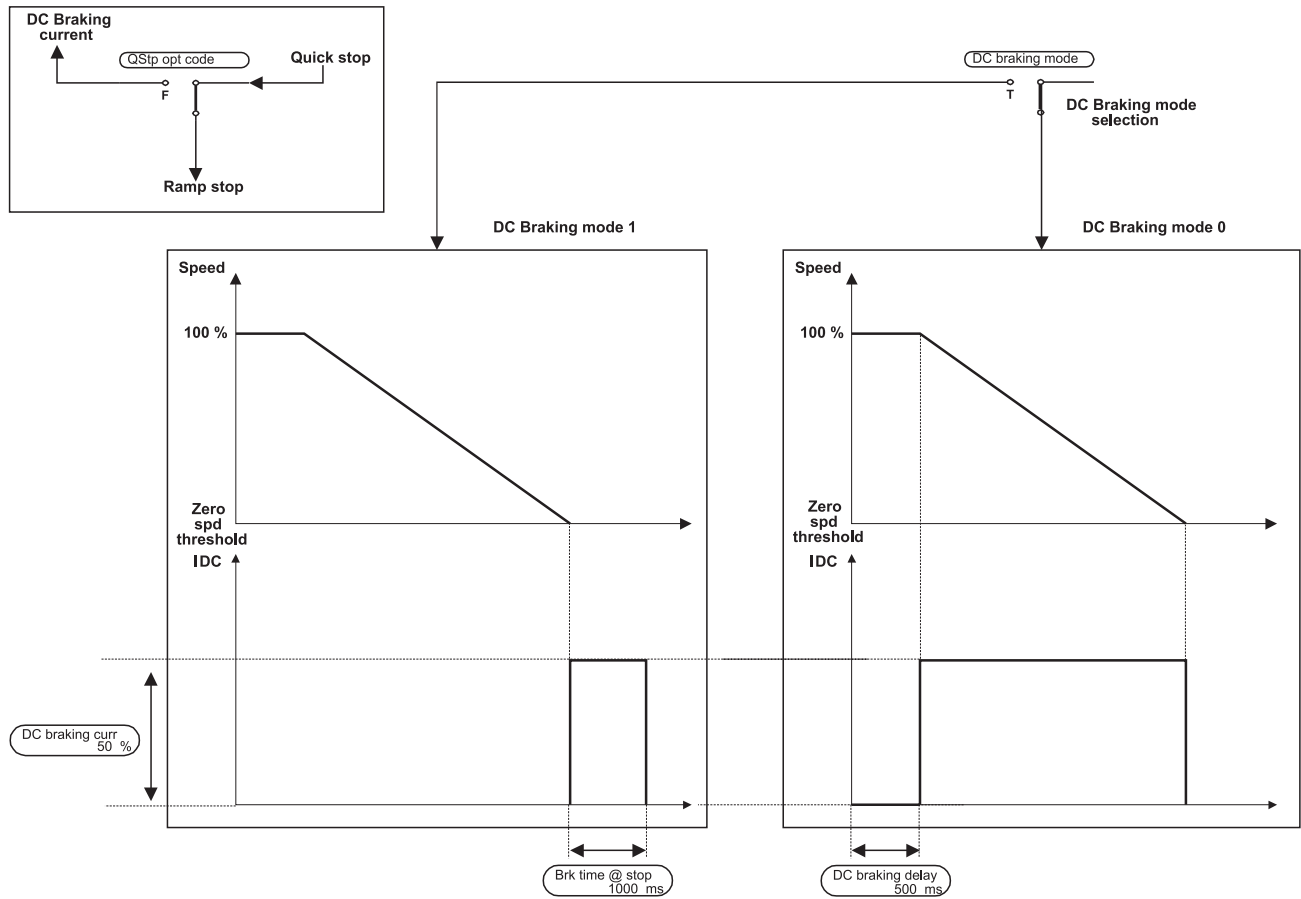


Figure 6.16.7.1: DC Braking function

The drive offers the capability of D.C. braking as a standard function. With this operation, the Inverter injects D.C. current into the motor, thereby generating braking torque. The level of braking current (=braking torque) can be set between 0 and 100% of the **Full load curr**.

The kinetic energy of the machine is dissipated as heat in the motor.

To enable this function it is necessary select the parameter **Qstp Option code** = DC braking curr (in the Configuration menu).

DC braking is then turned “ON” or “OFF” by the “Quick Stop” command, which can be programmed to a digital input. Once turned on the DC brake modes are as follows:

DC braking mode = 0

DC Braking function is activated and brakes the drive in the shortest possible time using the “**Quick stop**” command. The level of the current is set by the “DC Braking Curr” parameter.

DC braking mode = 1

When the “**Stop**” command is activated the motor decelerates with the ramp time selected.

When the threshold of zero speed (**speed zero level**) detection is reached, D.C. braking is activated and the motor is braked to a standstill. The level of the current is determined by **DC braking curr** parameter and the braking time is determined by **Brk time @ stop** parameter.

Brk time @ stop	Braking time of DC braking (msec).
DC braking curr	Level of current for DC operation. It is specified as a percentage of Full load curr.
DC braking delay	Delay from the assertion of the command to the actuation of the DC braking. This delay allow the motor to demagnetize, thus avoiding Overcurrent trip due to electro motive force (e.m.f.) In the motor.

Note:

The Enable command is required during braking. If this command is not present or is removed during the braking process, the drive coasts to a halt without braking. Once braking has been initiated, the drive ignores a Start or Jog command.

6.17 Options

6.17.1 Option 1

OPTIONS	
	Option1
	Menu
	PDC config
	PDC inputs
	PDC in 0
	PDC in 1
	PDC in 2
	PDC in 3
	PDC in 4
	PDC in 5
	PDC outputs
	PDC out 0
	PDC out 1
	PDC out 2
	PDC out 3
	PDC out 4
	PDC out 5
	Virt dig in
	Virt dig in 0
	Virt dig in 1
	Virt dig in 2
	Virt dig in 3
	Virt dig in 4
	Virt dig in 5
	Virt dig in 6
	Virt dig in 7
	Virt dig in 8
	Virt dig in 9
	Virt dig in 10
	Virt dig in 11
	Virt dig in 12
	Virt dig in 13
	Virt dig in 14
	Virt dig in 15
	Virt dig out
	Virt dig out 0
	Virt dig out 1
	Virt dig out 2
	Virt dig out 3
	Virt dig out 4
	Virt dig out 5
	Virt dig out 6
	Virt dig out 7
	Virt dig out 8
	Virt dig out 9
	Virt dig out 10
	Virt dig out 11
	Virt dig out 12
	Virt dig out 13
	Virt dig out 14
	Virt dig out 15

ai61710

Through this Menu, the setting of Drive parameters to the virtual digital I/O (menu MONITOR/Virtual digital Inp-Out) and the data channels (PDC) of the field Bus can be carried out.

If an OPT1 (LAN Communication) board is not present you will be prompted by the message **OPT1 not present**.

If the used OPT1 card does not support the configuration from this menu you will be prompted by the message **OPT1 old version**. For further and detailed information see the instruction book of the optional board.

6.17.1.1 Process Data Channel

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pdc in 0	1095	0	65535	0	
Pdc in 1	1096	0	65535	0	
Pdc in 2	1097	0	65535	0	
Pdc in 3	1098	0	65535	0	
Pdc in 4	1099	0	65535	0	
Pdc in 5	1100	0	65535	0	
Pdc out 0	1101	0	65535	0	
Pdc out 1	1102	0	65535	0	
Pdc out 2	1103	0	65535	0	
Pdc out 3	1104	0	65535	0	
Pdc out 4	1105	0	65535	0	
Pdc out 5	1106	0	65535	0	
Virt dig in 0	1107	0	65535	0	
Virt dig in 1	1108	0	65535	0	
Virt dig in 2	1109	0	65535	0	
Virt dig in 3	1110	0	65535	0	
Virt dig in 4	1111	0	65535	0	
Virt dig in 5	1112	0	65535	0	
Virt dig in 6	1113	0	65535	0	
Virt dig in 7	1114	0	65535	0	
Virt dig in 8	1115	0	65535	0	
Virt dig in 9	1116	0	65535	0	
Virt dig in 10	1117	0	65535	0	
Virt dig in 11	1118	0	65535	0	
Virt dig in 12	1119	0	65535	0	
Virt dig in 13	1120	0	65535	0	
Virt dig in 14	1121	0	65535	0	
Virt dig in 15	1122	0	65535	0	
Virt dig out 0	1123	0	65535	0	
Virt dig out 1	1124	0	65535	0	
Virt dig out 2	1125	0	65535	0	
Virt dig out 3	1126	0	65535	0	
Virt dig out 4	1127	0	65535	0	
Virt dig out 5	1128	0	65535	0	
Virt dig out 6	1129	0	65535	0	
Virt dig out 7	1130	0	65535	0	
Virt dig out 8	1131	0	65535	0	
Virt dig out 9	1132	0	65535	0	
Virt dig out 10	1133	0	65535	0	
Virt dig out 11	1134	0	65535	0	
Virt dig out 12	1135	0	65535	0	
Virt dig out 13	1136	0	65535	0	
Virt dig out 14	1137	0	65535	0	
Virt dig out 15	1138	0	65535	0	

ai61711

Through the parameters of this menu, it is possible to manage the process data channel coming from a field bus interface card. The exchange of high priority parameters (see list at chapter 10.4) with the bus interface, can be performed by programming the **Pdc input** and **Pdc output**. The exchange of the high priority parameters is executed in automatic synchronous communication with the speed regulator.

For this purpose the regulation card of the drive provides 6 dedicated words, while the number of the words used by the bus interface cards is dependant on the type of bus connected (for further information see the instruction manual of the relative interface cards).

Pdc input refers to the data transfer from master to slave (Input to the drive). **Pdc output** refers to the data transfer from slave to master (Output from the drive)

To assign a drive parameter to a Pdc I/O it necessary to add an offset equal to decimal number 8192 to the number of the parameter itself.

E.g.: Reading **Actual speed** from **Pdc out 2** [1103]

Actual speed [122]

$\text{Pdc out 2} = 122 + 8192 = 8314$

Writing **Ramp ref 1** to **Pdc in 1** [1096]

Ramp ref 1 [44]

$\text{Pdc in 1} = 44 + 8192 = 8236$

A virtual terminal is available as a 16 bit format for input and output. The bit terminal functionality is programmable by assigning drive parameter number to the **Virt dig in** and **Virt dig out** parameters.

Virt dig in refers to the data transfer from master to slave (Input to the drive)

Virt dig out refers to the data transfer from slave to master (Output from the drive)

To assign a parameter to a Virtual I/O, it is necessary to add an offset equal to 8192 to the number of the parameter itself.

E.g.: To set **Enable/Disable** on **Virt dig in 1** [1108]

Enable/Disable [314]

$\text{Virt dig in 1} = 314 + 8192 = 8506$

To set **Drive ready** status on **Virt dig out 2** [1125]

Drive ready [380]

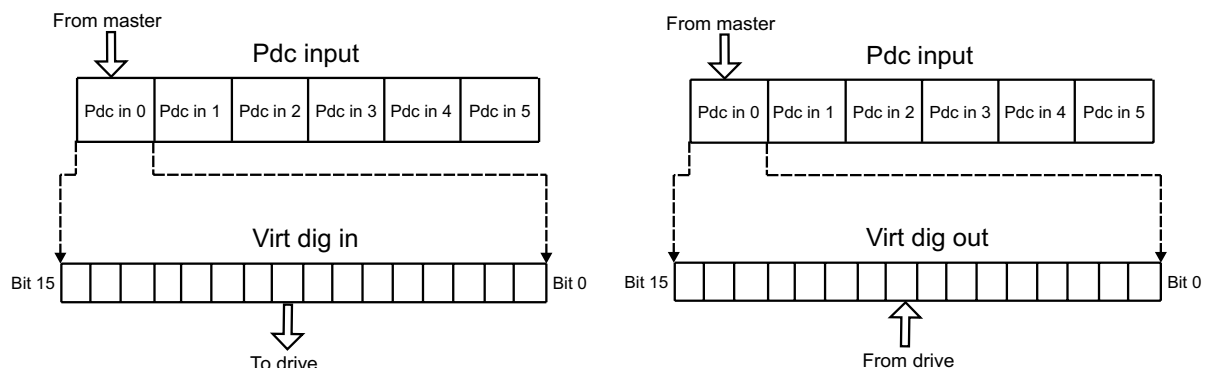
$\text{Virt dig out 2} = 380 + 8192 = 8572$

To connect the **Pdc Input** to the **Virt dig in**, the parameter index 582 is used.

This index must be assigned to the configuration parameter of the selected **Pdc input** word.

Eg: **Virt dig in** has to be assigned to the **Pdc in** word no. 0.

This can be performed by assigning parameter number [582+8192] to the configuration parameter 1095 of the **Pdc input**.



To connect the **Pdc Output** to the **Virt dig out**, the parameter index 583 is used.

This index must be assigned to the configuration parameter of the selected **Pdc output** word.

Eg: **Virt dig out** has to be assigned to the **Pdc out** word no.1.

This can be performed by assigning parameter number (583+8192) to the configuration parameter 1102 of the **Pdc output**.

The following table shows the different error codes that may occur during the execution of an operation.

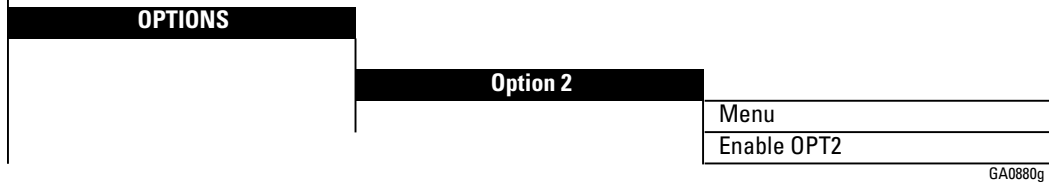
RESULT	VALUE	RESULT	VALUE
OK no error	0000H	Reserved	0017H
Parameter not exist	0001H	Unknown Command	0018H
Reserved	0002H	Read only Parameter	0019H
Control Access denied	0003H	Write not allowed	001AH
Reserved	0004H	Value out of constant limits	001BH
Attribute Access denied	0005H	State not correct	001CH
Type value error	0006H	Password	001DH
Reserved	0007H-000FH	Type Unknown	001EH
Destination option not exist	0010H	Hardware Fail	0030H
Parameter Access Conflict	0011H	Checksum Fail	0031H
Value out of the maximun range	0012H	Reserved	001FH-007CH
Value out of the minimun range	0013H	Reserved	0082H-00FCH
Value not supported	0014H	NOK generic	00FFH
Parameter Configuration Conflict	0015H	User defined	0100H-FFFFH
Command Submitted	0016H		

tai6000

Explanation:

Parameter not exist	The specified parameter does not exist
Control Access denied	The access is denied because of the control status
Attribute Access denied	The parameter attributes do not allow the access
Type value error	The specified type value is incorrect
Destination option not exist	The destination option does not exist at the node
Parameter Access Conflict	The addressed parameter can not be accessed (for example if the command is write and parameter is connected to an external input)
Value out of the max range	Value is out of the maximum range
Value out of the min range	Value is out of the minimum range
Value not supported	Value is in range but not allowed
Parameter Configuration Conflict	The addressed parameter can not be accessed because of system configuration conflict (for example trying to connect an input source to a parameter that is already connected to an input source)
Command Submitted	Command has been submitted but is not possible to know whether it has been executed
Unknown Command	The command is not known
Read only Parameter	The parameter has a read only attribute
Write not allowed	Write operation is not allowed for the slave conditions
Value out of constant limits	Value is out of constant fixed limits
State not correct	The control state doesn't allow the command execution
Password	The command is not executed because the password is active
Type Unknown	The parameter type is not known
Hardware Fail	The access is denied because of an hardware failure
Checksum Fail	The access is aborted because of an error in checksum control
NOK generic	The access is aborted because of an undetermined error

6.17.2 Option 2



This menu allows the user access to the parameter set of the OPT2 option card.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Menu					
Enable OPT2	425	0	1	Disabled	

GA6356g

Menu

The menu is active only if the OPT2 card is present (e.g. a DGF card). If the user tries to enter in the Option 2 menu and the card is not mounted on the drive the message “Not present” is displayed.

For further information see the optional board instruction book.

Enable OPT2

Default configuration = Disabled.

To change the configuration:

- 1 - set the new value of **Enable OPT2** parameter
- 2 - store via the **Save parameters** (BASIC MENU)
- 3 - switch-off and switch-on the drive

If this parameter is Enabled and the DGF card is not present, the following error will be generated:

OPT2 failure code 100-98 or OPT2 failure code 100-96.

Note!

When using the DGF card (Option 2), all parameters listed in the “Opt2-A/PDC” column of Parameter List (section 10.1 and 10.2) can be accessed through automatic asynchronous communication. Parameters listed in the High Priority Parameter List (section 10.4) can also be accessed by means of the automatic synchronous communication. (See DGF manual for more details.)

If the software has detected the presence of the DGF card the parameter set of the optional card will become accessible. See the DGF user manual for detailed information.

6.17.3. PID Function

OPTIONS	
	PID
	Enable PI PID
	Enable PD PID
	PID source
	PID source
	PID source gain
	Feed-fwd PID
	PID references
	PID error
	PID feed-back
	PID offs. sel
	PID offset 0
	PID offset 1
	PID acc time
	PID dec time
	PID clamp
	PI controls
	PI P gain PID %
	PI I gain PID &
	PI steady thr
	PI steady delay
	P init gain PID %
	I init gain PID %
	PI central v sel
	PI central v 1
	PI central v 2
	PI central v 3
	PI top lim
	PI bottom lim
	PI integr freeze
	PI output PID
	Real FF PID
	PD controls
	PD P gain 1 PID
	PD D gain 1 PID
	PD P gain 2 PID
	PD D gain 2 PID
	PD P gain 3 PID
	PD D gain 3 PID
	PD D filter PID
	PID output PID
	PID out.sign PID
	PID output
	PID target
	PID target
	PID out scale
	Diameter calc
	Diameter calc
	Positioning spd
	Max deviation
	Gear box ratio
	Dancer constant
	Minimum diameter

GA0881g

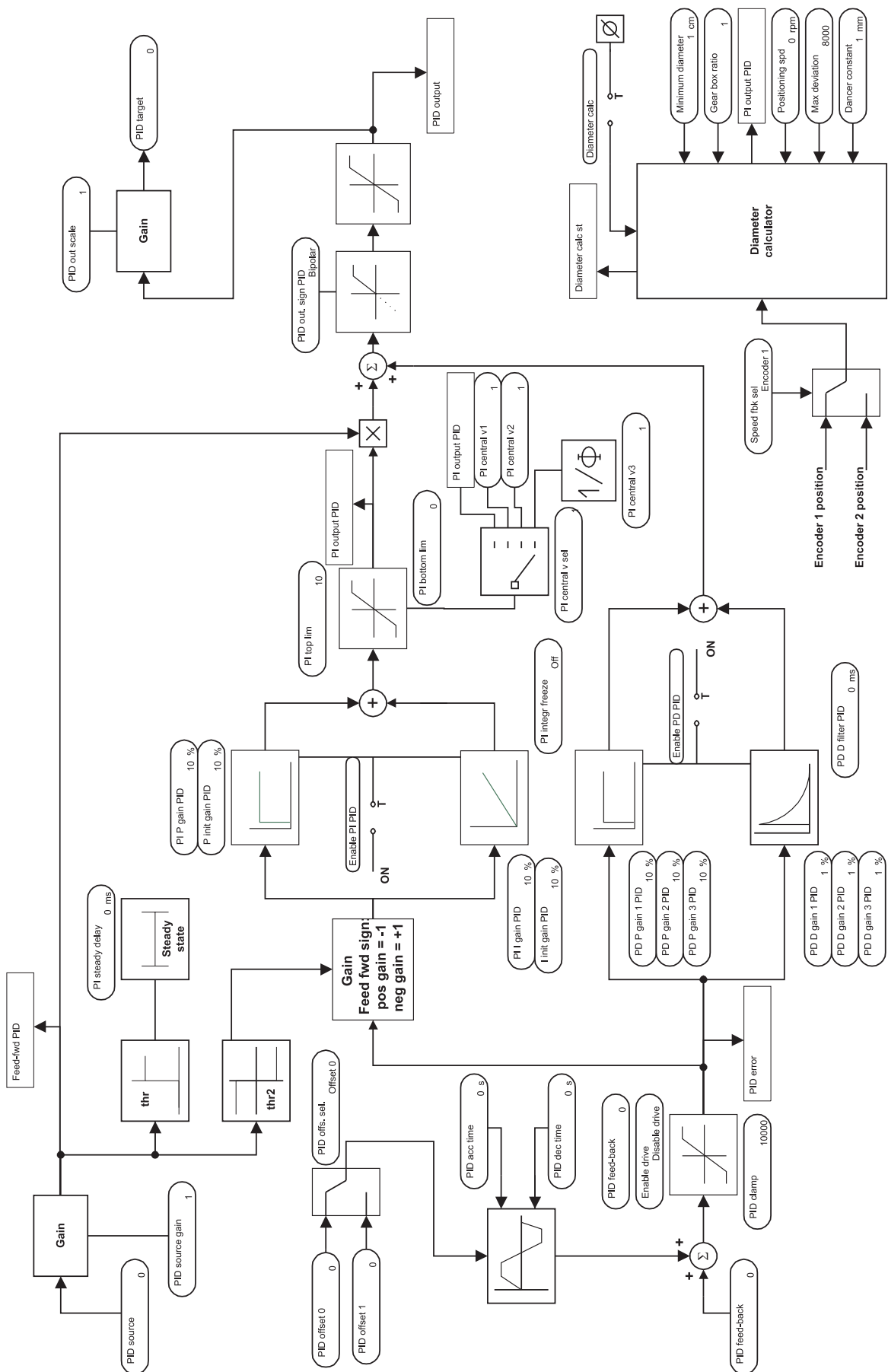


Figure 6.17.3.1: PID function

6.17.3.1. General

The PID function has been developed for general uses which can include nip-rolls, winders, unwinders, pressure control of pumps and extruders.

A dancer or a load cell can be used as the position/tension transducer.

The inputs (with the exception of the transducers) and the outputs can be configured. They can be associated to various converter parameters, E.g. the PID output can be sent to the speed or to the current regulator.

The analog inputs/outputs will be sampled every 2ms.

The digital inputs/outputs will be sampled every 8ms.

Note!

The PID function and the DGF card are mutually exclusive.

6.17.3.2. Inputs / Outputs

Regulation Inputs/outputs

PID source	Sample parameter of Feed-forward, normally programmed on analog input.
PID feed-back	Analog input of position / tension transducer (dancer/load cell). PID feed-back must be programmed on the analog input 1 (terminals 1-2) because of the input filter provided on this input.
PID offset 0	Offset analog input added to PID feed-back . Used for the adjustment of the dancer position.
PID target	Parameter associated with the regulator output. Normally, it will be programmed to the speed reference of the drive.
PID output	Analog output of the regulator. Used to supply a reference in multidrive systems.
PI central v3 PID	Initial value setting of the integral component of the regulator (correspondent to initial diameter). It can be programmed on an analog input. E.g. to an ultrasonic transducer used for the diameter measurement of a winder/unwinder.

Input Command (programmable on digital inputs)

Enable PI PID	Enable of the PI (proportional - integral) of the regulator.
Enable PD PID	Enable of the PD (proportional - derivative) of the regulator.
PI integral freeze	Freezing of the actual value of the integral component of the regulator.
PID offset sel	Offset selection, in addition to PID feed-back : L = PID offset 0 , H = PID offset 1 .
PI central v S0	Output selector of the initial block PI. With PI central v S1 determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.
PI central v S1	Output selector of the initial block PI. With PI central v S0 determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.
Diameter calc	Enable calculation of the diameter.
Diameter calc st	Calculation of the initial diameter (digital output).

6.17.3.3. Feed - Forward

PID source	
	PID source
	PID source gain
Feed-fwd PID	

GA0882g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID source	786	0	65535	0	
PID source gain	787	-100,000	100,000	0	
Feed-fw PID	758	-10000	+10000	0	*

ga6390i

* This parameter can be set on an analog programmable input.

When used , the feed-forward signal represents the main reference of the regulator. Inside the regulator it will be attenuated or amplified by the PID function and sent to the output as a reference signal for the drive.

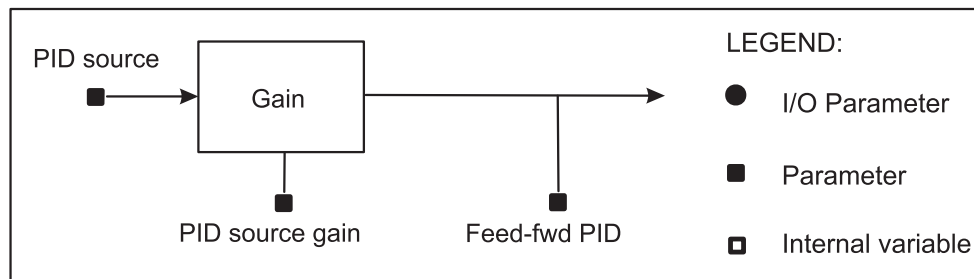


Figure 6.17.3.1: Feed-forward block description

PID source	Address of the parameter (Feed-forward value) containing the value which will be used as the PID source. Number +2000H (8192 decimal) must be added to the parameter.
PID source gain	Multiplier factor of the input value to the PID source.
Feed-fw PID	Value of feed-forward

Through the parameter **PID source**, it is possible to select which point the feed-forward signal may be sent. The selectable parameters are those indicated in paragraph 10.4. "List of the high-priority parameters". The measure units are those indicated in the notes at the end of this paragraph.

1. Programming example of the ramp output block (Parameter Ramp out) on PID source:

Menu' OPTION

```

      _____> PID
      _____> PID source
      _____> PID source = 8305

```

The **PID source** must be set to the parameter number to which it will be associated, it must be chosen from paragraph 10.4. "List of high-priority parameters' (**Ramp out** has the decimal number 113).

To obtain the correct value, it must be added to the decimal value 8192 (fixed offset):

$$8192 + 113 = 8305.$$

If you need to set the feed-forward on a analog input, given that it is not directly accessible from the 'high-priority parameters', it is necessary to pass it through a **PAD 0.....PAD 15** parameter.

2. Programming example of the analog input 2 on PID source:

a) Input programming on a PAD parameter

Menu' I/O CONFIG

```

———> Analog input
      ——> Analog input 2
            ——> Select input 2 = PAD 0

```

b) Setting of the **PAD 0** as feed-forward input:

Menu' OPTION

```

———> PID
      ——> PID source
            ——> PID source = 8695

```

The **PID source** must be set to the parameter number to which it will be associated, it must be chosen from paragraph 10.4 "List of high-priority parameters" (**PAD 0** has the decimal number 503).

To obtain the correct value, it must be added to the decimal value 8192 (fixed offset):

$$8192 + 503 = 8695.$$

The full-scale of the feed-forward is limited to a value of +/- 10,000, the exact number depends on the parameter set on the **PID source**. It will be necessary to perform the calibration through the **PID gain source** parameter.

The measure units are those indicated in the notes at the end of the paragraph 10.4. "List of the high-priority parameters".

The feed-forward value can be read through the parameter **Feed-fwd PID** via keypad or serial line.

Examples:

1. Programming example of the ramp output block (**Parameter Ramp out**) on the **PID source**:

Speeds will be converted inside the drive into RPM x 4.

The ramp input references take as a maximum value that which is set in **Speed base value**.

$$\text{Feed - fwd PID} = \text{Speed base value} \times 4 \times \text{PID source gain}$$

With a max. ramp reference and **Speed base value** = 3000rpm, then to get

Feed - fwd PID = 10,000, it will be necessary to set:

$$\text{PID source gain} = 10,000 / (3000 \times 4) = 0.833$$

2. Programming example of the analog input 2 to the **PID source**:

When a 10V analog input is set on a **PAD** parameter, the max. value will be + / - 2047.

To get **Feed - fwd PID** = 10,000, it is necessary to set:

$$\text{PID source gain} = 10,000 / 2047 = 4.885.$$

Note!

Using the regulator as "generic PID" without the feed -forward function, **Feed - fwd PID** must be at its max. value.

To do this, it is necessary to set **PID source** on a **PAD** parameter and program it = 10,000

6.17.3.4. PID function

The PID function is divided in three blocks:

- Feed-back input “**PID reference**”
- Proportional-integral control block “**PI controls**”
- Proportional-derivative control block “**PD controls**”

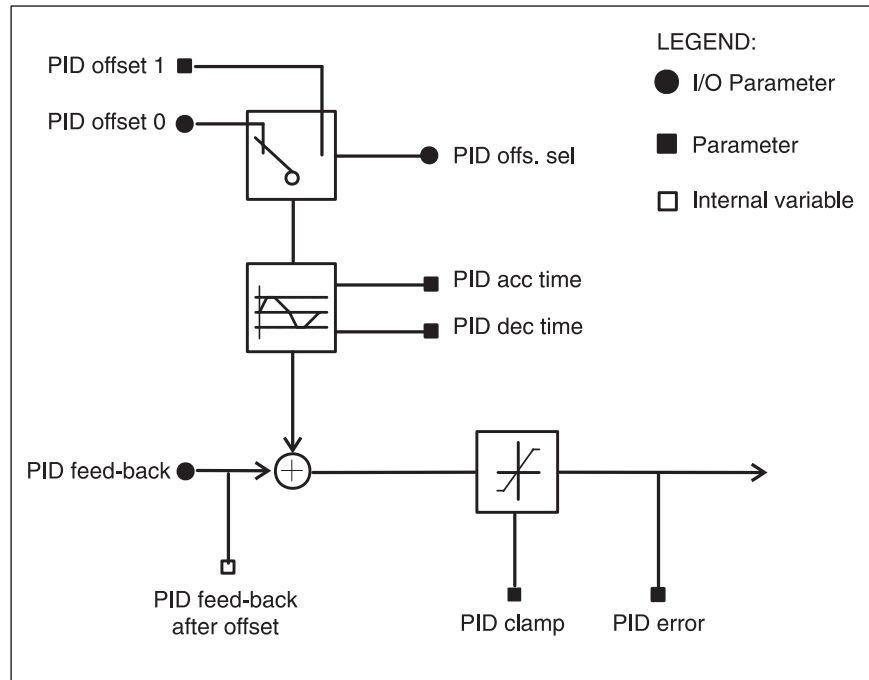


Figure 6.17.3.2: Feedback block description

PID reference	
	PID error
	PID feed-back
	PID offs. Sel
	PID offset 0
	PID offset 1
	PID acc time
	PID dec time
	PID clamp

GA0883g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID error	759	-10000	+10000	0	
PID feed back	763	-10000	+10000	0	**
PID offs. Sel	762	0	1	0	*
PID offset 0	760	-10000	+10000	0	**
PID offset 1	761	-10000	+10000	0	
PID acc time [s]	1046	0.0	900.0	0.0	
PID dec time [s]	1047	0.0	900.0	0.0	
PID clamp	757	0	+10000	10000	

GA6391g

* This function can be set on a digital programmable input

** This parameter can be set on an analog programmable input

PID error	Error reading the input of the function PID clamp block output.
PID feed-back	Reading of the feed-back value from the transducer position (dancer) or tension (load cell).
PID offs. sel	Offset selector added to PID feed-back . This parameter can be set on a digital programmable input. 0 = PID offset 0 1 = PID offset 1
PID offset 0	Offset 0 added to PID feed-back . This parameter can be set to an analog input , E.g. for the tension setting when a load cell has to be used as feed-back.
PID offset 1	Offset 1 added to PID feed-back .
PID acc time	Acceleration ramp time value in seconds after the PID offset block.
PID dec time	Deceleration ramp time value in seconds after the PID offset block.
PID clamp	This clamp allows a smooth tension setting of a controlled system winder/unwinder, when the "Function for the calculation of the initial diameter" cannot be used. When enabling the drive, the dancer could be at its lowest position, causing the PID error to be at its maximum value. The motor could accelerate too fast, trying to get the dancer to its correct position Setting PID clamp at a value sufficiently low, e.g. = 1000, the value of PID error to 1000 till the signal coming from the dancer (PID feed-back) recovers. Then the PID clamp is automatically set back to a value corresponding to 10000 until the next disabling of the drive or of Enable PD PID .

The feed - back input is provided for analog transducer connections like dancers, or load cells. Nevertheless, it is possible to use this input block as comparison point between two different analog, + / - 10V, signals.

Connection to a dancer with a potentiometer connected between - 10 and + 10V.

The cursor of the potentiometer can be connected to one of the analog inputs of the drive. Normally it should be used the analog input 1 (terminals 1 and 2) should be used because it has an input filter.

The input chosen for that connection must be programmed in the menu I/O CONFIG as **PID feed - back**. Its value can be read in the **PID feed - back** parameter in the **PID REFERENCE** submenu.

Through **PID offset 1** (or PID offset 0), it is possible to perform adjustments of the dancer position.

Connection to a load cell with full range + 10V.

The output of the load cell can be connected to one of the drive analog inputs. Normally the analog input 1 (terminals 1 and 2) should be used because of its filtered input.

The input chosen for the connection must be programmed in the menu I/O CONFIG as **PID feed - back**. Its value can be read in the **PID feed - back** parameter of the **PID REFERENCE** submenu.

The tension setting can be sent to one of the remaining programmable analog inputs in the **I/O CONFIG** menu as **PID offset 0**.

6.17.3.5. Proportional - integral block

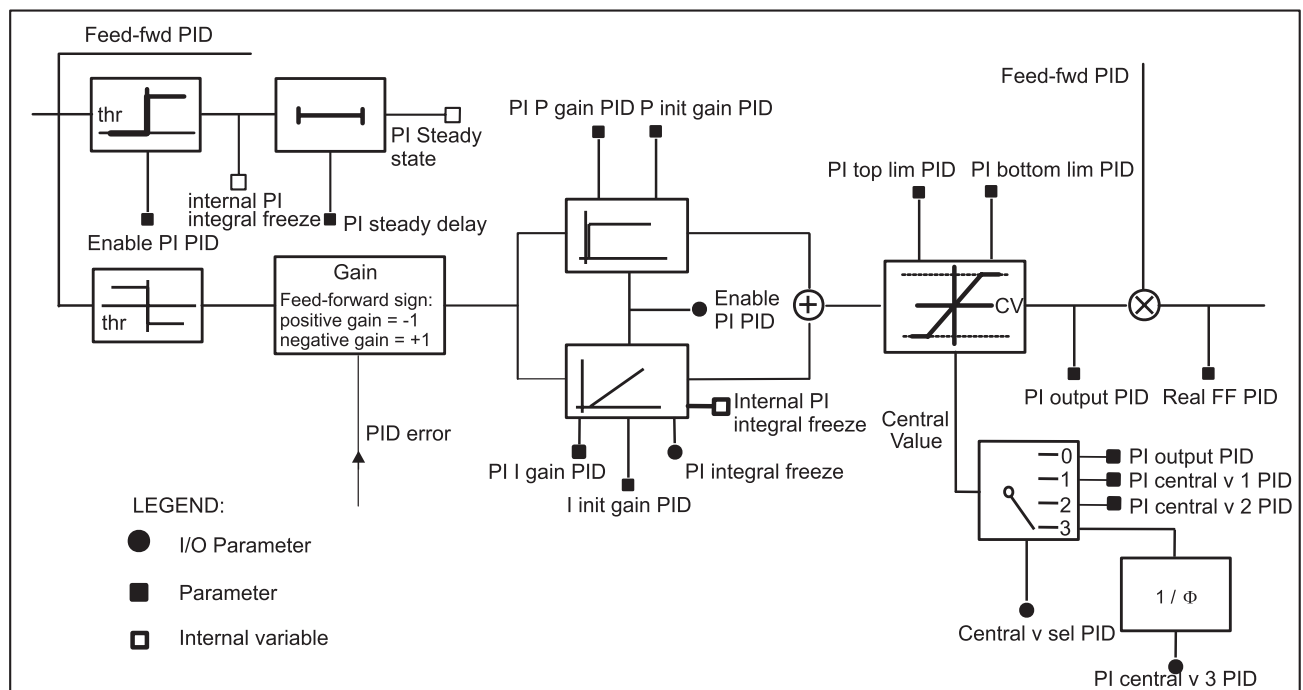


Figure 6.17.3.3: PI block description

The PI block receives its input from the **PID error** parameter, which represents the error that must be corrected by the regulator. The PI block carries on the proportional-integral regulation. Its output, **PI output PID**, will be used as multiplier factor of the feed-forward (**Feed-fwd PID**), obtaining the correct value of the speed reference for the drive (**Real FF PID**).

The PI block will be enabled by setting **Enable PI PID** = Enable. If **Enable PI PID** has been programmed on a digital input, this must be set to a high logic level (+24V).

PID	
	Enable PI PID

GA0931g

Parameter	N.	Value			Standard configuration
		min	max	default	
Menu					
Enable PI PID	769	0	1	Disabled	*

GA6392g

* This function can be set on a digital programmable input

Enable PI PID Enabled Enable of the proportional-integral block
 Disabled Disabling of the proportional-integral block.

PI controls	
PI P gain PID %	
PI I gain PID %	
PI steady thr	
PI steady delay	
P init gain PID %	
I init gain PID %	
PI central v sel	
PI central v 1	
PI central v 2	
PI central v 3	
PI top lim	
PI bottom lim	
PI integr freeze	
PI output PID	
Real FF PID	

GA0884g

Parameter	N.	Value			Standard configuration
		min	max	default	
PI P gain PID	765	0:00	100.00	10.00	
PI I gain PID	764	0:00	100.00	10.00	
PI steady thr	695	0	10000	0	
PI steady delay	731	0	60000	0	
P init gain PID	793	0:00	100.00	10.00	
I init gain PID	734	0:00	100.00	10:00	
PI central v sel	779	0	3	1	*
PI central v 1	776	PI bottom lim	PI top lim	1.00	
PI central v 2	777	PI bottom lim	PI top lim	1.00	
PI central v 3	778	PI bottom lim	PI top lim	1:00	**
PI top limit	784	PI bottom lim	10.00	10.00	
PI bottom limit	785	-10.00	PI top lim	0:00	
PI integral freeze	783	0	1	0	*
PI output PID	771	0	1000 x PI top lim	1000	
Real FF PID	418	-10000	+10000	0	

GA6393g

* This function can be set on a digital programmable input

** This parameter can be set on an analog programmable input

PI P gain PID	Proportional gain of PI block
PI I gain PID	Integral gain of PI block
PI steady thr	Threshold feed-forward survey. If Feed-fwd PID is less than PI steady thr the integral regulation will be frozen, the proportional gain then assumes the value set in P init gain PID . When Feed-fwd PID overcomes the threshold, the integral regulation with the gain set in I init gain PID will be enabled. The PI block will maintain the gains P init gain PID and I init gain PID for the time preset through PI steady delay . Once this delay is over, they will revert to PI P gain PID and PI I gain PID .
PI steady delay	Time for which the gains P init gain PID and I init gain PID have been kept operative after overcoming the feed-forward PI steady thr threshold. The delay time for the transition from “Low” to “High” of the Enable PI PID parameter.
P init gain PID	Initial proportional gain. P init gain PID operates when feed-forward is less than PI steady thr and for the time set in PI steady delay . It also operates during the transition L to H of Enable PI PID (for the time set in PI steady delay).
I init gain PID	Initial integral gain. I init gain PID operates after the threshold PI steady thr has been overcome or the transition L to H of Enable PI PID for the time set in PI steady delay .
PI central v sel	Output selector of the starting PI block. PI central v sel (0...3) selects between the 4 possible settings of the initial value of the regulator integral components (corresponding to initial diameter).

PI central v sel can be set directly from the keypad, serial link or two digital inputs set respectively as **PI central v S0** and **PI central v S1**.

Selecting **PI central v sel = 0**, when PI block is disabled (**Enable PI PID = Disable**), will cause the last value of the integral component calculated (corresponding to roll diameter) to be stored. This value is displayed in **PI output PID**. When enabled again, the regulator restarts from that value. The same functionality is used when switching off the drive. This feature can be used when controlling a winder and it becomes necessary to stop the machine and disable the drive or even remove AC incoming power from the case.

Selecting **PI central v sel =** when PI block has been disabled, will cause the value of **PI output PID** to be set at what is programmed in the corresponding parameter (x1000). When the drive is restarted after a power off, the precalculated value will be automatically set only if the digital input programmed as **Enable PI PID** is already set at a high level.

PI central v 1	Setting of the first initial value of the regulator's integral component (corresponding to initial diameter 1). The PI central v 1 value must be included in the limits set in PI top lim PID and PI bottom lim PID . PI central v 1 will be selected by setting PI central v sel = 1 .
PI central v 2	Setting of the second initial value of the regulator's integral component (corresponding to initial diameter 2). The PI central v 2 value must be included in the limits set in PI top lim PID and PI bottom lim PID . PI central v 2 will be selected by setting PI central v sel = 2 .
PI central v 3	Setting of the third initial value of the regulator's integral component (correspondent to initial diameter 3). The PI central v 1 value must be included in the limits given by PI top lim PID and PI bottom lim PID . PI central v 3 will be selected by setting PI central v sel = 3 .
PI top lim	It defines the higher limit of the PI correction.
PI bottom lim	It defines the lower limit of the PI correction.

The output of the PI block represents the multiplier factor of feed-forward, whose value must be adapted from the regulator between +10000 and -10000 and defined by **PI top lim** and **PI bottom lim**. The value of these parameters will be defined according to the system that has to be controlled. For a better understanding, please refer to the paragraph “Examples of application”.

PI output PID Output of the PI block, limited by **PI top limit** and **PI bottom limit**. At the power up of the drive, **PI output PID** automatically acquires the selected value of **PI central v sel** multiplied by 1000.

Example: If **PI central v 2** = 0.5 is selected at the start **PI output PID** acquires value = 500.

When **Enable PI PID** has been enabled, the output **PI output PID** is dependent on the and limited by **PI top limit** or **PI bottom limit** multiplied by 1000.

Example: **PI top limit** = 2, **PI output PID** max = 2000.

The PI block output will be further limited by the saturation of parameter **Real FF PID** (see corresponding parameter). As previously described, **PI output PID** is used as a multiplier factor of the feed-forward in order to obtain the angular speed reference of the motor. If the PID function is used to control a winder/ unwinder system, its value is inversely proportional to the roll diameter. When winding with a constant peripheral speed, the following is valid:

$$\omega_0 \Phi_1 = \omega_1 \Phi_0$$

where:

ω_0 = angular speed at minimum diameter

Φ_0 = minimum diameter

ω_1 = angular speed at actual diameter

Φ_1 = actual diameter

$\omega_1 = \omega_0 \times (\Phi_0 / \Phi_1)$

If the drive is set correctly, and ω_0 is equivalent to the maximum value of the feed-forward, then **PI output PID** depends on (Φ_0 / Φ_1) .

Taking into consideration the internal coefficients of the firmware, it can be written:

$$\text{PI output PID} = (\Phi_0 / \Phi_1) \times 1000$$

This formula can be used to verify the accuracy of the setting when the system is working or during the calculation of the initial diameter.

Real FF PID

Represents the feed-forward value which has been recalculated according to the PI correction. It will be calculated with the following formula:

$$\text{Real FF PID} = (\text{Feed-fwd PID} / 1000) \times \text{PI output PID}$$

The max. value of Real FF PID is +/- 10,000. If this limit had been reached during operation, because of regulator saturation, further increases of PI output PID will be blocked.

Example: Feed-fwd = + 8000, the positive limit of PI output PID will be automatically set at $10,000 / (8000 / 1000) = 1250$.

6.17.3.6. Proportional - Derivative control block

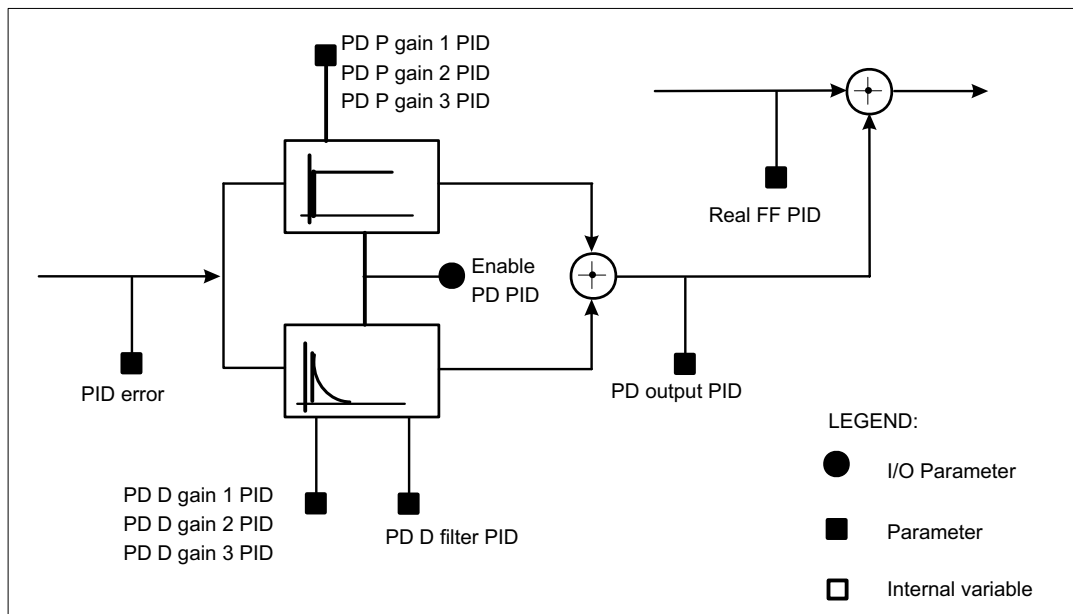


Figure 6.17.3.4: PD block description

The PD block receives the values **PID error** at its input, which represents the error that must be corrected by the regulator. The PD block carries out proportional-derivative regulation and its output **PD output PID** will be added to **Real FF PID**.

The PD block is enabled by setting **Enable PD PID** = Enable. If **Enable PD PID** has been programmed on a digital input, this must be set to a high logic level.

PID	
	Enable PD PID

GA0932g

Parameter	N.	Value			Standard configuration
		min	max	default	
Menu					
Enable PD PID	770	0	1	Disabled	*

GA6394g

* This function can be set on a digital programmable input.

Enable PD PID	Enabled	Enabling of the proportional-derivative
	Disabled	Disabling of the proportional-derivative

PD controls	
	PD P gain 1 PID
	PD D gain 1 PID
	PD P gain 2 PID
	PD D gain 2 PID
	PD P gain 3 PID
	PD D gain 3 PID
	PD D filter PID
PD output PID	

GA0885g

Parameter	N.	Value			Standard configuration
		min	max	default	
PD P gain 1 PID	768	0.00	100.00	10.00	
PD D gain 1 PID	766	0.00	100.00	1.00	
PD P gain 2 PID	788	0.00	100.00	10.00	
PD D gain 2 PID	789	0.00	100.00	1.00	
PD P gain 3 PID	790	0.00	100.00	10.00	
PD D gain 3 PID	791	0.00	100.00	1.00	
PD D filter PID	767	0	1000	0	
PD output PID	421	-10,000	+10,000	0	

GA6395g

The gains of the block can be programmed through the parameters **PD P gain 1 PID** and **PD I gain 1 PID**, or changed through the function **Adap spd reg**. In the latter case the gains come from **PD P gain 1-2-3 PID** and **PD I gain 1-2-3 PID**.

For example, it is possible to modify the gains of the PD block according to speed, a regulation parameter or to an analog input proportional to the unit related to the machine.

Note!

When **Adap Spd reg** has been enabled (paragraph 6.14.2. of the manual), it operates both on the PID function and on the gains of the speed regulator. Therefore it is necessary to program all relative parameters. To modify only the gains of the speed regulator and keep the gains of the PID function fixed, it is necessary set the three proportional gains and integral gains of the PD block at the same value. The same is true if the PID gains have to be modified and the speed regulator gains must remain fixed.

PD P gain 1	Proportional gain 1 of the block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).
PD D gain 1	Derivative gain 1 of block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).

PD P gain 2	Proportional gain 2 of the block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).
PD D gain 2	Derivative gain 2 of block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).
PD P gain 3	Proportional gain 3 of the block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).
PD D gain 3	Derivative gain 3 of block PD (its value can also depend on the enabling of the function Adap Spd reg and its configuration).
PD D filter PID	Time constant of the filter from the derivative side.
PD output PID	PID block output.

6.17.3.7. Output reference

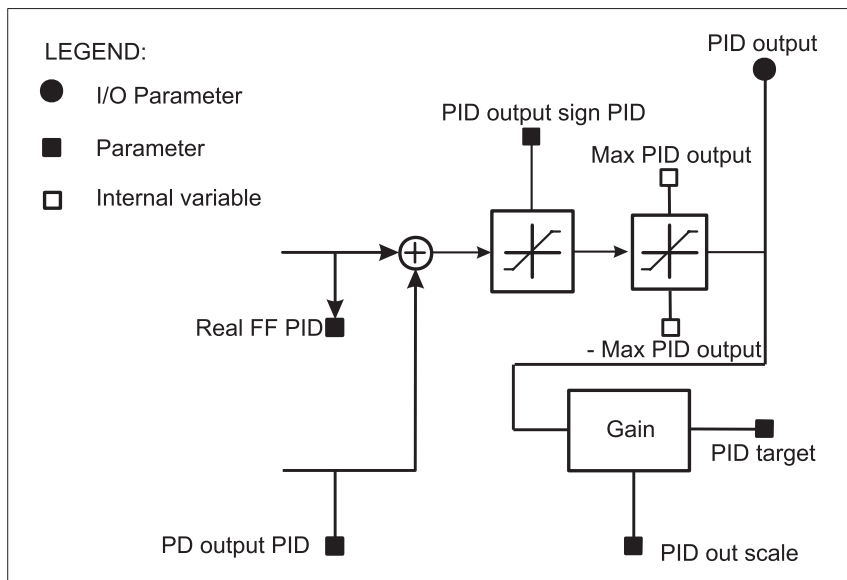


Figure 6.17.3.5: Output reference block description

PID	PID out. sign PID
	PID output

GA0886g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID output sign PID	772	0	1	1	
PID output	774	-10000	+10000	0	*

GA6396g

* This parameter can be set on an analog programmable output.

PID out. sign PID Through this parameter it is possible to set the output of the regulator to be either bipolar or unipolar.

PID output Display of regulator output. It is possible to program this parameter to an analog output in order to send the value to other drives.

PID target	
	PID target
	PID out scale

GA0887g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID target	782	0	65535	1	
PID out scale	773	-100.00	+100.00	1.000	

GA6397g

PID target Address of the parameter which contains the value to be used as PID target. To obtain the real settable value, it is necessary to add +2000H (8192 decimal) to the parameter number.

PID out scale Matching factor of **PID output**. Its value depends on the parameter to which the regulator output is addressed.

Through the parameter **PID target** it is possible to select which point in the drive will receive the output signal of the PID Loop. The selectable parameters are those designated as “write-to” parameters (W or R/W) indicated in the paragraph 10.4. “*List of high-priority parameters*”. The units are those indicated in the notes at the end of the paragraph.

Programming example of the speed reference 1 (parameter **Speed ref 1**) on **PID target**:

Menu' OPTION

```

      —————> PID
            —————> PID target
                  —————> PID target = 8234

```

PID target must be set by the number of the parameter to which it will be pointed, choosing it from the paragraph 10.4. “*List of high-priority parameters*” (**Speed ref 1** has the decimal number 42). To obtain the value, the parameter number must be added to the decimal number 8192 (fixed offset).

$$8192 + 42 = 8234.$$

Note:

When the ramp function has been enabled its output will be automatically directed to **Speed Ref 1** otherwise it is necessary to set parameter **Enable ramp** = disable.

Speed ref 1 will be set by RPM x 4, considering that **PID output** assumes values included between 0....10,000, it is necessary to set the calibration correctly through **PID out scale**.

Calculation of PID out scale

If it is necessary that the **PID output** equal its max. value = 10,000 when the speed reference = 2000rpm, it will be necessary to scale the output as follows:

$$\text{PID out scale} = (2000 \times 4) / 10000 = 0.8$$

Speed ref 1 can be read in the in the menu **INPUT VARIABLES / Speed ref.**

6.17.3.8. Calculation for Initial Diameter Function

This function performs a preliminary calculation of the diameter of an unwinder/winder before starting the line. This allows better control of the system avoiding unwanted movement of the dancer.

The calculation is based on measuring the movement of the dancer from its lowest position to its normal working position and on the measurement of angular movement of the motor.

Note!

The initial diameter calculation can be carried out only when the winder/unwinder is controlled through a dancer (no load cell) and the speed feed-back is carried out through an encoder.

The result of the calculation is assigned to the parameter **PI output PID** and so that it represents the multiplier factor of the feed-forward. This will allow calculation of the angular speed of the motor.

Its value is universally proportional to the roll diameter.

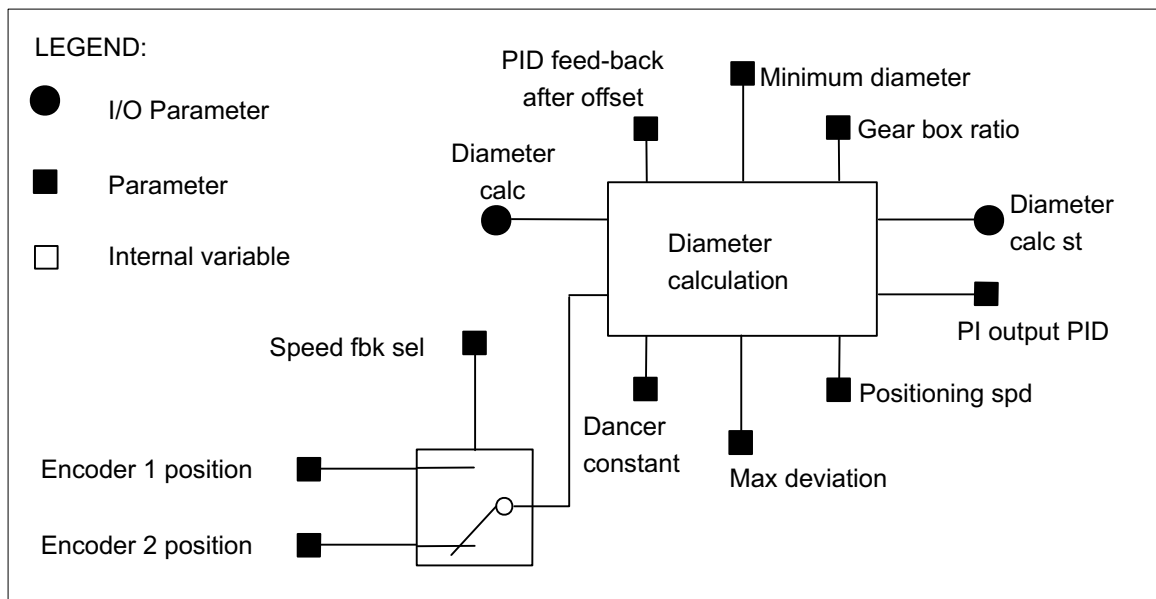


Figure 6.17.3.6: Diameter calculation block description

Diameter calc	
	Diameter calc
	Positioning spd
	Max deviation
	Gear box ratio
	Dancer constant
	Minimum diameter

GA0888g

Parameter	N.	Value			Standard configuration
		min	max	default	
Diameter calc	794	0	1	0	*
Positioning spd	795	-100	+100	0	
Max deviation	796	-10000	+10000	8000	
Gear box ratio	797	0.001	1.000	1.000	
Dancer constant	798	1	10000	1	
Minimum diameter	799	1	2000	1	

GA6398g

* This function can be set on a digital programmable input.

Diameter calc

Enables the function of initial diameter calculation.

The calculation will be enabled by setting **Diameter calc** = Enable.

If **Diameter calc** has been programmed on a digital input, this must be brought to a high logic level.

Positioning spd

Motor speed at which the dancer is at when in normal working position.

Max deviation

Value expressed in counts of D/A which corresponds to the maximum movement allowed by the dancer. This value will be used as the starting measurement of the dancer movement during the calculation of the initial diameter.

During start-up, it will be necessary to calibrate the analog inputs, so that at fullrange position of the dancer they will correspond to their maximum value. The parameter **Max deviation**, in order to guarantee an accurate calculation of movement, must be set at a value slightly lower. (standard **Max deviation** = 8000).

Gear box ratio

Ratio reduction between the motor and the winder (≤ 1).

Dancer constant

It expresses the distance in mm, the total loop of material in the dancer.

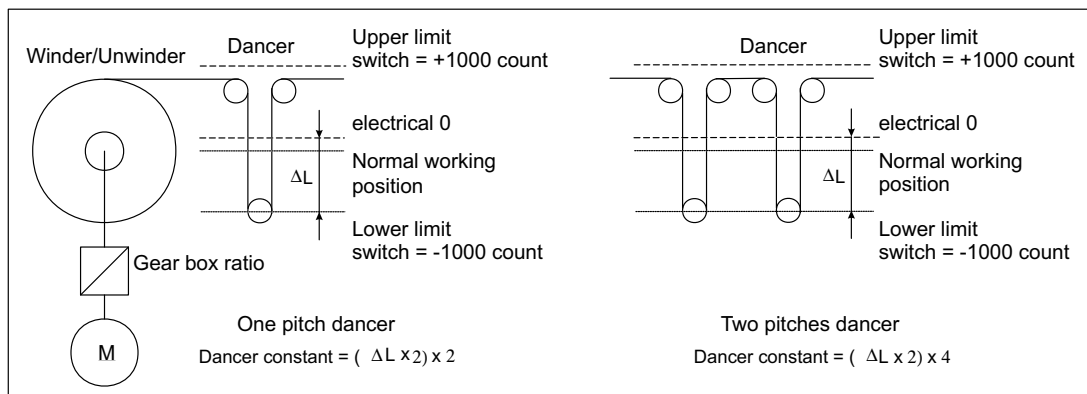


Figure 6.17.3.7: Diameter calculation

Measurement of Dancer constant

Perform the self-calibration of the analog input programmed as **PID feed-back** with the dancer in lower fullrange position. Set the keypad of the drive on the parameter **PID feed-back**.

Measure and multiply by 2, the distance in mm between the lower mechanical fullrange and the position of the dancer that, on the parameter **PID feed-back**, will display 0 (position of electrical 0).

Multiply the above calculation by 2 if the dancer has only one pitch, by 4 if the dancer has two pitches and so on, see the above figure.

Minimum diameter Min. value of core diameter expressed in cm.

6.17.3.9. Procedure of calculation for initial diameter

This calculation is based on the measurement of the dancer movement from the lower fullrange position to its normal working position, and on the measurement of the angular movement of the motor. For this reason it may be necessary to enable the regulation of the nip-roll drive with speed reference = 0.

If line nip-rolls are controlled by dancers or load cells, it is necessary to perform the diameter calculation of the winders/unwinders first.

The parameter **PI central v sel** must be set at 0 to avoid **PI output PID** being set automatically at a predefined value.

Bring the digital input programmed as **Diameter calc** to a high logic level (+24V) , and if the drive is enabled this will start the procedure. During this phase, the parameters **Enable PI PID** and **Enable PD PID** are automatically disabled.

The regulator verifies the signal coming from the dancer potentiometer. If this is higher than what is already set in **Max deviation**, the motor begins following the speed reference set in **Positioning speed** to bring the dancer to its normal working position.

The polarity of the reference assigned to **Positioning speed** will be equal to one working as a winder.

If the initial regulation verifies that the signal coming from the potentiometer of the dancer is lower than what was already set in **Max deviation**, the motor starts running with speed reference set in **Positioning speed**. This will unwind the material and bring the dancer to the point identified by **Max deviation**. At this point the reference will be inverted to bring the dancer to its normal position.

When the dancer has reached its normal position, the parameter **PI output PID** will be set at a value inversely proportional to the diameter. The digital output **Diameter calc st** will be brought to high logical level, indicating the end of the diameter calculation.

At this point, if **Enable PI PID** and/or **Enable PD PID** are enabled, the system transfers automatically into normal regulation. For this reason the digital inputs programmed as **Diameter calc** and **Enable PI PID** and/or **Enable PD PID** will be brought to high logic level at the same time.

The output signal **Diameter calc st** can be used to reset the command **Diameter calc**. For that reason, it must be brought to high logic level after the initial calculation phase has finished.

The value of **PI output PID** will be calculated with the following formula:

$$\text{PI output PID} = (\text{Min diameter} \times \text{PI top lim}) / \text{Value of the calculated diameter}$$

The parameters **PI top limit** and **PI bottom limit** in the menu **PI controls** have to be set according to the max. and min. diameter of the roll. For better explanation, please refer to paragraph 6.17.3.10 "Application examples".

6.17.3.10. Examples of application

Nip-roll control with dancer

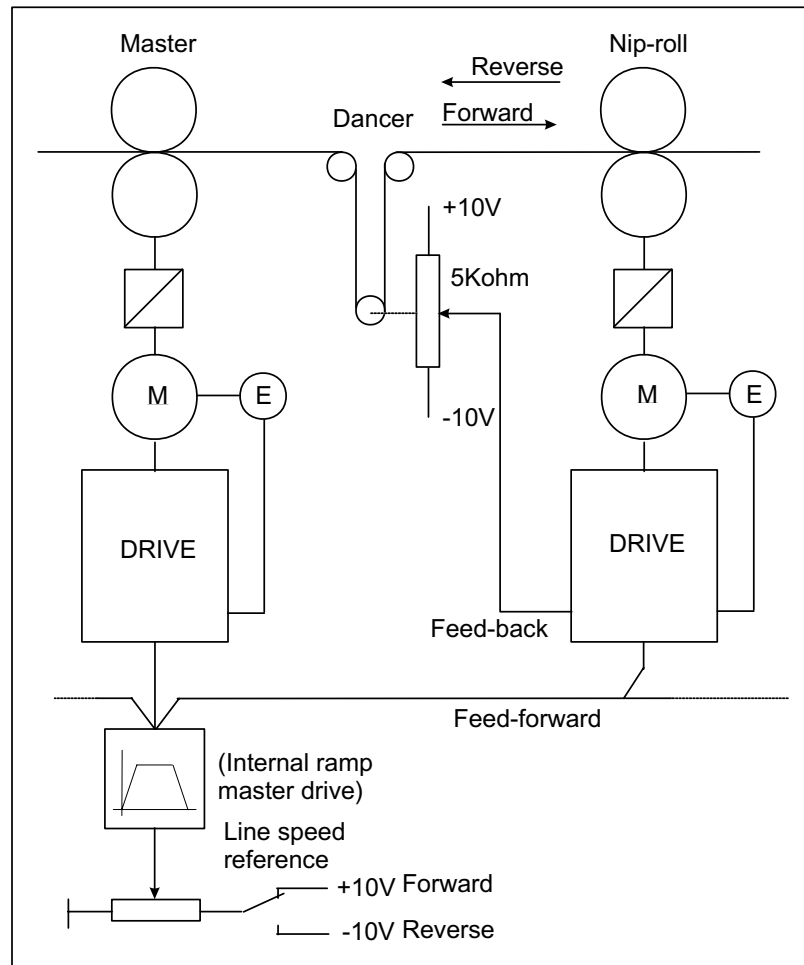


Figure 6.17.3.8: Nip-roll control with dancer

Machine data:

Rated speed of slave motor $V_n = 3000\text{rpm}$

Slave motor speed corresponding to the max. line speed = $85\% V_n = 2550\text{rpm}$

Max. correction of the dancer = $\pm 15\%$ of the line speed = $\pm 382.5\text{rpm}$

The slave drive must be given the analog signals specifying line speed, position of the dancer and the digital commands enabling the PID control.

The regulator output will be sent to speed reference 1.

Drive setting: (parameters related to the PID function)

Input/output.

Set **Analog input 1** as input for the wiper of the dancer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on an analog input, it will be necessary to pass it through a parameter **PAD 0.....PAD 15** because it is not in the list of high-priority parameters.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** to enable the input of PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** to enable the input of PD block of the PID

Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as the parameter for the feed-forward reading on **Analog input 2**)

For **PID source**, set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "List of high-priority parameters" (**PAD 0** has the decimal number 503).

To obtain the correct value it must be added to the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on Analog input 2, 85% of its max. value = 10000 x 85%. When the max value on Analog input 2 reached.

When an analog input is set on a PAD parameter, 10V will equal 2047.

So: **PID source Gain** = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

Note!

When the ramp function is enabled, **Speed ref 1** is not available. In order to keep it available, it is necessary to set the parameter **Enable ramp** = Disable.

The **PID target** must now be set to the correct regulator parameter number, choosing it from the list of paragraph 104,

"List of high-priority parameters" (**Speed ref 1** has the decimal number 42).

To obtain the correct value the parameter number must be added the decimal number 8192 (fixed offset)

$$\text{PID target} = 8192 + 42 = \underline{8234}$$

Set **PID out scale** so that the max. analog value on **Analog input 2 (Feed-fwd PID = 8500)**, **Enable PI PID**, **Enable PD PID** = Disable and **Speed ref 1** are the same at 2550rpm.

The parameter **Speed ref 1** will set as RPM x 4, so:

$$\text{PID out scale} = (2550 \times 4) / 8500 = \underline{1.2}$$

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In the absence of a correction performed by the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

In this application, the regulator carries out a mono type proportional control. The correction will be indicated in percentage from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that, with max. movement of the dancer (max.value of the analog input 1 = **PID Feed-back**) and the proportional gain of the PI block at 15%, it will correspond to an equal proportional correction of feed-forward. For this reason set:

$$\text{PI top limit} = 10$$

$$\text{PI bottom limit} = 0.1$$

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 0%

With this configuration, with a correction proportional to the line speed, the PI block is not able to position the dancer at speed = 0. In order to do this at zero speed, it is necessary to use the PD block.

Set **PD P gain PID** to a value that allows positioning of the dancer without large dynamic variations.

For example:

$$\text{PD P gain PID} = 1\%$$

If necessary, use the derivative component as a damping component of the system, for example:

$$\text{PD D gain PID} = 5\%$$

$$\text{PD D filter PID} = 20\text{ms}$$

However, if possible, keep these parameters = 0.

If it is necessary to send a reference to a follower drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10,000 count, **Analog output 1** = 10V).

Nip-rolls control with load cell

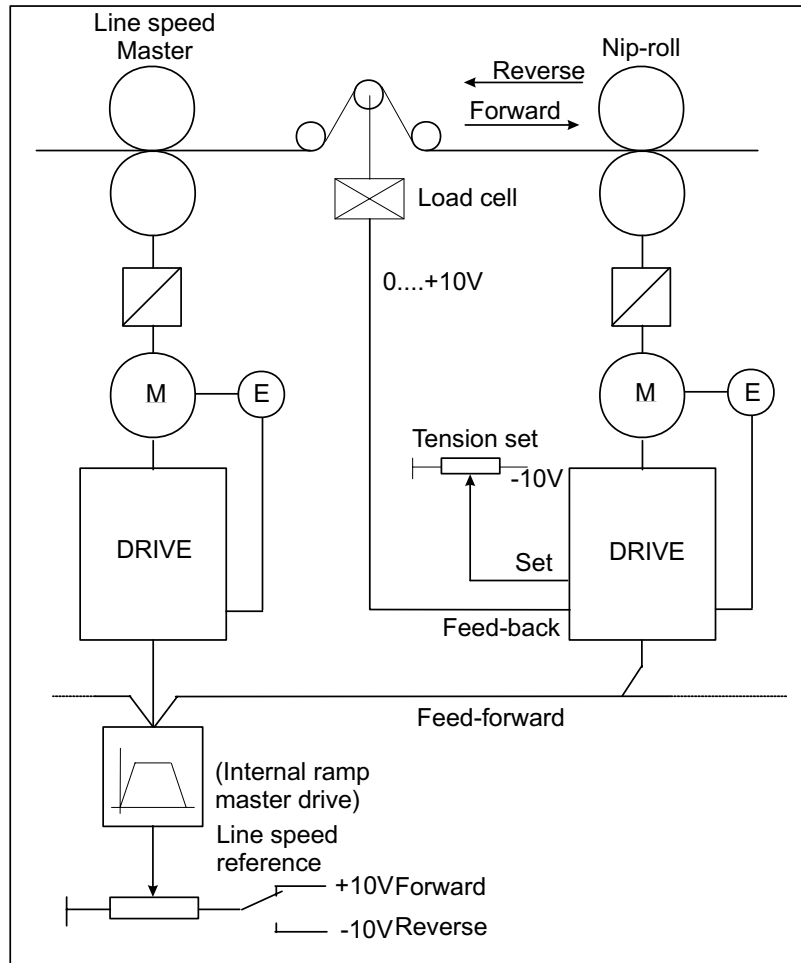


Figure 6.17.3.9: Nip-rolls control with load cell

Machine data:

Rated speed of slave motor $V_n = 3000\text{rpm}$

Slave motors speed corresponding to the max. line speed = $85\% V_n = 2550\text{rpm}$

Max. correction of the dancer = $\pm 20\%$ of the line speed = $\pm 510\text{rpm}$

Analog signals representing the line speed, position of the load cell ($0 \dots +10\text{V}$) tension ($0 \dots +10\text{V}$), and the digital commands enabling of the PID control must be sent to the slave drive.

The regulator output will be sent to speed reference 1.

Drive setting: (below are parameters for the PID function)

Input/output.

Set **Analog input 1** as input for the load cell signal.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on an analog input, it will be necessary to pass it through a parameter **PAD 0.....PAD 15** because it is not in the list of high priority parameters.

Analog input 2 / Select input 2 = PAD 0

Set **Analog input 3** as input for tension (**PID offset 0**).

Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** to enable the input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** to enable the input of the PD block of the PID

Digital input 2 = Enable PD PIDParameters

Program **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Program **PID source** as **PAD 0**.

(**PAD 0** has been used as the parameter of the feed-forward on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "List of high-priority parameters" (**PAD 0** has the decimal number 503).

To obtain the correct value the decimal number 8192 (fixed offset) must be added to the parameter number:

PID source = $(8192 + 503) = 8695$

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value = $10,000 \times 85\%$ when Analog input 2 reaches its max value..

When an analog input is set on a PAD parameter, 10V will equal 2047.

So:

PID source Gain = $(\text{max Feed-fwd PID} \times 85\%) / \text{max PAD 0} = (10,000 \times 0.85) / 2047 = 4.153$

Set **PID target** as **Speed ref 1**.

Note!

When the ramp function is enabled, **Speed ref 1** is not available. In order to have it available, it is necessary to set the parameter **Enable ramp** = Disable.

The **PID target** must now be set to the correct parameter number, choosing it from the list of paragraph 10.4 "List of high-priority parameters" (**Speed ref 1** has the decimal number 42).

To obtain the correct value, the parameter number must be added to the decimal number 8192 (fixed offset)

PID target = $8192 + 42 = 8234$

Set **PID out scale** so that the max. analog value on **Analog input 2** (**Feed-fwd PID** = 8500), **Enable PD PID** = disable and **Speed ref 1** are the same at 2550rpm.

Speed ref 1 will be set as $RPM \times 4$, so:

$$\text{PID out scale} = (2550 \times 4) / 8500 = \underline{1.2}$$

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In the absence of a correction carried out from the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

This application operates by using proportional control. The correction will be indicated in percentage according to the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that the max. correction of the PI block corresponds to 20% of line speed.

PI top limit and **PI bottom limit** parameters are the maximum and minimum multiplier factors of the Feed forward value.

At the max. line speed it will correspond to 2550rpm of the motor (max. feed-forward).

$$\text{Max. correction} = 2550 \times 20\% = 510\text{rpm}$$

$$2550 + 510 = 3060\text{rpm} \longrightarrow \text{PI top limit} = 3060 / 2550 = \underline{1.2}$$

$$2550 - 510 = 2040\text{rpm} \longrightarrow \text{PI bottom limit} = 2040 / 2550 = \underline{0.80}$$

which will multiply the setting of **PI central v 1** by + 20% (1.2) and - 20% (0.80).

With this configuration, with a correction proportional to the line speed, the PI block is not able to apply tension at speed = 0. In order to apply tension at zero speed, it is necessary to use on the PD block.

The gains of the single components have to be set with material in the machine; it is possible to start the tests with values below:

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 10%

Set **PD P gain PID** = 10%

In order to use the derivative component for forcing the regulator output during velocity changes of the system, programming is as follows:

PD D gain PID = 5%

PD D filter PID = 20ms

However, if possible, keep these parameters = 0.

If it is necessary to send a reference to a follower drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1 = PID output

(with **Real FF PID** = 10,000 count, **Analog output 1** = 10V).

Note!

If it is necessary, to apply tension in the system with null error and when the machine stopped, please refer to the paragraph "Generic PID".

Winder/Unwinder control with dancer

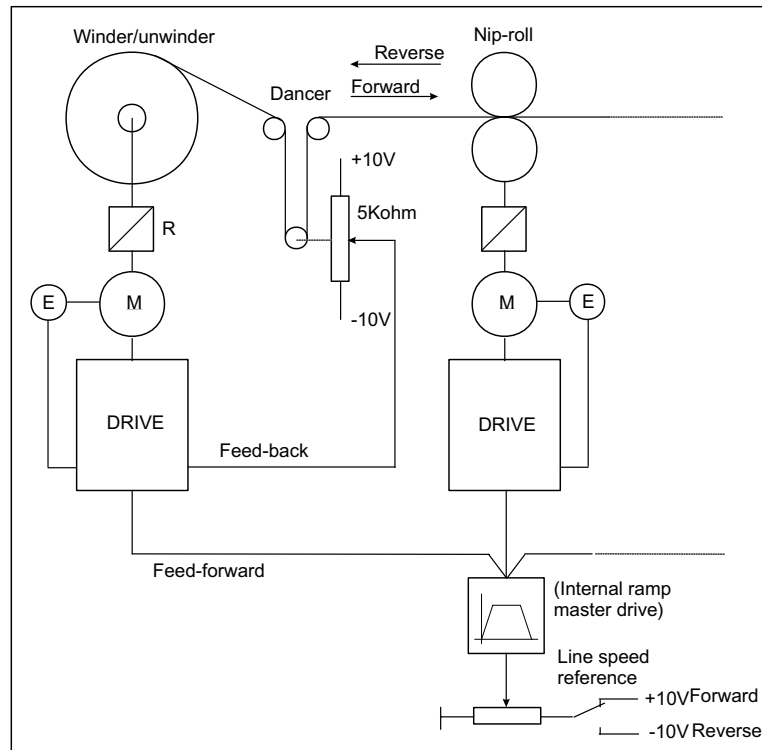


Figure 6.17.3.10 Winder/Unwinder control with dancer

Machine data:

Max. line speed = 400m/min

Rated speed of the motor (winder/unwinder) $V_n = 3000\text{rpm}$

Max. diameter of the winder/unwinder = 700mm

Min. diameter of the winder/unwinder = 100mm

Reduction ratio (motor-gear) = 0.5

One pitch dancer

Dancer distance from the lower limit switch to the position of electric 0 = 160mm

The winder/unwinder drive must be sent analog signals specifying line speed, position of the dancer and digital commands enabling the PID control.

The regulator output will be sent to speed reference 1.

Drive setting: (parameters regarding the PID function)

Input/output.

Set **Analog input 1** as input for the wiper of the dancer.

Analog input 1 / Select input 1 = PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on an analog input, it will be necessary to pass it through a parameter **PAD 0.....PAD 15** because it is not in the list of high priority parameters.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** to enable the input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** to enable the input of the PI block of the PID

Digital input 2 = Enable PD PID

Set **Digital input 3** to enable the calculation function of initial diameter.

Digital input 3 = Diameter calc

Set **Digital output 1** to signal "calculation of starting diameter".

Digital output 1 = Diameter calc st

Parameters

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as the parameter of the feed-forward on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of the paragraph 10.4. "List of high-priority parameters" (**PAD 0** had the decimal number 503). To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **Gain source** and **PID out scale** so that the max. analog value on **Analog input 2** without the PID correction (**Enable PD PID** = Disable), will be the speed of the motor in conditions of minimum diameter and max. line speed.

Calculation of the motor speed in the condition mentioned above:

$$V_p = \pi \times \Phi_{\min} \times \omega \times R$$

where:

V_p = peripheral speed of the winder = line speed

$\Phi_{\min}$ = min. diameter of the winder [m]

ω = angular speed of the motor [rpm]

R = reduction ratio motor-gear

$$\omega = V_p / \pi \times \Phi_{\min} \times R = 400 / (\pi \times 0.1 \times 0.5) = 2546\text{rpm} = \text{about } 2550\text{rpm}$$

Maintaining a 15% margin on the saturation limit of the regulator (10,000 count), it is necessary to set **PID source Gain** so that **Feed-fwd PID** reaches 85% of its max. value with the max analog value on Analog Input 2.

When an analog input is set on a PAD parameter, 10V will equal 2047.

So:

$$\text{PID source Gain} = (\text{max Feed-fwd PID} \times 85\%) / \text{max PAD 0} = (10,000 \times 0.85) / 2047 = 4.153$$

The speed reference of the motor is set as $RPM \times 4$, so program as follows:

$$\text{PID out scale} = (2550 \times 4) / (10,000 \times 0.85) = \underline{1.2}$$

Set **PID target** as 1 **Speed ref 1**.

Note!

When the ramp function has been enabled, **Speed ref 1** is not available. To keep it available it is necessary to set the parameter **Enable ramp** = Disable.

The **PID target** must now be set to the correct parameter number, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*" (**Speed ref 1** has the decimal number 42).

To obtain the correct value the parameter number must be added the decimal number 8192 (fixed offset):

$$\text{PID source} = (8192 + 42) = \underline{8234}$$

Set **PI central v sel** = 0.

Using this procedure it is possible to calculate the initial diameter and store it in memory in case the drive switched off. As previously stated, the procedure determines the theoretical multiplier factor (**PI output PID**) of feed-forward as relation of the diameter calculated. This is necessary in order to send to the drive the correct angular value speed

.

Note!

When **PI central v sel** = 0 has been selected and the the PI block has been disabled, the system keeps in memory the last value calculated for **PI output PID**.

So configure:

Digital input 4 = PI central v S0

PI central v 1 = 1.00

Bringing the digital input to logical high level, the **PI output PID** will be reset.

Set **PI top lim** and **PI bottom lim** according to the ratio of the diameters.

Parameters **PI top lim** and **PI bottom lim** can be considered as multiplier factors, max. and min. of the feed-forward. Considering that the angular speed of the motor and the corresponding reference change inversely with the unwinder/winder diameter;

Set:

PI top lim = 1

PI bottom lim = $\Phi_{\min} / \Phi_{\max} = 100 / 700 = 0.14$

Below is an explanation of the above settings.

Calculation of the angular speed of the motor:

$$\omega_{\max.} = V_l / (\pi \times \Phi_{\min} \times R)$$

and

$$\omega_{\min} = V_l / (\pi \times \Phi_{\max.} \times R)$$

where:

$\omega_{\max.}$ = angular speed of the motor with min. diameter [rpm]

$\omega_{\min}$ = angular speed of the motor with max. diameter [rpm]

V_l = line speed

$\Phi_{\min}$ = min. diameter of the core[m]

$\Phi_{\max.}$ = max. diameter of the core[m]

R = gear reduction ratio of the motor-winder/unwinder

So: $\omega_{\max.} / \omega_{\min} = \Phi_{\max.} / \Phi_{\min}$

from which

$$\omega_{\min} = (\Phi_{\min} / \Phi_{\max}) \times \omega_{\max.}$$

Considering that the **PI top lim** and **PI bottom lim** parameters can be considered as multiplier factors (max. and min.) of the feed-forward:

Multiplying the feed-forward by **PI top lim** = 1 gives the max. speed reference with minimum diameter.

Multiplying the feed-forward by **PI bottom lim** = 0.14, gives the min. speed reference with max. diameter.

This application operates by using the proportional-integral regulator.

The gains of a single component will be experimentally set with material in the machine. It is possible to begin the tests with the values below:

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 8%

Set **PD P gain PID** = 5%

In this case, use the derivative component for forcing the regulator output during velocity changes of the system. Programming for example:

PD D gain PID = 20%

PD D filter PID = 20ms

In case it is necessary to supply a reference to a follower drive, program **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

Parameters regarding the calculation function of the initial diameter

This function is always necessary when one has to control an unwinder or when the starting diameter is unknown.

Set **Positioning spd** at the rpm that the tune-up of the dancer has to be done. For example:

Positioning spd = 15rpm

The polarity of the reference assigned to **Positioning speed** will be equal to one functioning as a winder.

If for example one has to control an unwinder and the speed reference is positive, assign **Positioning spd** a negative value.

Set **Max deviation** at a value slightly lower than the one corresponding to the position of max. mechanical travel allowed by the dancer.

During start-up, it is always necessary to calibrate the analog inputs to the drive. In particular analog input 1, with the dancer in its lowest position. This position is automatically assigned the value 10,000. So in order to guarantee a precise calculation it might be re-assigned as follows:

Max deviation = 8000 (Default value)

Set **Gear box ratio** equal to the reduction ratio between the motor and the winder/unwinder:

Gear box ratio = 0.5

Set **Dancer constant** to the value in mm corresponding to the total accumulation of material in the dancer:

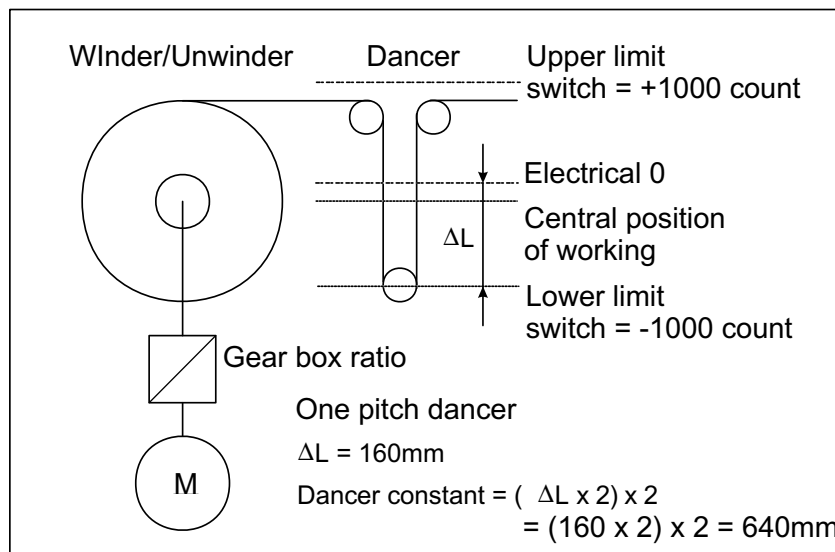


Figure 6.17.3.11: Diameter calculation

Measure of **Dancer constant**:

Set the keypad of the drive to the parameter **PID feed-back**.

Measure and multiply by 2 the distance between the lower mechanical fullrange and the position of the dancer so that the parameter **PID feed-back** will display 0 (position of electric 0).

As the dancer has only one pitch, multiply the above calculated value by 2.

In this case set:

Dancer constant = 640mm

Program **Minimum diameter** equal to the minimum value of the core diameter [cm]:

Minimum diameter = 10cm

Use of a diameter sensor

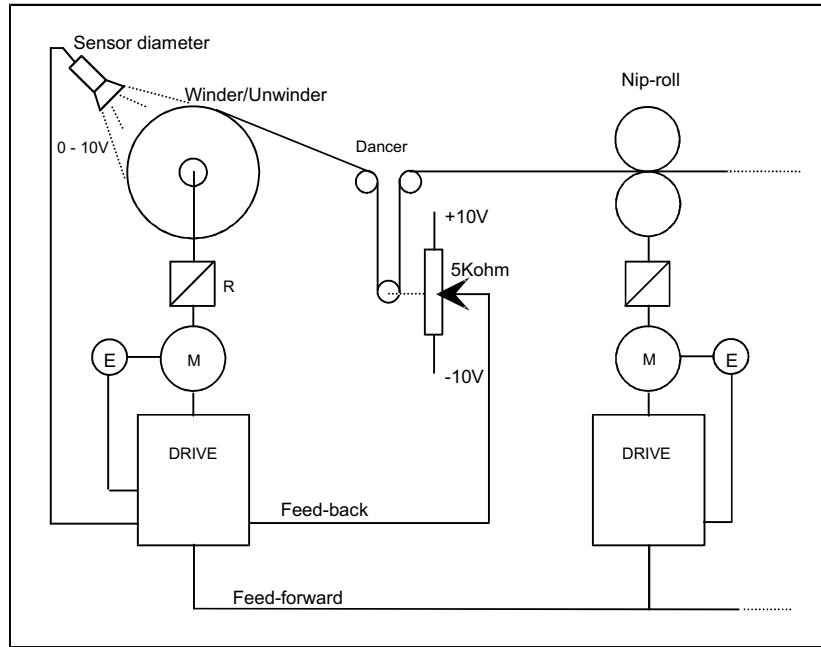


Figure 6.17.3.12 Winder/unwinder control with diameter sensor

The diameter sensor can be used in systems with automatic gear.

In these cases it is necessary to know the value of the starting diameter in order to calculate the angular speed of the motor.

The transducer must adjusted to supply a voltage signal proportional to the roll diameter.

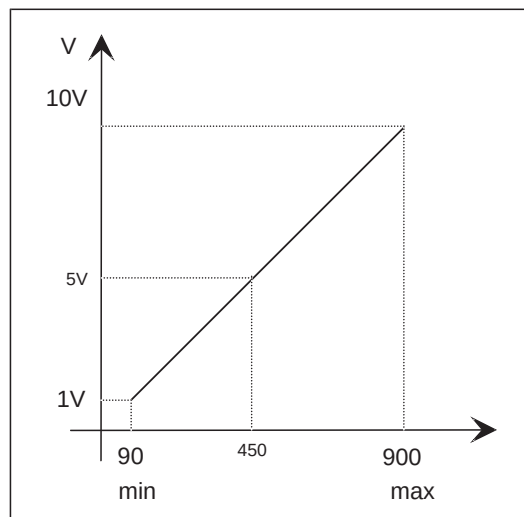


Figure 6.17.3.13: Relation between transducer signal and winder/unwinder diameter

Example:

$\Phi_{\min}$	= 90 mm	transducer output = 1V
$\Phi_{\max}$	= 900 mm	transducer output = 10V
Φ	= 450 mm	transducer output = 5V

The analog input to which the sensor is connected, must be programmed as **PI central V3**.

The parameter **PI central v sel**, must be set = 3.

When **Enable PI PID** = disable, the value of **PI central V3** is written in **PI output PID** and used as multiplier factor for feed-forward.

As previously described in the instruction book, the setting of **PI output PID** depends on the diameter ratio. Therefore the voltage signal proportional to the diameter will be automatically recalculated with the formula:

$$\text{PI central V3} = (\Phi_0 / \Phi_1)$$

Where: Φ_0 = minimum winder diameter

Φ_1 = actual diameter

Set the resolution of this parameter to 3 places beyond the decimal point.

Note !

During start-up, it is necessary to verify that the signal coming from the sensor is proportional to the diameter and that its maximum value is equal to 10V (then carry out the autotune of the analog input).

It is also necessary to verify that **PI top lim** and **PI bottom lim** have been programmed

Pressure control for pumps and extruders

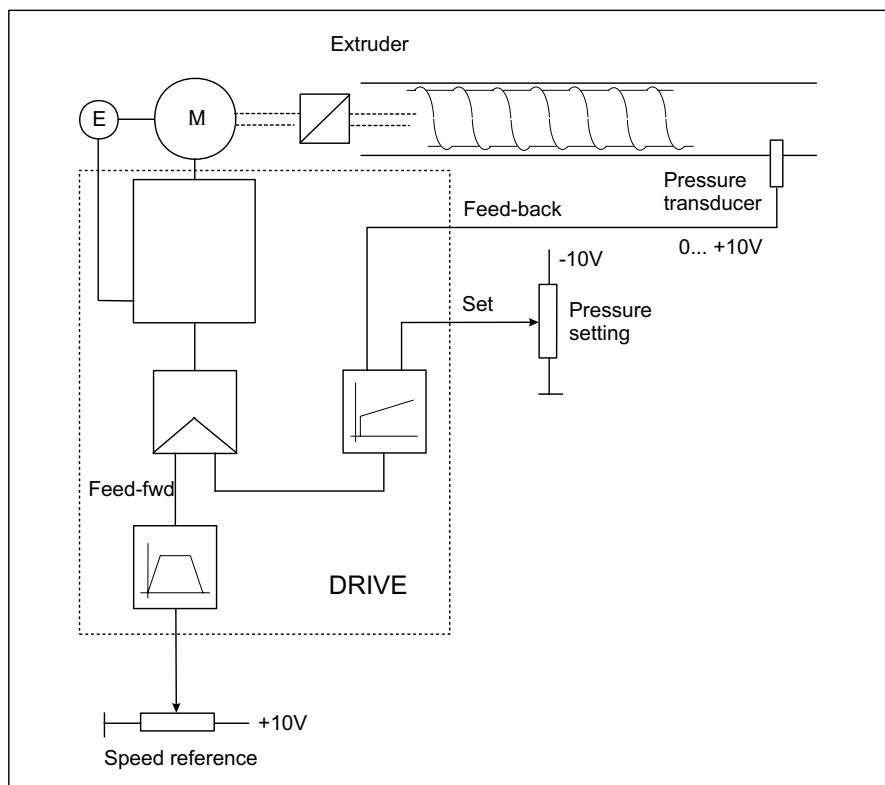


Figure 6.17.3.14: Pressure control for pumps and extruder

Machine Data:

Nominal speed of the extruder motor $V_n = 3000\text{rpm}$

Pressure transducer 0... +10V

The extruder drive must be sent analog signals specifying speed reference, the setting of the pressure transducer, the setting of the pressure reference (supplied between 0V... -10V) and the digital commands for PID control.

The regulator output must be sent to speed reference 1.

Setting of the drive: (parameters related to the PID function)

Input/output.

Set **Analog input 1** as input for the pressure transducer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as input for the ramp. The output of the ramp must be used as speed reference. (feed- forward).

Analog input 2 / Select input 2 = Ramp ref 1

Set **Analog input 3** as input for the pressure reference (**PID offset 0**).

Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** to enable the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** to enable the PD block of the PID

Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the motor nominal speed .

Speed base value = 3000rpm

Set **PID source** as **Ramp output**.

For **PID source** set the parameter number to which it will be associated, choosing it from the list of section 10.4. "*List of high priority parameters*" (**Ramp output** has the decimal number 113).

To obtain the correct value the decimal value 8192 (fixed offset) must be added to the parameter number:

PID source = $(8192 + 113) = \underline{8305}$

Set **PID source Gain** so that **Feed-fwd PID**, reaches 100% of its value = 10,000 when **Ramp output** reaches its maximum volume.

The ramp reference and its output automatically acquire their maximum value from the setting of **Speed base value**. It must be remembered that any parameter concerning the speed is defined as $RPM \times 4$.

So:

$$\text{PID source Gain} = \text{max Feed-fwd PID} / (\text{Speed base value} \times 4) = 10,000 / (3000 \times 4) = \underline{0.833}$$

Set **PID target** as **Speed ref 1**.

Note!

When the ramp function is enabled, **Speed ref 1** is not available. In order to make it available it is necessary to set the parameter **Enable ramp** = Disable. (This setting frees up the ramp function, but disconnects its output from the speed reference 1).

For **PID target**, set the parameter number to which it will be associated, choosing it from the list of the section 10.4. "*List of high priority parameters*" (**Speed ref 1** has the decimal number 42). To obtain the correct value, decimal value 8192 (fixed offset) must be added to the parameter number:

$$\text{PID target} = 8192 + 42 = \underline{8234}$$

Set **PID out scale** so that the maximum analog value on **Speed Ref 1** and **Analog input 2** (**Feed-fwd PID** = 10,000) with **Enable PI PID** and **Enable PD PID** = Disable, were equal to 3000rpm.

The **Speed ref 1** must be set as RPM x 4, then:

$$\text{PID out scale} = (3000 \times 4) / 10000 = \underline{1.2}$$

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In absence of a correction performed by the PI block of the regulator, the line reference speed (Feed-forward) must be multiplied x 1 and sent directly to the speed regulator of the drive.

In this application, the regulator performs a proportional-integral control.

Set **PI top limit** and **PI bottom limit** in order to obtain maximum correction of the PI block with 100% of the speed reference.

The parameters, **PI top limit** and **PI bottom limit** could be considered maximum and minimum multiplier factors of the feed-forward.

PI top limit = 1

PI bottom limit = 0

In this application the regulator uses a proportional-integral type of control.

The gains of the various components must be set with load on the machine. It is possible to start the test with the values below (default values):

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 20%

Set **PD P gain PID** = 10%

If necessary, use the derivative component for forcing the regulator output during velocity changes of the system,

example settings are:

PD D gain PID = 5%

PD D filter PID = 20ms

However, if possible, keep these parameters = 0.

6.17.3.11. Generic PID

Drive settings: (parameters for the PID function)

Input/output.

Set **Analog input 1** as the variable to be regulated (Feed-back).

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as offset signal (**PID offset 0**).

Analog input 2 / Select input 2 / PID offset 0

Set **Digital input 1** to enable the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** to enable the PD block of the PID

Digital input 2 = Enable PD PID

Parameters

If it necessary to use the regulator as a “Generic PID”, independent from the feed-forward function, the parameter **Feed-fwd PID** must be set to its maximum value. In order to do this it is necessary to go through a PAD parameter.

Set **PID source** to **PAD 0**.

For **PID source** set the parameter number to which it will be associated, choosing it from the list of the section 10.4. “*List of high priority parameters*” (**PAD 0** has the decimal number 503).

To obtain the correct value, the decimal value 8192 (fixed offset) must be added to the parameter number:

PID source = (8192 + 503) = 8695

Set **PAD 0** = 10,000 (The parameter **PAD 0** is found in the “Special Function” menu’).

Note:

Setting PAD 0 = -10,000, the output regulator polarity will be overwritten (10,000 is the max. value).

Set **PID source Gain** = 1

Set **PID target** with the parameter number that will be addressed in the regulator.

To obtain the correct value it must be added to the decimal value 8192.

The parameters that can be addressed are described in “List of high priority parameters” in section 10.4.

Set **PID out scale** according to input the parameter in the regulator that it is directed to.

From the section 10.4. “List of high priority parameters “:

The parameters relating to speed are expressed as **[SPD]**.

The parameters related to current are expressed as **[CURR]**.

Calculation of **PID out scale** when **PID target** is addressed to a parameter related to speed:

[SPD] = *RPM* x 4, so:

PID out scale = (max. speed x 4) / max. output PID = (max. speed x 4) / 10,000

Calculation of **PID out scale** when **PID target** is addressed on a parameter relative to the current (active current):

1[CURR] = [**Current norm** / (2¹⁵ x 2)] A_{RMS}

Current norm depends on the inverter size, it can be chosen from the following table:

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
6KAVI43F75	2.4	10.8
6KAVI43001	4	17.5
6KAVI43002	5.6	25.1
6KAVI43003	7.5	33.4
6KAVI43005	9.6	42.4
6KAVI43007	12.6	56.5
6KAVI43010	17.7	79
6KAVI43015	24.8	110.4
6KAVI43020	33	147.2
6KAVI43025	47	211
6KAVI43030	63	256.4
6KAVI43040	79	33.3
6KAVI43050	93	421.9
6KAVI43060	114	512.8
6KAVI43075	142	606.1
6KAVI43100	185	847.1
6KAVI43125	210	847.1
6KAVI43150	250	1129.9
6KAVI43200	324	1432.2

ga9349ai

Through the parameter **Full load curr** (FLC) in the CONFIGURATION menu, the user must define the motor current at full load.

The inverter calculates the magnetizing current value, **Magn working curr**, based on parameters **Base voltage**, **Base frequency** and motor plate data.

The active current of the motor is defined by the internal parameter (not accessible via keypad) “Full load torque current” (Flt 100mf), and calculated through the formula:

$$Flt\ 100mf = \sqrt{FLC^2 - I_{\mu_{work}}^2}$$

The percentage values of **Torque current ref** and **Torque current limit** are based on **Flt 100mf**.

The maximum value of the torque current can be defined as “Full load torque current” and it is calculated as:

$$\text{Full scale torque current} = \sqrt{FLC^2 - I_{\mu_{work}}^2} / CURR [\text{count}]$$

PID out scale = Full scale torque current / max. output PID = Full scale torque current / 10,000

Example:

Mains voltage = 400V Ambient temperature = 40°C (104°F)

Motor:

Nominal Voltage = 400V Nominal frequency = 50Hz

Nominal current = 6.8A Nominal speed = 1415rpm

Inverter type: 6KAVI43003

Switching frequency = standard

The output of the PID function is sent to the parameter **T current ref 2**.

After having carried out the base settings and selftuning of the drive from the MOTOR PARAMETER menu, it can be seen that **Magn working curr** = 3.2A.

(Although an approximation this number is also used as the **Magnetizing Current**).

Program the following in the CONFIGURATION menu:

Full load current = 6.8A

From the above table **Current norm** = 29.6A for an AVi3003 drive.

$$CURR = [\text{Current norm} / (2^{15} \times 2)] = 29.6 / 46340.95 = 0.0006387 = 6.387 \times 10^{-4} \text{ A}_{\text{RMS}}$$

$$\text{Full scale torque current} = \sqrt{FLC^2 - I_{\mu_{work}}^2} / CURR = \sqrt{6.8^2 - 3.2^2} / 6,387 \times 10^{-4} = 9394 [\text{count}]$$

PID out scale = Full scale torque current / max. output PID = 9394 / 10,000 = 0.939

With this configuration the PID output reaches its maximum value when the reference for the active current, **T current ref 2**, receives a value equal to the active nominal current of the motor.

It must be said that, in this way, the drive is not driven at its maximum. By increasing the value of **PID out scale** it is possible to control the motor in an overload condition.

If the application requires working in overload conditions, it is necessary to calculate the maximum admissible overload of the drive.

Inverter continuous current $I_{\text{cont}} = 7.5\text{A}$

$$\text{Full scale inverter torque current} = \sqrt{(I_{cont} \times 1.36)^2 - I_{\mu_{work}}^2} / CURR =$$

$$\sqrt{(7.5 \times 1.36)^2 - 3.2^2} / 6,387^{e-4} = 15163 \text{ [count]}$$

PID out scale = Full scale inverter torque current / max. output PID = 15163 / 10000 = 1.516

With this configuration the PID output receives its maximum value when the active current reference,

T current ref 2, gets the value corresponding to 161% of the active current of the motor (1.516 / 0.939 = 1.61)

Furthermore it is necessary to set **T current lim+** and **T current lim-** = 161%

Note!

The firmware of the drive does not retain the polarity of the value sent. For this reason, if it is necessary to address the regulator output parameters that are unipolar or "Unsigned", then set the PID output so that it can only be positive.

PID out. sign PID = Only positive

"Unsigned" parameters, for example the current limits **T current lim +** and **T current lim -**, are indicated in the "List of high priority parameters" with the symbol "U16".

Set **PI central v sel** = 1.

Set **PI central v 1** = 0

In this configuration, when the PID function is switched from "Disable" to "Enable" the regulator output starts from 0.

If it is necessary to retain the last value calculated when the machine is disabled, it will be necessary to use a digital input programmed as:

Digital input xx = PI central vs0

PI central v 1 = 0

When the digital input is at a low logic level (L), the last value calculated is stored. Applying a high logic level (H) will reset the value.

Set **PI top lim** and **PI bottom lim** in order to obtain a correction of the PID block equal to 100% of its maximum value.

PI top lim = 1

PI bottom lim = -1

In this configuration the PID block output will be either positive or negative.

Setting **PI top lim** = 0, the positive part is blocked.

Setting **PI bottom lim** = 0, the negative part is blocked.

The gains of the various components must be set experimentally with the motor loaded.

It is possible to start the test with the following values:

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 4%

Set **PD P gain PID** = 10%

If necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

However, if possible, keep these parameters = 0.

6.17.3.12. Application Notes:

Dynamic modification of the integral gain of the PI block

In standard dancer applications, where there is not a build up of material, the PI gains are set to a constant value. Where dancers are used in conjunction with material winding, the gains are a compromise between low gain settings at large diameter, and high gain settings at a small diameter. Using the drawing as an example, it can be seen that with a large diameter roll, the amount of material to move the dancer requires only a fraction of a turn. At a small diameter, or empty roll, the center of the roll must rotate a whole turn to move the same amount of material. Since the PI regulator is used to provide the correction in rpm to maintain the dancer position, having the gain set by a single value is inadequate.

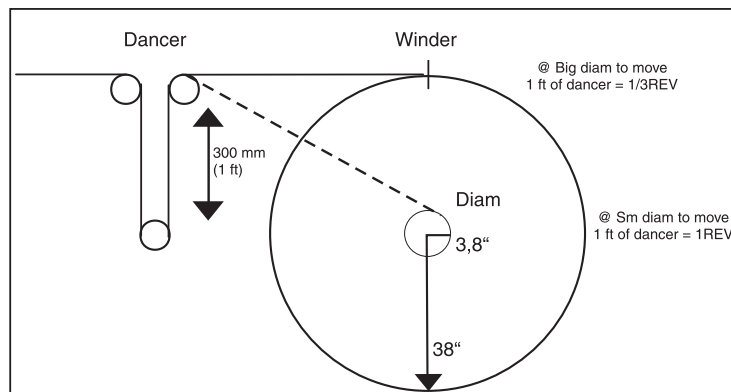


Figure 6.17.3.15 Example with small and large diameter

Better dancer control is realized if the gain of PI is modified dynamically based on diameter.

This can be accomplished using the LINKS function.

In case of higher ratio diameters, **PI I gain PID** could be dynamically changed according to the actual diameter. At the moment this functionality has not been implemented as a specific function.

For example to control a winder having a diameter ratio of 1/10. The function LINK 1 is used to generate a correlation between the diameter and the value of the integral component of the PI block.

The integral component of the regulator must be inversely proportional to the diameter.

The value of the parameter **PI output PID** already follows this behavior, in fact it changes according to the relation Φ_0/Φ_{ACT}

Where: Φ_0 = minimum winder diameter

Φ_{ACT} = actual winder diameter

The operation programmed in the LINK parameter is:

$$\text{PI output PID} \times \text{KI} = \text{PI I gain PID}$$

Where KI corresponds to the value of the integral component during the minimum diameter condition.

Supposing that by testing it is determined that the system, during a condition of minimum diameter, is able to work at the maximum speed with a steady dancer in the electric zero position with **PI I gain PID** = 40%.

The LINK source must be directed to **PI output PID** [771]:

$$\text{Source link 1} = 8192 + 771 = 8963$$

The LINK destination must be directed to the value of the integral component= parameter **PI I gain PID** [764]:

$$\text{Destination link 1} = 8192 + 764 = 8956$$

The multiplier factor must be set to the value defined by the tests mentioned above:

$$\text{Mul gain link 1} = 40$$

It will be necessary to set:

$$\text{Div gain link 1} = 1000 *$$

$$\text{Input max link 1} = 1000 *$$

$$\text{Input min link 1} = 100 **$$

$$\text{Input offset link 1} = 0$$

$$\text{Output offset link 1} = 0$$

$$\text{Input absolute link 1} = \text{OFF}$$

* The value 1000 is defined by **PI top lim** which will be in this case = 1 (correspondent to a maximum value of **PI output PID** = 1000).

** The value 100 is defined by **PI bottom lim** which will be in this case = 0.1 (correspondent to a minimum value of **PI output PID** = 100).

With this configuration, at minimum diameter, it will correspond an integral gain = 40% and at maximum diameter it will correspond an integral gain = 4%. Between the two setpoints the gain will change with a hyperbolic characteristic.

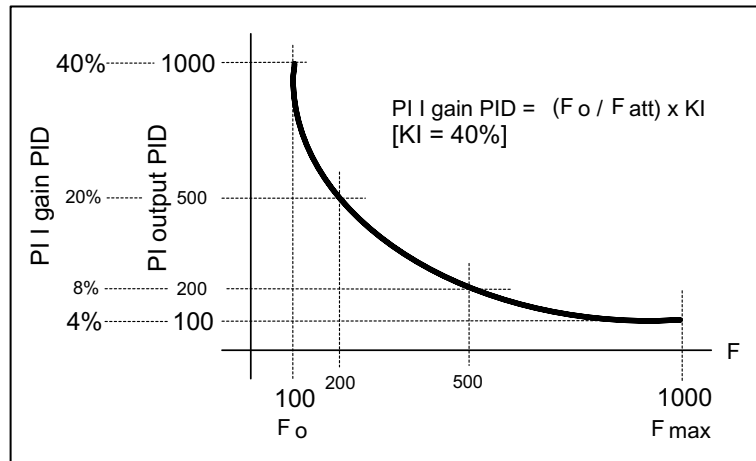


Figure 6.17.3.16: Relation between PI I gain PID and PI I output PID

The value of **PI I gain PID** will be displayed in the relative parameter of the submenu **PI controls**.

If necessary it is also possible to dynamically modify the proportional gain **P gain PID**.

6.18. Drivecom

The DRIVECOM profile #21, “Power transmission” defines the behavior of the drive if it is operated via the INTERBUS-S field bus. The DRIVECOM menu of the AV-300i Drive provides functions that were defined in the preceeding standards and which are required to operate a motor with the drive.

The AV-300i Drives, however, have a considerably greater range of functions than is defined here. Apart from a few exceptions the parameters provided in this menu are described elsewhere in more detail. This description will be limited to the Parameter function. See section 10, “Parameter lists”, for further information on the parameters discussed. When operating from a Bus, the parameters in the Drivecom group can also be accessed using the format and index specified earlier in the manual.

6.18.1. Control word, status word, malfunction code

DRIVECOM	
	Malfunction code
	Control word
	Status word

GA0890g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Malfunction code	57	0	65535		
Control word	55	0	65535	0	
Status word	56	0	65535		

GA6360g

Malfunction code Malfunction code according to DRIVECOM specification (Mandatory functions)
The code displayed indicates a particular failure. The meaning of the individual failures is described in section 6.12.9, "Programmable Alarms".

The code and the alarm are displayed in plain text in the event of a failure. The code is given in hexadecimal format.

Control word Control word according to DRIVECOM specification (Mandatory functions)

Status word Status word according to DRIVECOM specification (Mandatory functions).

6.18.2. Speed

DRIVECOM	
	Speed input var
	Speed ref var
	Act speed value
	Speed base value
	Speed input perc
	Percent ref var
	Act percentage

GA0900g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed input var [FF]	44	-2*P45	+2*P45	0	*
Speed ref var [FF]	115	-32768	+32767		**
Act speed value [FF]	119	-32768	+32767		***
Speed base value [FF]	45	1	16383	1500	
Speed input perc [%]	46	-32768	+32767	0	*
Percent ref var [%]	116	-32768	+32767		**
Act percentage [%]	120	-32768	+32767		***

GA6365g

* Factory set as Ramp ref 1 and connected to analog input 1 (terminal 1 and 2). See reference values

** Factory set as Speed ref 1 and connected to the ramp output. See reference values.

*** Factory set as Motor Speed and connected to analog output 1. See BASIC MENU

Speed input var 1st ramp reference value. The value to be entered is based on the factor function

Speed ref var 1st speed reference value. The value to be entered is based on the factor function

Act speed value Actual speed value in the units specified in the factor function.

Speed base value The Speed base value is given in the units specified in the factor function. It is the base value for all speed values given as a percentage (reference values, adaptive speed regulation ...). It is possible to modify the parameter only when the drive is disabled. (Enable drive = Disabled).

Speed input perc 1st ramp reference value. Defined as a percentage of the Speed base value

Percent ref var 1st speed reference value. Defined as a percentage of the Speed base value

Act percentage Actual speed value as a percentage of the Speed base value.

6.18.3. Speed limitation

DRIVECOM	
	Speed amount
	Speed min amount
	Speed max amount
	Speed min/max
	Speed min pos
	Speed max pos
	Speed min neg
	speed max neg

GA0910g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	$2^{32} - 1$	0	
Speed max amount [FF]	2	0	$2^{32} - 1$	2000	
Speed min pos [FF]	5	0	$2^{32} - 1$	0	
Speed max pos [FF]	3	0	$2^{32} - 1$	2000	
Speed min neg [FF]	6	0	$2^{32} - 1$	0	
Speed max neg [FF]	4	0	$2^{32} - 1$	2000	

G/

Speed min amount	Defines the minimum speed for both directions. A lower value than the defined value is not possible, regardless of the reference set. If the Speed min amount parameter is changed, the Speed min pos and Speed min neg parameters are set to the same value. If one of these two parameters is changed, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.
Speed max amount	Defines the maximum speed for both directions. The function effects the input of the speed regulator and therefore takes into account the reference value that comes from the ramp as well as the directly defined values (see Figure 6.5.2.1). If the Speed max amount is changed, the Speed max pos and Speed max neg parameters are set to the same value. If one of these two parameters is changed, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.
Speed min pos	Defines the minimum speed for the clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.5.1.1). The value to be entered is based on the factor function.
Speed max pos	Defines the maximum speed for the clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as those that are entered directly (see Figure 6.5.2.1). The value to be entered is based on the factor function.
Speed min neg	Defines the minimum speed for the counter clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.5.1.1). The value to be entered is based on the factor function.
Speed max neg	Defines the maximum speed for the counter clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as the those that are entered directly (see Figure 6.5.2.1). The value to be entered is based on the factor function.

6.18.4. Acceleration / Deceleration

DRIVECOM	
	Acceleration
	Acc delta speed
	Acc delta time
	Deceleration
	Dec delta speed
	Dec delta time
	Quick stop
	Qstp opt code
	Qstp delta speed
	Qstp delta time

GA0920g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	$2^{32} - 1$	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	$2^{32} - 1$	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	$2^{32} - 1$	100	
Qstp delta time [s]	38	0	65535	1	
Quick stop	343	0	1	No Quick stop	
Quick stop					
No Quick stop				(1)	
Quick opt code	713	-2	-1	Ramp stop	
Ramp stop				(-1)	
DC Braking curr					

GA6375g

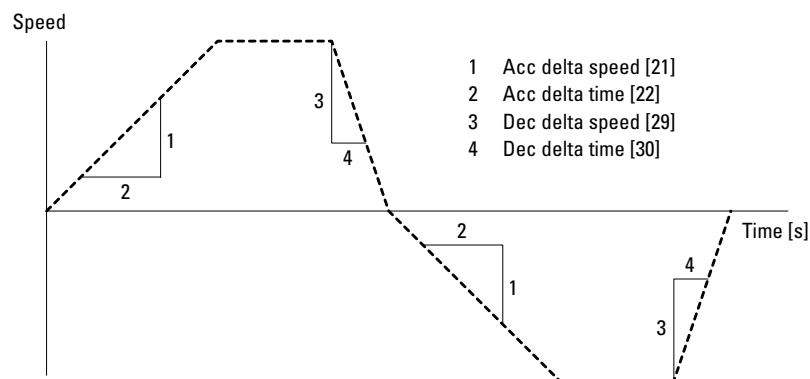


Figure 6.18.4.1: Accel and Decel

Acc delta speed

Has the same units as the ramp reference value and is based on the factor function.

Acc delta time

Is defined in seconds. The ramp output follows the reference value directly if "0" is entered.

Dec delta speed

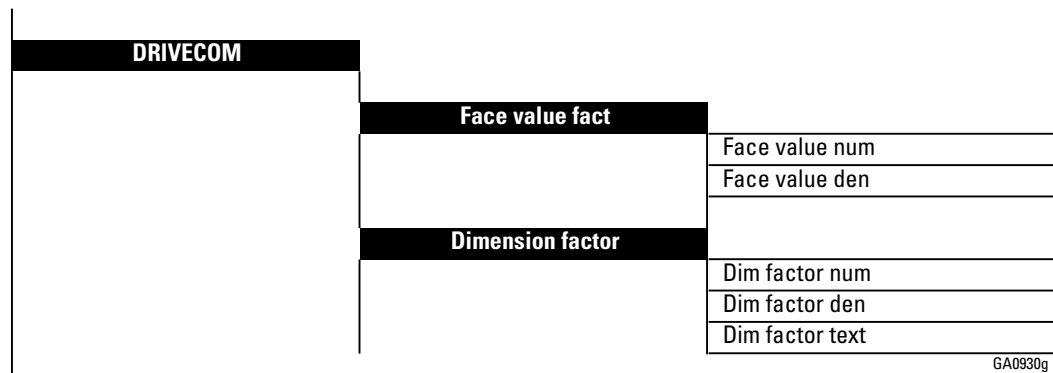
Has the same units as the ramp reference value and is based on the factor function.

Dec delta time

Is defined in seconds. If "0" is entered, the ramp output follows the reference value directly.

Qstp delta speed	Has the same units as the ramp reference value and is based on the factor function.
Qstp delta time	Is defined in seconds. If "0" is entered, the ramp output follows the reference value directly.
Quick stop	Activates the Quick stop ramp to stop the drive. If SELECT Qstp Opt code = Ramp stop, the drive is stopped with the ramp defined by Qstp Delta speed and Qstp delta time. If SELECT Qstp Opt Code = DC braking curr, the drive is stopped by injection of DC current (section 6.16.7)

The acceleration of the drive is defined as a quotient of the **Acc delta speed** and **Acc delta time** parameters. It is the same for both rotation directions of the motor. The deceleration of the drive is defined as a quotient of the **Dec delta speed** and **Dec delta time** parameters. It is the same for both rotation directions of the motor.



The factor function contains two functions, the Dimension factor and Face value factor. They are both expressed as fraction numbers.

The dimension factor enables the drive speed to be defined in a machine-related dimension, e.g. kg/h or m/min. Further information and examples are given in section 6.12, "Configuration".

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	+2 ³¹ -1	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

GA6380g

Dim factor num	Numerator of the dimension factor
Dim factor den	Denominator of the dimension factor
Dim factor text	Unit of the dimension factor. This text is shown in the display of the keypad when the reference value is shown. Possible characters: / % & + , - . 0...9 : < = > ? A...Z [] a...z
Face value num	Numerator of the reference value factor.
Face value den	Denominator of the reference value factor.

See example in section 6.12.8, "Dimension Factor, Face Value Factor on how to make the calculation.

6.19. Service

The SERVICE menu is reserved for the manufacturer's service personnel.

Section 7: Maintenance

7.1. Care

The AV-300i Drives must be installed according to local installation regulations. They do not require any special maintenance. They should not be cleaned with a wet or moist cloth. The power must be disconnected before cleaning.

7.2. Service

The screws on all terminals in the drive should be re-tightened two weeks after initial commissioning. This should be repeated once each year.

If the drives have been stored for more than three years, the capacitors in the DC Link circuit may have been impaired. Before commissioning these devices, it is advisable to regenerate the capacitors by connecting them to the voltage for two hours with the inverter disabled. After these precautions the drive is ready to be installed.

7.3. Repairs

Repairs of the drive should only be carried out by specialists qualified by the manufacturer.

If repair is carried out by the customer, the following points should be observed:

- When ordering spare parts state the drive model and serial number (nameplate). It is also useful to state the type of regulator card and the version of the operating system (on Firmware & Card revision level nameplate, see figure 2.1.3.2).
- When exchanging cards ensure that the position of switches and jumpers are observed! This especially applies to switch S3 on the regulation card.

Note !

The manufacturer does not accept any liability for any parts that are damaged due to the incorrect position of "switch S3".

7.4. Customer Service

For customer service please contact your sales office or General Electric Company at (540) 387-7595, 8a.m. to 5p.m. (EDT) weekdays. For emergency weekend service, call (540) 387-8080.

Notes

Section 8: Troubleshooting

The following describes possible drive faults and their causes. Use the Table of Contents to find information on a particular keyword.

<u>FAILURE ALARM</u>	<u>POSSIBLE CAUSES</u>
	Failure alarms on the keypad display
BU overload	The braking duty cycle is out of the allowed range
Bus loss	Failure in the Bus connection (only with interface Bus option card) Check the Bus connection EMC compatibility problem, check wiring.
Curr fbk loss	Failure in the connection between regulation card and TA transformer. Check the connection cable on XTA connector.
DSP error	Processor program error Switch off the drive and restart If unsuccessful: there is probably an internal fault. Contact your service office.
Enable seqerr	Drive is powered up or RESET* with ENABLE input connected to 24V (picked up) with the drive in "terminal mode". Refer to CONFIGURATION/Main Commands.
External fault	External failure, connected to terminal 15 If the "External fault" message is displayed, the connection may be missing between terminals 16 and 18 (reference point) and/or 15 and 19. If the "External fault" message is displayed: - The signal on terminal 15 is missing (15 ... 30 V to terminal 16). With an external voltage supply, "commons" must be connected together!
Failure supply	Fault in the voltage supply; the voltages are below the permitted value CAUTION: switch off voltage before removing terminal strips. In most cases the cause is in the external wiring. Pull out the plug-in terminal strips of the regulator card and enter the Reset command. If no other failures are reported, check your wiring for a short-circuit, check cable shields. If this does not correct the fault, try to RESET* once more. If still unsuccessful, the fault is probably internal. Contact your service office.

FAILURE**POSSIBLE CAUSES**

Heatsink ot	(For sizes from 30 Hp ... and higher). Temperature of the drive heatsink is too high. Failure of drive fans. Failure in the IGBT module in the power section. Fast overload current duty cycle.
Heatsink sensor	Ambient temperature too high. Failure of drive fans. Dirty heatsink.
Intake air ot	(For sizes from 30HP ... and higher). Temperature of the cooling air too high. Failure of drive fan(s). Air intake obstructed.
Interrupt error	An unused interrupt has occurred. Switch off drive and restart. If unsuccessful, the fault is probably internal. Contact your service office.
Module overtemp	(For sizes from 1HP to 20HP). Temperature of the IGBT module is too high. Failure of drive fans. Failure in the IGBT module in the power section. Fast overload current duty cycle.
Output stages	Internal Overcurrent failure of IGBT power section. Switch off drive and restart. If unsuccessful, contact your service office.
Overcurrent	Overcurrent in the motor circuit. Short-circuit or ground fault at the output of the drive. Current regulator tuned incorrectly. Message appears when switching on the drive: drive is connecting to a motor that is running. Auto capture function must be activated. Switch off drive and restart. If unsuccessful, contact your service office.
Overvoltage	Overvoltage on DC Bus due to energy regenerated from the motor. Lengthen deceleration ramp. If not possible: Use a BU... braking unit to increase the energy absorption capability.

FAILURE

POSSIBLE CAUSES

Overtemp Motor

Overtemperature of the motor (indicated via thermistor on terminals 78/79)

Cable between thermistor in motor and terminals 78 and 79 interrupted.

Overheating of motor:

- Load cycle too extreme.
- Ambient temperature at motor location too high.
- Motor has an external blower and it has failed.
- Motor does not have an external blower: load too large at low speeds. The cooling effect of the fan on the motor shaft is inadequate for this load cycle. Change the cycle or install an external blower.

Regulation ot

Temperature of the drive Regulator card too High.

Ambient temperature too high.

Speed fbk loss

Speed feedback loss

Encoder not connected, or incorrectly connected.

Select the **Enc 1 speed** parameter in the MONITOR\ Measurement \ Speed \ Speed in rpm menu.

- With the Drive disabled manually turn the motor clockwise (viewed from the front of the shaft). The value indicated must be positive.
- If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder.
- If the indicated value is negative, reverse the encoder connections. Exchange channel A+ and A- or B+ and B-

Undervoltage

Line voltage parameter incorrectly set. Remedy: set parameter correctly and then acknowledge the failure via RESET*.

The incoming voltage to the power section of the device is too low due to:

- too low an AC input voltage or extreme line dips
- poor cable connections (e.g. terminals on contactor, choke, filter ... not properly tightened). Remedy: check connections.

* To RESET the alarms press **[Escape]**. If **Enable** and **Start** commands are configured for terminal mode, remove both commands before "Reset".

Note:

The RESET alarm operation can be also configured for a digital input.

FAILURE**POSSIBLE CAUSES*****Other faults*****Motor not turning**

Failure alarm is displayed: see above. Once the error has been corrected enter the failure Reset command.

Keypad display is dark: AC voltage supply to terminals U1/V1/W1 missing or an internal fuse is faulty.

Enable and/or start command missing (Check configuration of the reg. terminals).

Drive not accepting commands: incorrect or wrong operating mode.

Protective device ahead of the power supply has tripped: protective device incorrectly sized or input jumper faulty.

The analog input used for the reference value was not assigned or assigned incorrectly.

Motor turning in the wrong direction.

Polarity of the reference signal incorrect .

Motor incorrectly connected. CAUTION: if the motor rotation is reversed the two encoder cables (A+ and A- or B+ and B-) have to be reversed also.

Motor not reaching nominal speed

Drive is encountering a speed limit. Remedy: check **Speed max amount**, **Speed max pos** and **Speed max neg** parameters

Drive working at current limit (LED limit) Possible causes:

- Motor overloaded
- Inverter sized too small
- Incorrect V/f characteristics set
- T current lim reduction selected via Torque reduct parameter

The entered value for the number of encoder pulses is too high. Remedy: check the parameter concerned "encoder 1 pulses" and set the correct value.

An override signal is reducing the main reference. Remedy: check the configuration

Speed base value parameter set too low.

Motor accelerates immediately to maximum speed

Reference set via analog input: Check whether the signal varies from min. to max. Potentiometer used for reference: Is there a 0V (common) connection present?

Encoder not connected, or incorrectly connected.

Select the **Enc 1 speed** parameter in the MONITOR \ Measurement \ Speed \ Speed in rpm menu.

- With the regulator disabled manually turn the motor clockwise (viewed from the front of the shaft). The value indicated must be positive.
- If the indicated value does not change or if random values are shown, check the power supply and the cabling to the encoder.
- If the indicated value is negative, reverse the encoder connections. Exchange channel A+ and A- or B+ and B-.

FAILURE

POSSIBLE CAUSES

Motor accelerates too slowly

- Ramp value incorrectly set
- Motor running at max. current
 - Motor overloaded
 - Drive sized too small
 - Incorrect V/f characteristics set

Motor decelerates too slowly

- Ramp value incorrectly set

Motor turns slowly, although reference value = Zero

- Minimum speed is entered in drive.
- Interference due to unused analog input. Remedy: set unused analog inputs to OFF
- Disconnect reference on the analog input
 - If drive now stands still, the effect is due to the cable resistance of the 0V (common) leg.
 - Use the offset compensation on the analog input. Set **Offset input xx** parameter so that the drive stands still.

Output voltage oscillates under load

The value for **Rotor resistance** is not correct. See section "Checking and manual tuning of rotor resistance for field oriented mode" in the AVi instruction book.

Motor not supplying the maximum torque or maximum output power

- The value for **Magnetizing curr** is less than required for the connected motor.
 - The ratio **Output voltage / Output frequency** in the MONITOR / Measurements menu should be approx. equal to the ratio of **Base voltage / Base frequency**.
 - Drive working at current limit.
 - Check whether the value for **Full load curr** in the CONFIGURATION menu is correctly set.
 - Check the value for the current limit.
 - The value for **Magnetizing curr** and/or **Rotor resistance** parameters is not correct. Optimize the tuning as described in the instruction book.

The speed during acceleration with maximum current is not linear

Reduce the **Speed I** and **Speed P** proportionally. If this does not lead to an improvement, optimize the regulator per the instruction book.

FAILURE**POSSIBLE CAUSES****Speed oscillating**

Check **Speed P** and **Speed I** parameter

If the operating point is in the constant HP range, check the **Flux P** and **Flux I** parameters.

Incorrect value for Rotor resistance.

Remedy: Optimize the tuning as described in the AVi instruction book.

Drive not reacting to adaptive speed regulation

Adaptive speed regulation not enabled. **Enable spd adap** = Enabled

Adap reference not assigned to an analog input.

Motor potentiometer function not executed

Function not enabled. **Enable motor pot** = Enabled

With operation via the terminal strip: **Motor pot up** and/or **Motor pot down** and **Motor pot sign** were not assigned to digital inputs.

Jog operation not possible

A start command is still present.

Function not enabled. **Enable jog** = Enabled

With operation via terminal strip: **Jog +** and/or **Jog -** were not assigned to digital inputs.

Internal speed reference values not actuated

Function not enabled. **Enab multi spd** = Enabled

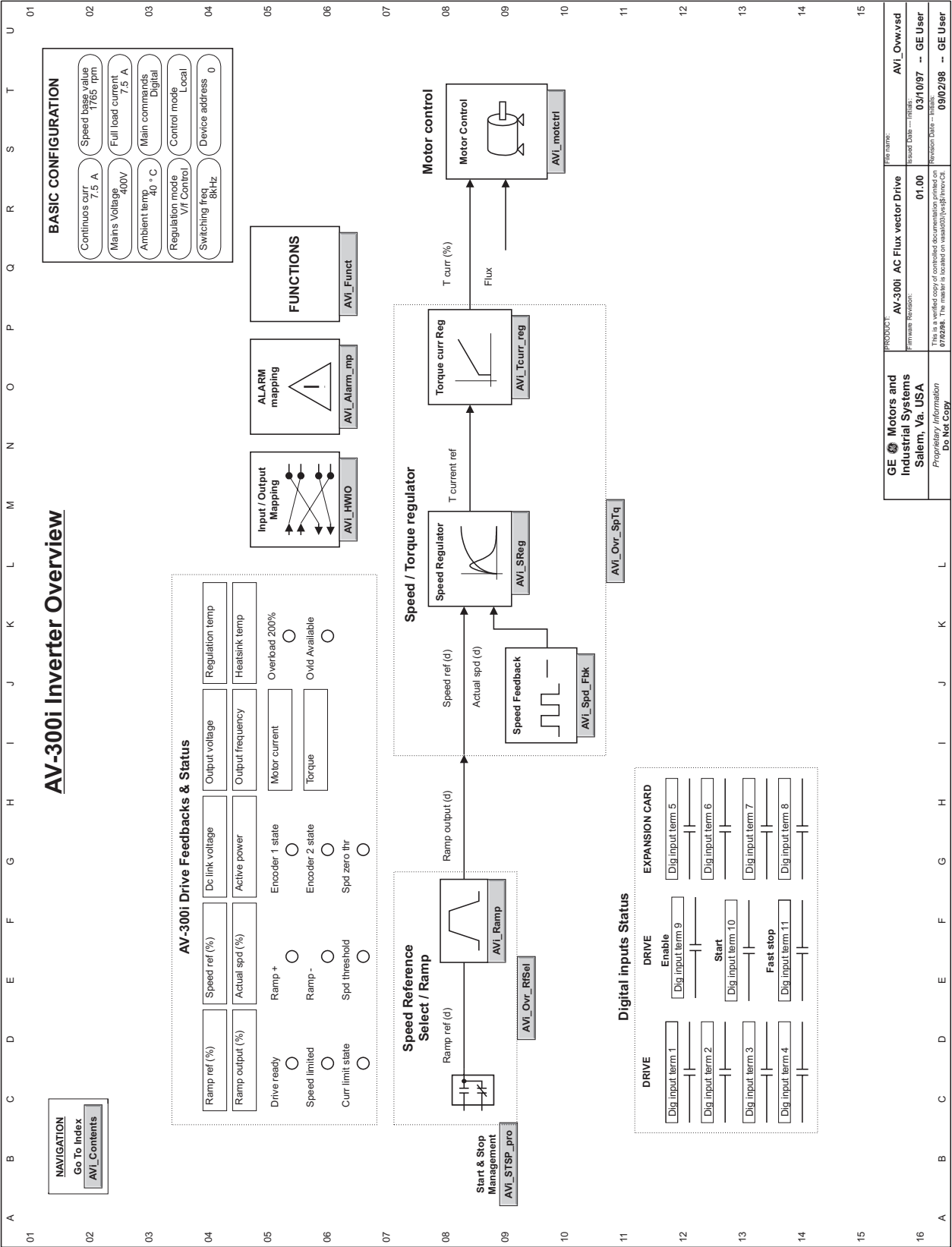
With operation via terminal strip: **Speed sel 0**, **Speed sel 1** and **Speed sel 2** were not assigned to digital inputs.

Multi-Ramp function not reacting

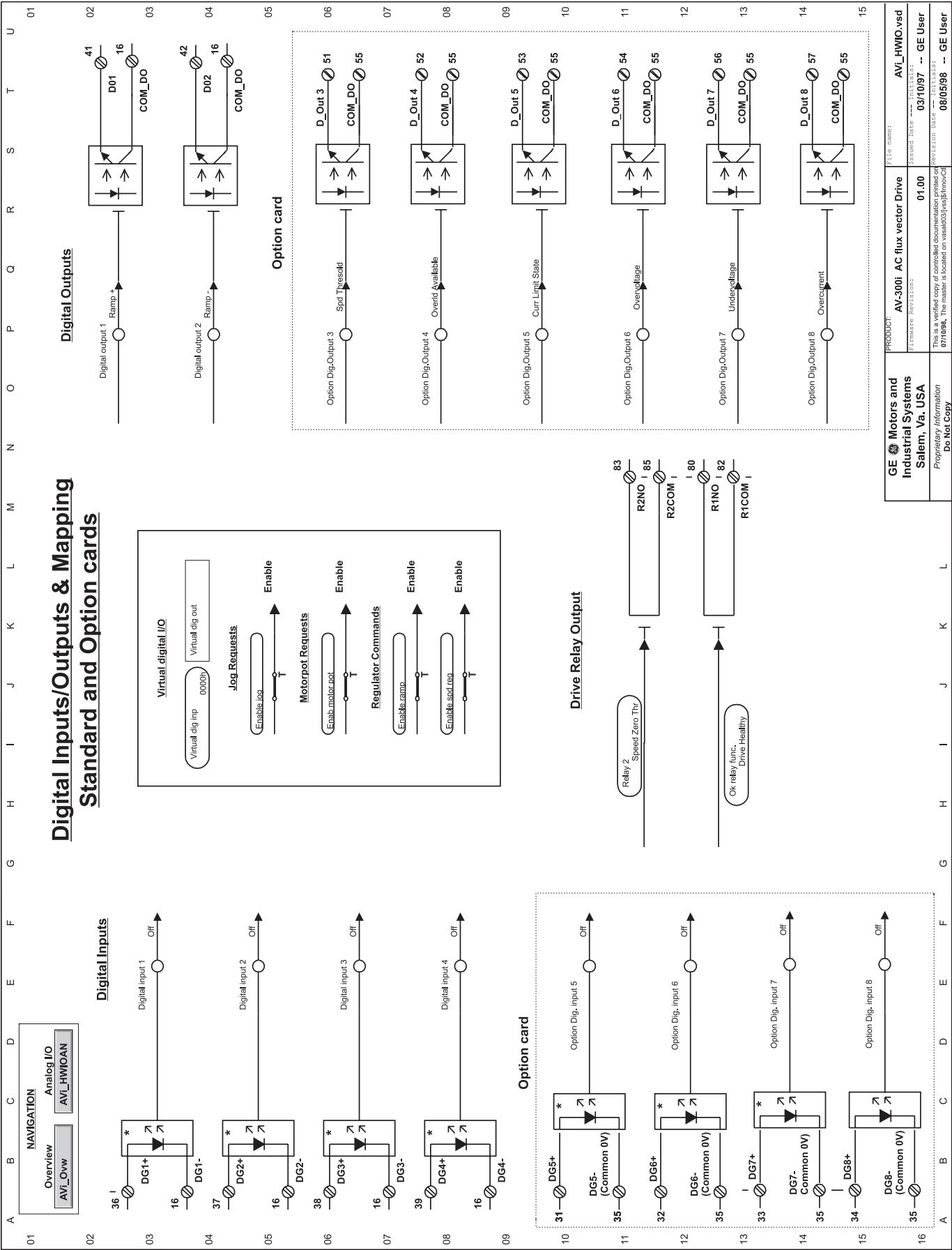
Function not enabled. **Enab multi rmp** = Enabled

With operation via terminal strip: **Ramp sel 0** and **Ramp sel 1** were not assigned to digital inputs.

Section 9: Block Diagram
AV-300i Drive Overview



Digital Inputs/Outputs & Mapping Standard and Option cards



Speed Reference generation

NAVIGATION
Back to Overview
AVI_Ovr

Jog +
Jog -
Speed Input
Ramp Input
Jog selection
AVI_Jog

Speed Draw
function

Speed ratio
10000

Speed ratio
10000

To Speed/Torque
Overview

AVI_Ovr_SpTq

Min Speed Limit

Speed limited

Speed min amount
0 rpm

Speed min pos
0 rpm

Speed min neg
0 rpm

Speed min neg
0 rpm

Ramp ref 1
0 rpm

Ramp ref 2
0 rpm

Ramp ref 1
0 rpm

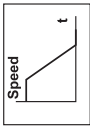
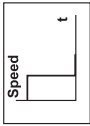
Ramp ref 2
0 rpm

Ramp ref 1
0 rpm

Ramp ref 2
0 rpm

Ramp ref 1
0 rpm

Ramp ref 2
0 rpm



Ramp Reference

AVI_Ramp

Zero

Ramp out = 0

Ramp out = 0

Ramp out = 0

Ramp out = 0

Ramp out = 0

Ramp out = 0

Ramp out = 0

Ramp out = 0



Zero

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0



Zero

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

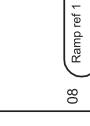
Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0



Zero

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0



Zero

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

Ramp in = 0

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Proprietary Information Do Not Copy	ESTIMATE Revision: 01.00	ISSUED DATE: 03/10/97
		Revision Date: 07/31/98
		GE User

Ramp reference Block

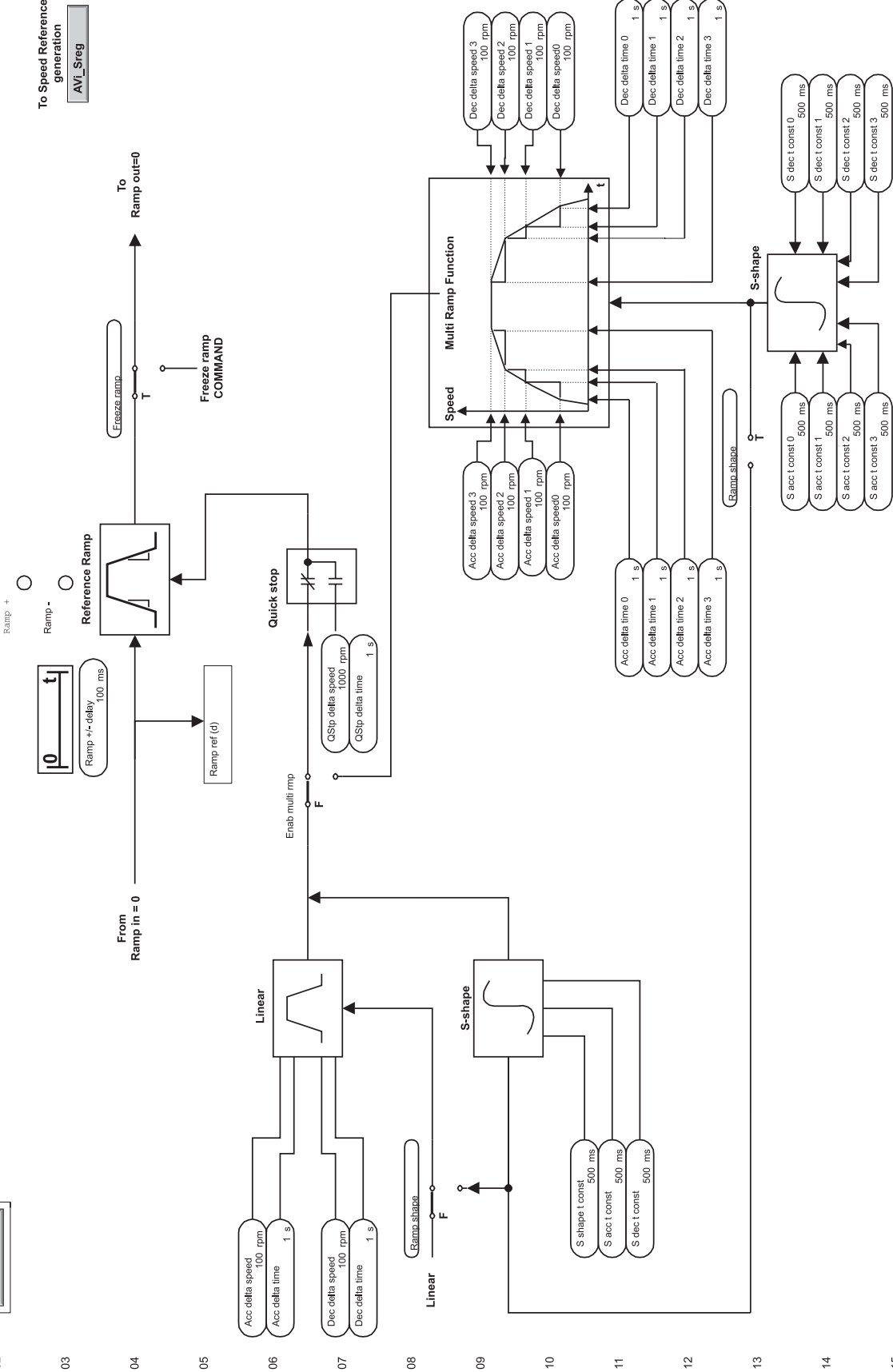
NAVIGATION

Back

AVI_Ovr_RfSel

To Speed Reference generation

AVI_Sreg



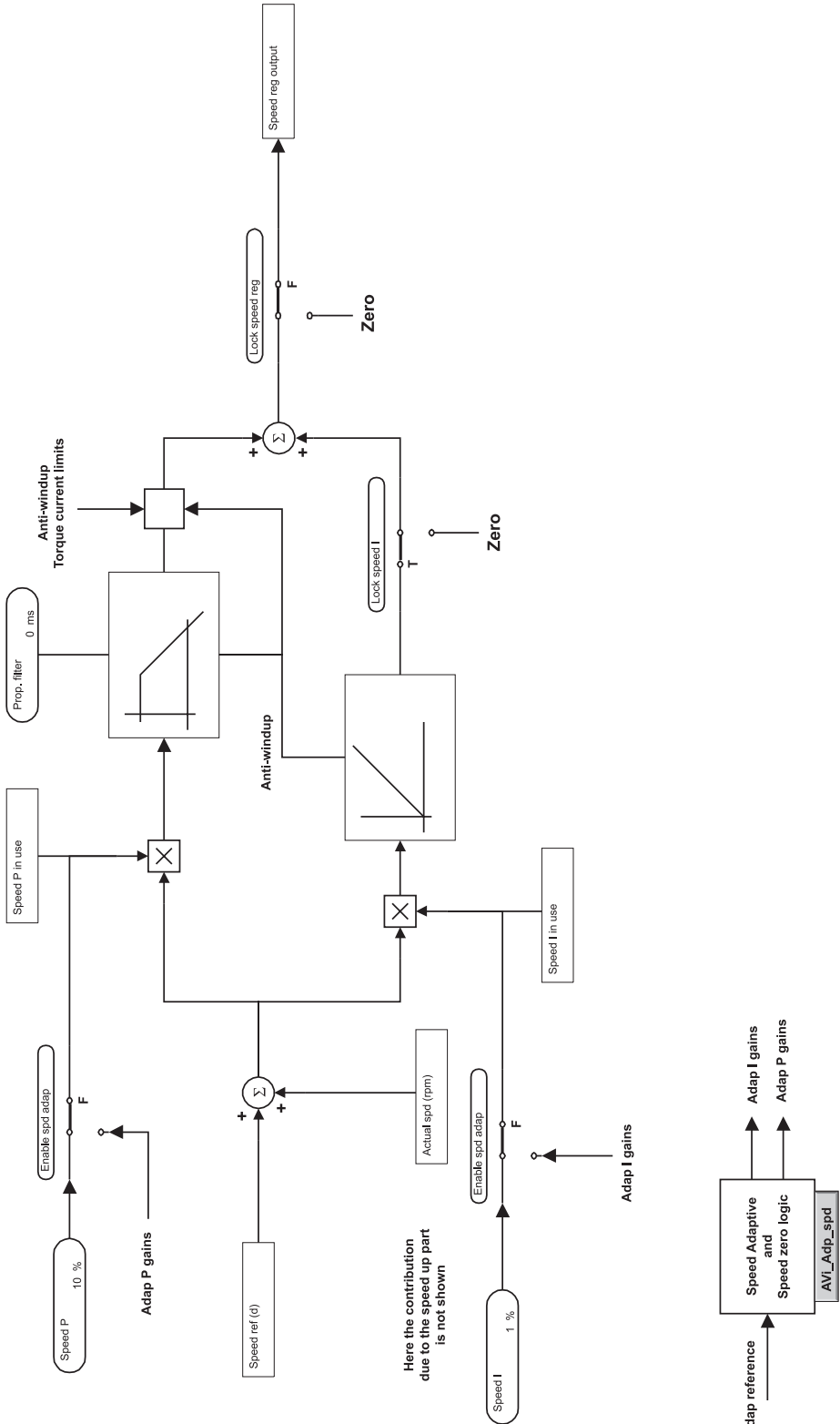
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				07/31/98 -- GE User	

Speed regulator PI part

NAVIGATION

Back to Overview

AVL_Sreg



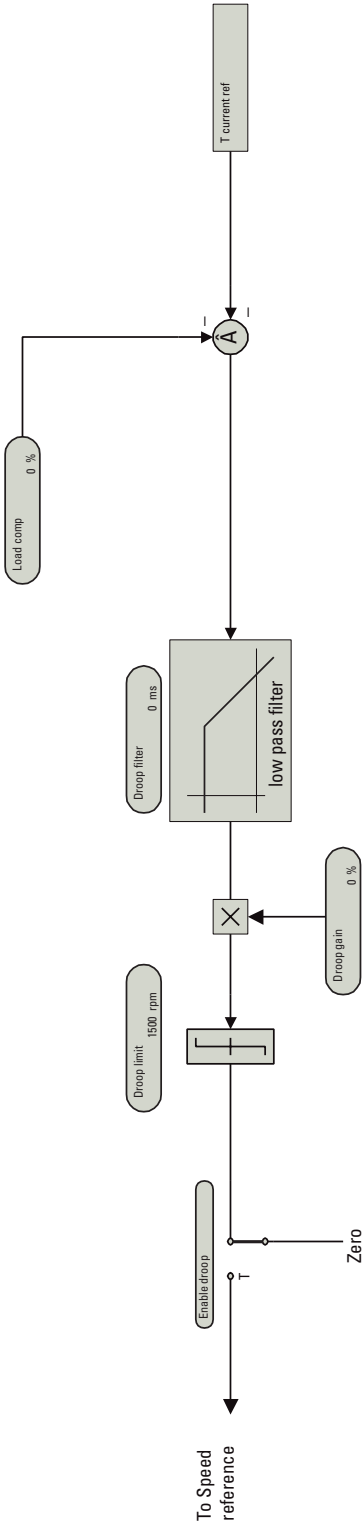
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Droop compensation

NAVIGATION

Back

AVi_Sreg



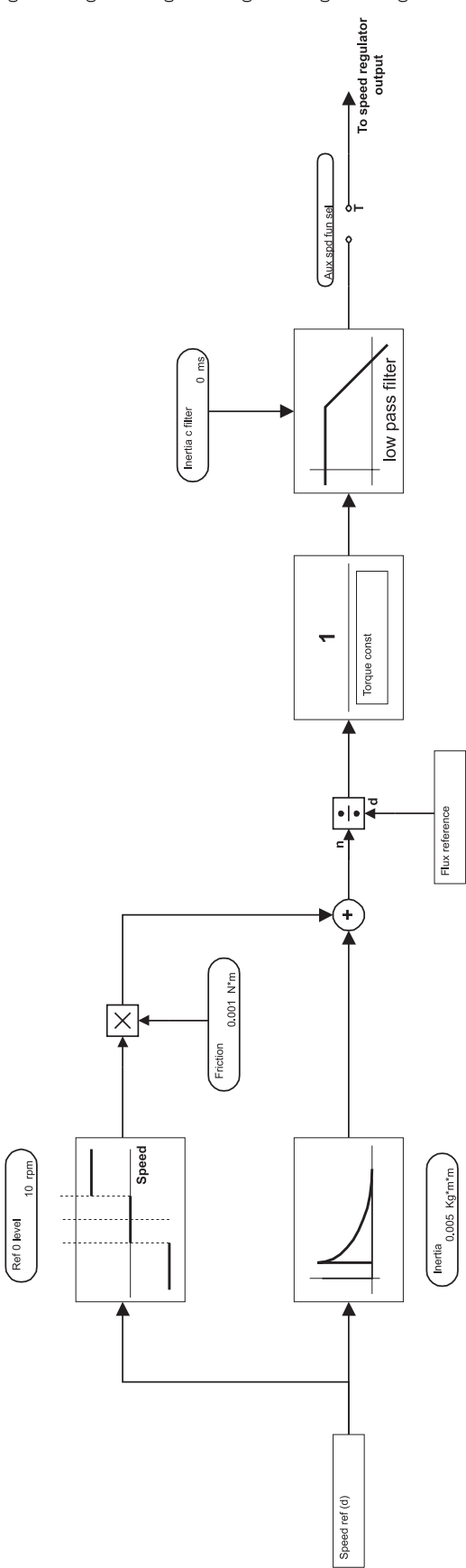
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																				Firmware Revision: 01.00										Issued Date -- Initials: 03/10/97 -- GE User									
										Proprietary information Do Not Copy										This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vaaid03jva@honeyCcl.										Revision Date -- Initials: 07/31/98 -- GE User									

Inertia/Loss compensation

NAVIGATION

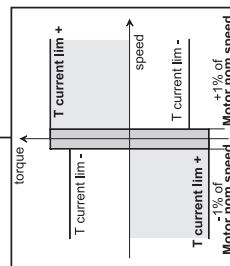
Back

AVI_Sreg



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	REVISION: 01.00		ISSUED DATE: 03/10/97
	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on versad03jres01mmov001		REVISION: 07/31/98

NAVIGATION
Back to Overview
AVi_Ovr_SpTq



Ovid Available	$L_{sqrt\_i\_accum}$	Overload 200%	$\emptyset$	Ovid not state	Motor cont curr 100 %	Trip time 50% 60 s

GE  Motors and Industrial Systems Salem, Va, USA	PRODUCT AV-3000 AC Flux vector Drive	File name: AVI_Tcurr_reg.yxd
PIRNAME Revision:	01.00	Issued Date 03/10/97
This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vsal033\pss\lrmovc01		Revision Date 07/31/98
Proprietary Information Do Not Copy		-- GE User

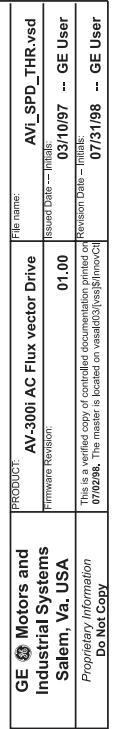
NAVIGATION

Overview

Go to functions

AVi_Ovw

AVi_Funct



Motor control

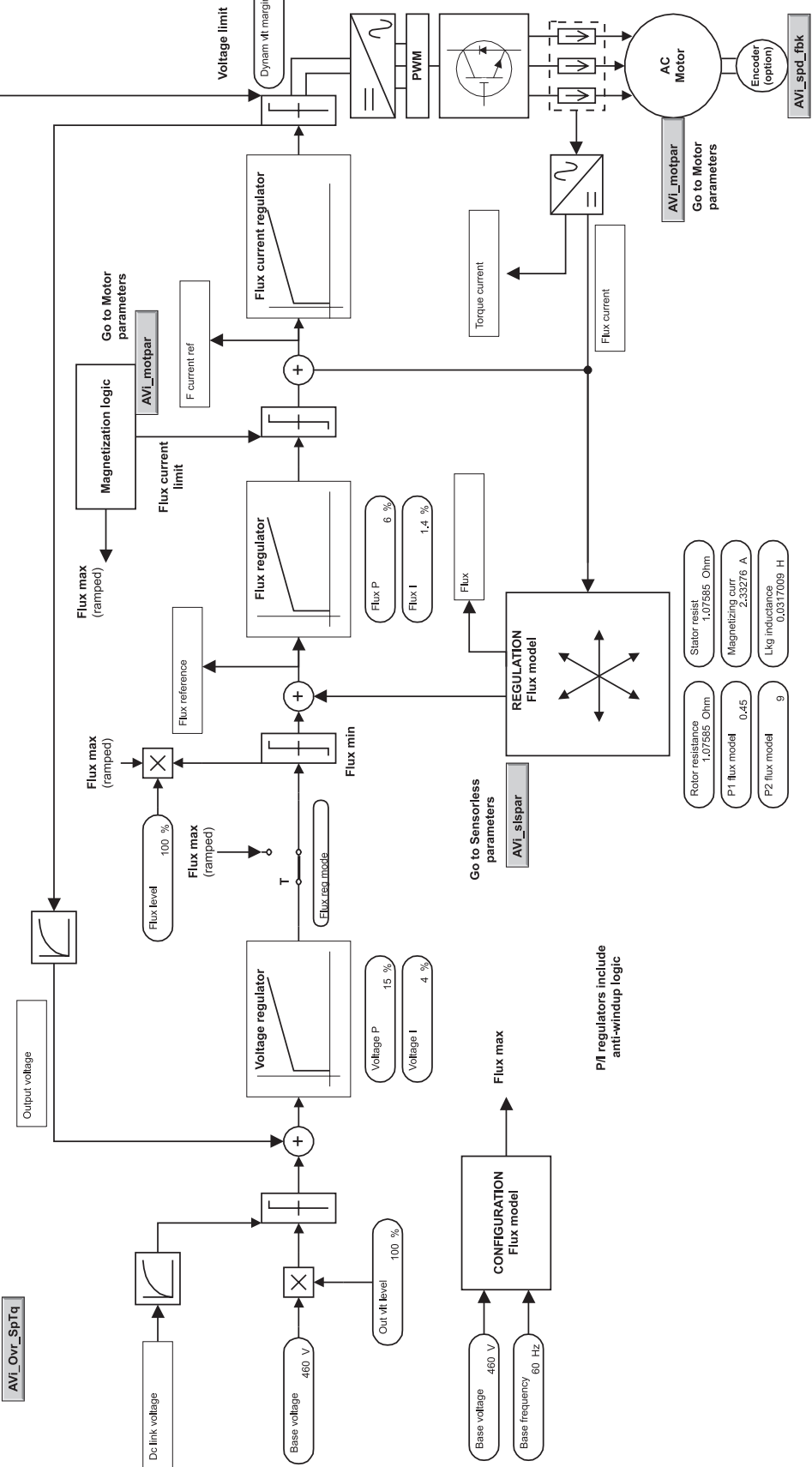
NAVIGATION

Back to Overview

AVI_Ovr

From Speed/Torque regulator

AVI_Ovr_SpTq



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	Firmware		Revision:	Assigned Date	03/10/97 -- GE User
	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vsad03jvsag5fmoov01		01.00	Revision	07/02/98 -- GE User
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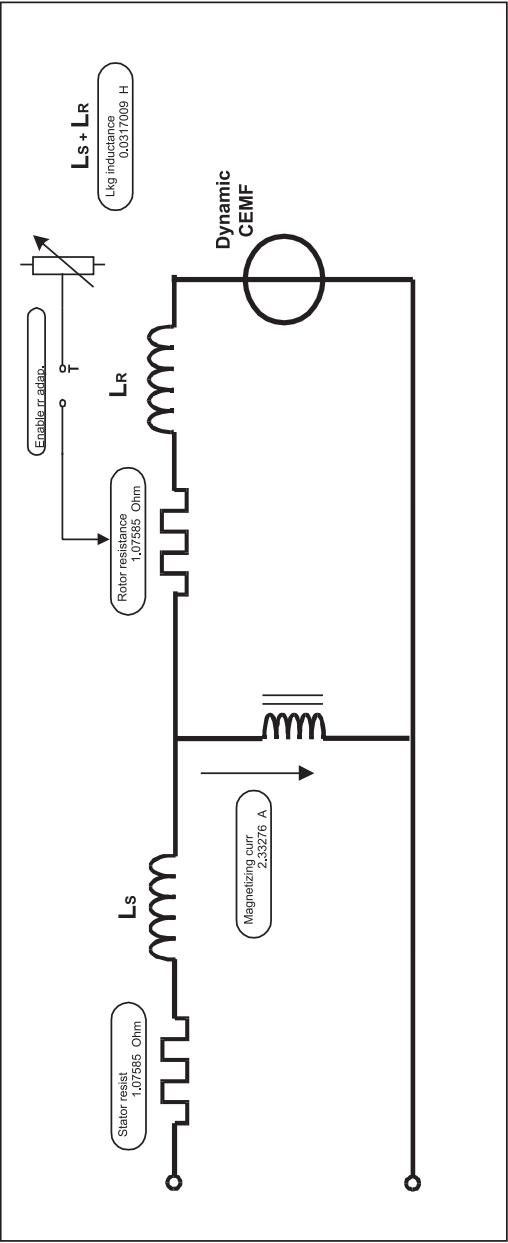
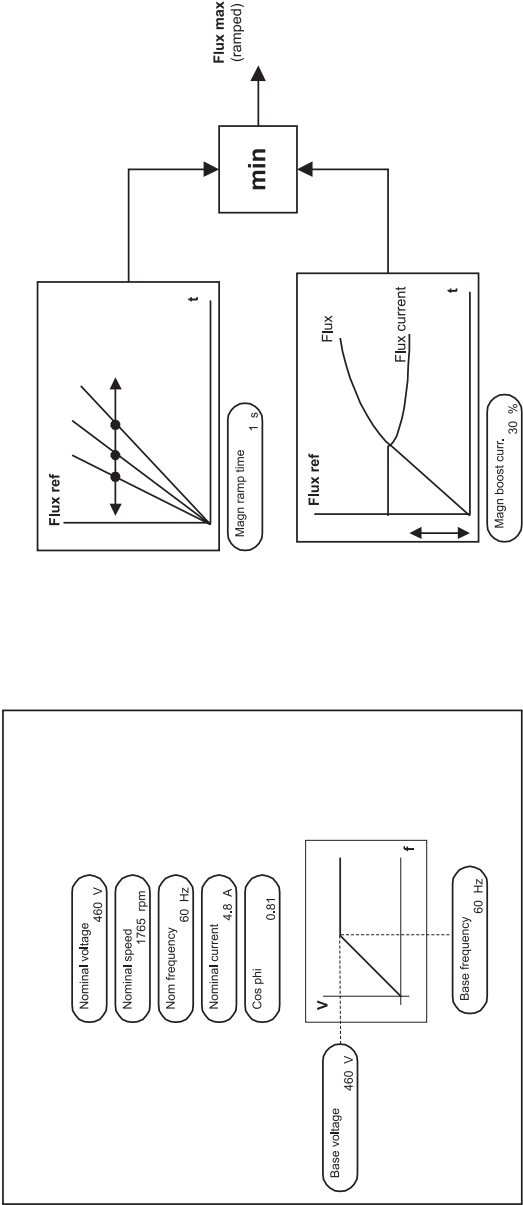
Motor parameters

NAVIGATION

Back to OverviewBack to mot ctrl

AVI_OvwAVI_motctrl

Magnetization init logic



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT:	AV-300i AC flux vector Drive	File name:
	PLM/MSD/REV/ISSUE:	01.00	AVI_motparvsvd
	Proprietary information Do Not Copy	03/10/97 -- GE User	07/31/98 -- GE User

SENSORLESS Parameters

NAVIGATION

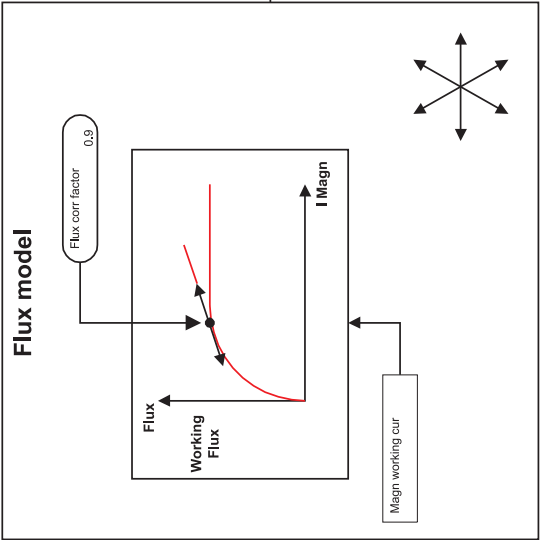
Overview

Back to Mot control

AVI_Ovw

AVI_motctrl

Regulation mode
V/f Control



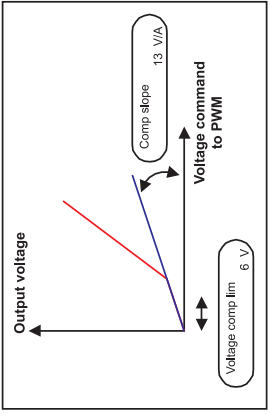
Low speed factor
5000

Slr speed filter
0.01 s

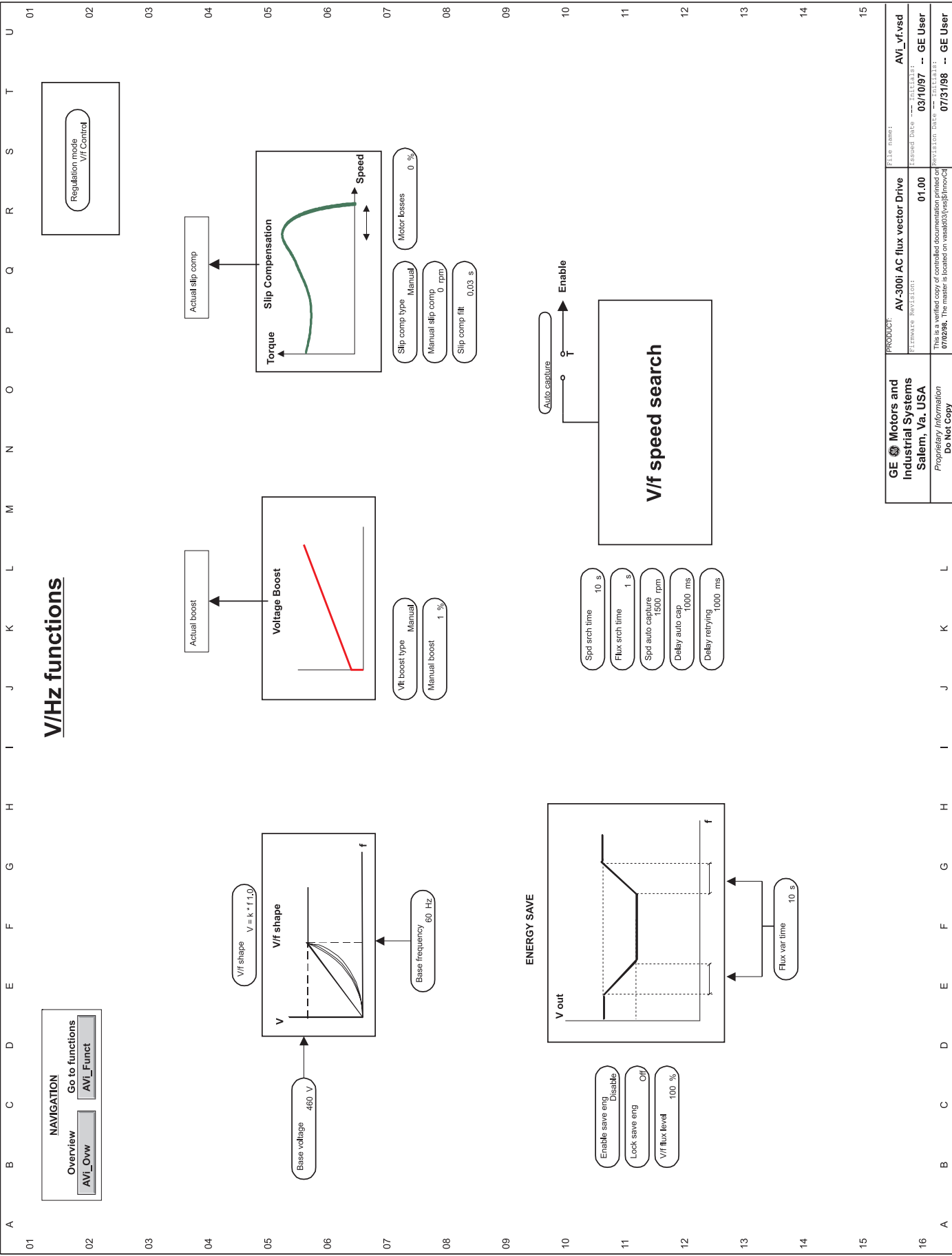
Estimated speed
for Sensorless mode



Dead time compensation



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT	AV-300i AC flux vector Drive	File name:	AVI_slspar.vsd
Proprietary Information Do Not Copy	Firmware Revision:	01.00	Issued Date	03/10/97 -- GE User
			Revision Date	07/02/98 -- GE User



GE Motors and Industrial Systems
Salem, Va, USA

Proprietary information
Do Not Copy

PRODUCT: AV-300i AC flux vector Drive

File name: AVI_vf.vsd

Estimate Revision: 01.00

Issued Date: 03/10/97

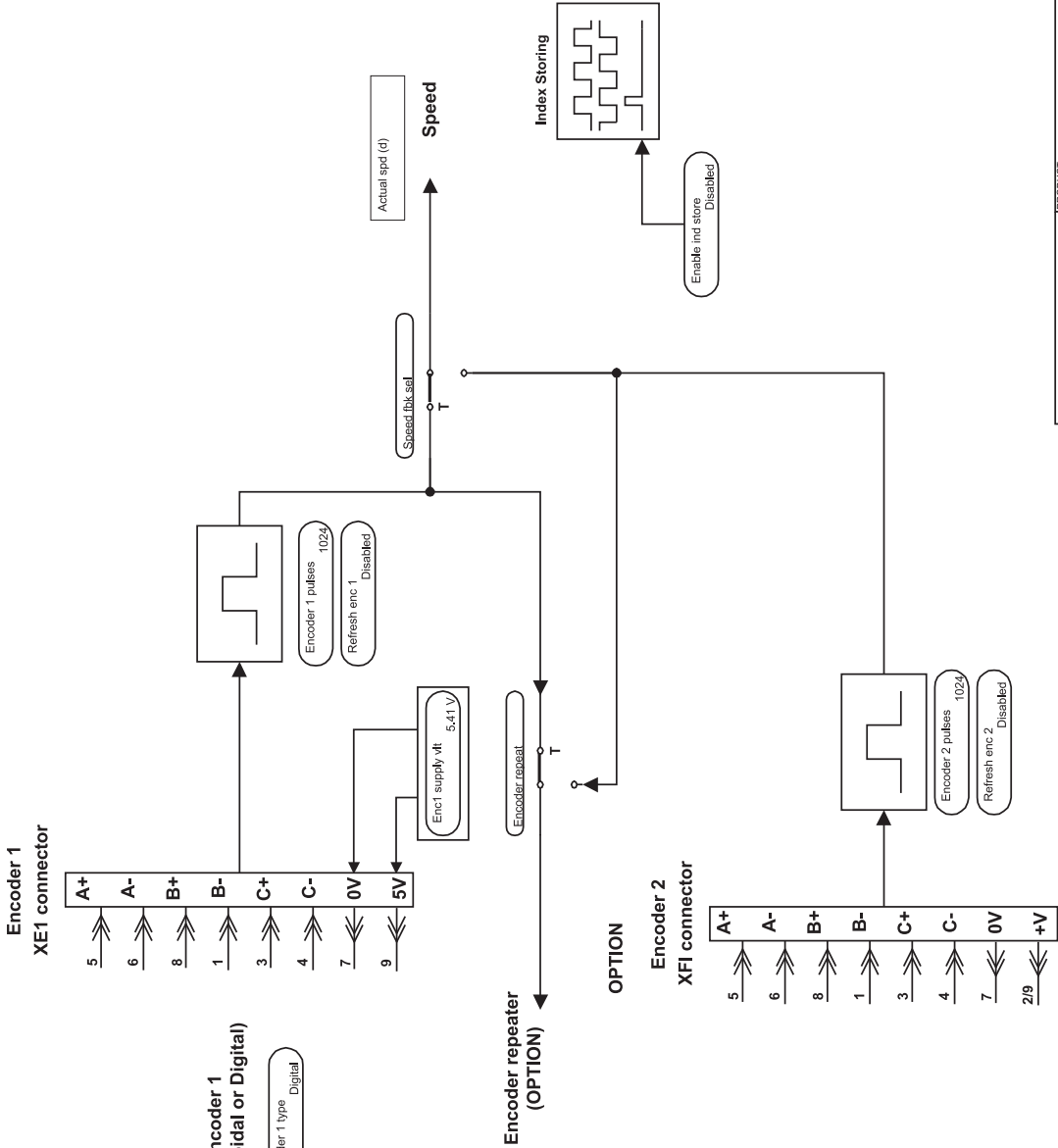
Initials: GE User

Revision Date: 07/31/98

Initials: GE User

Speed Feedback

Motor Encoder Setup



NAVIGATION

Back to Overview Go to motor control
AVI_Ovr_SpTq AVI_motctrl

GE Motors and Industrial Systems Salem, Va. USA <i>Proprietary Information</i> Do Not Copy	PRODUCT AV-300i AC flux vector Drive Firmware Revision: 01.00	File name: AVI_spd_fbk.vsd Issued Date: 03/10/97 Revision: 07/31/98

Speed adaptive and Speed zero logic

NAVIGATION

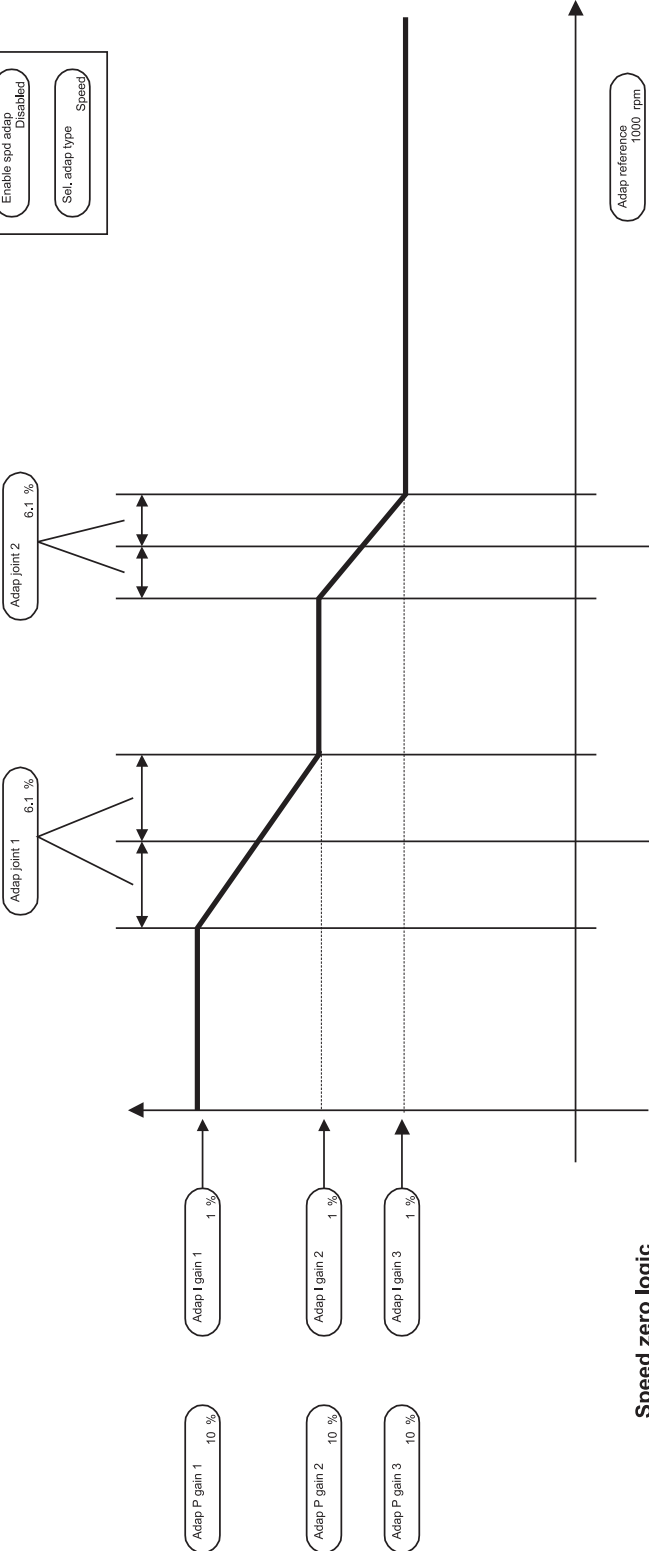
Back to overview

AVI_Sreg

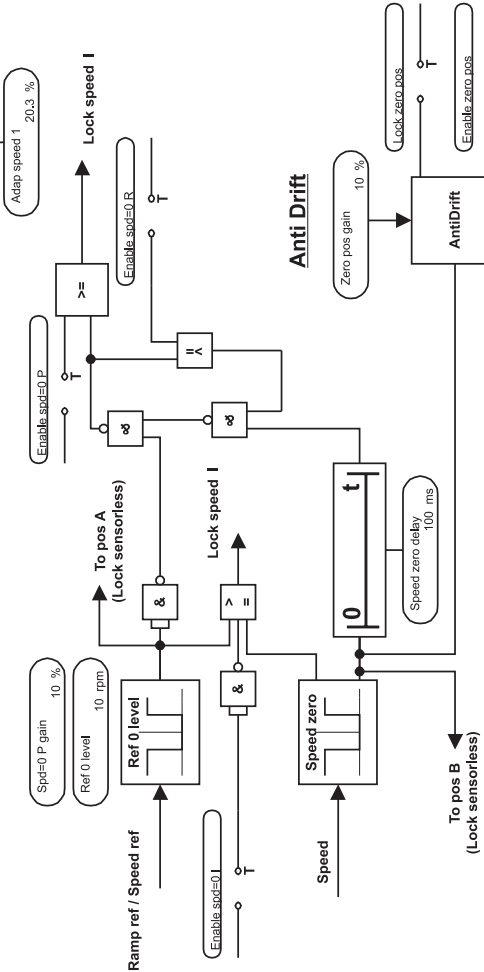
Speed Adap function

Enable spd adap Disabled

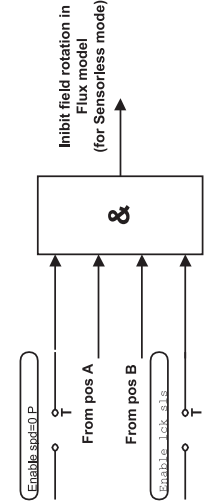
Sel. adap type Speed



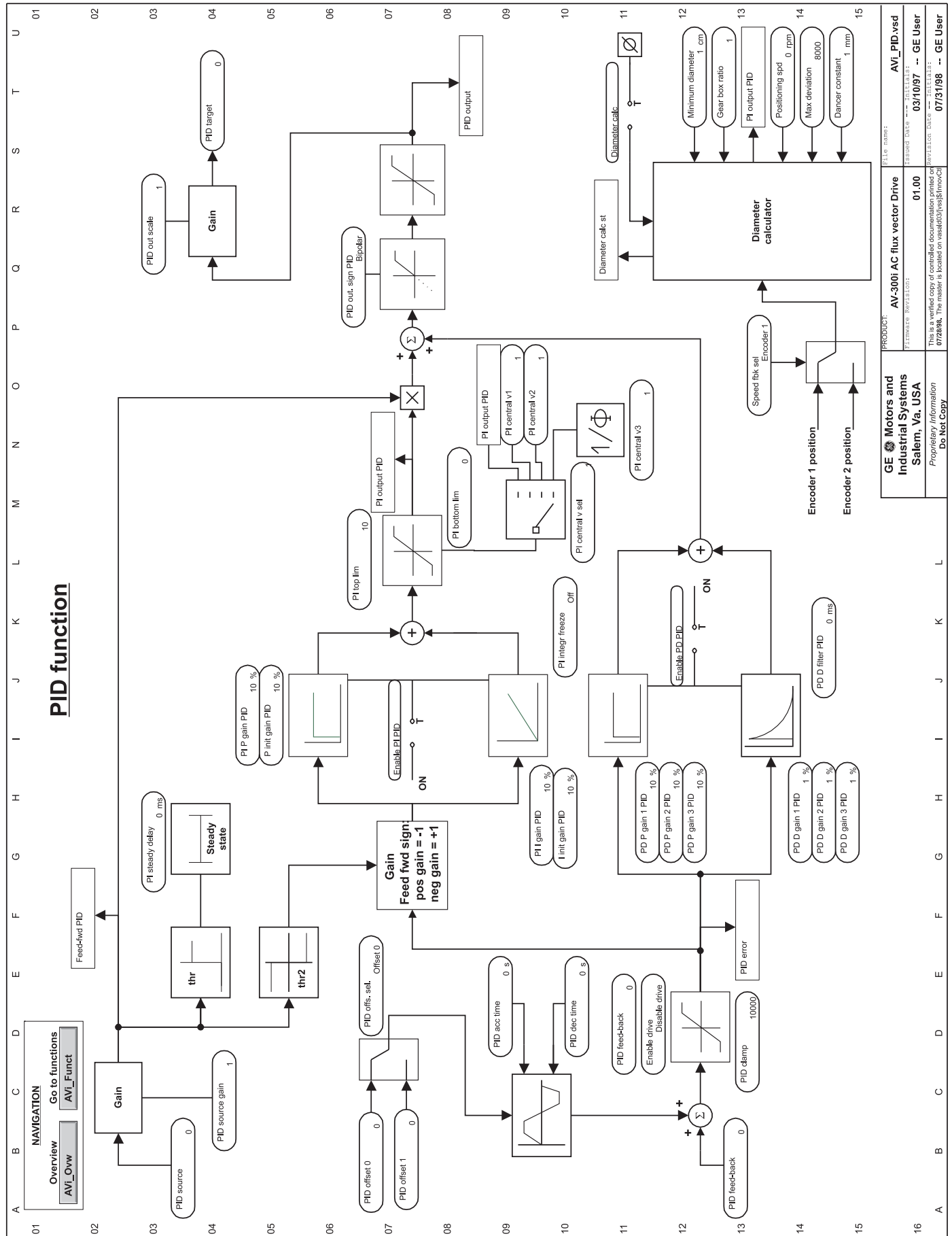
Speed zero logic



Lock Sensorless



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	FILE NAME: AVI_Adap_spd.vsd
Proprietary information Do Not Copy	FIRMWARE REVISION: 01.00	ISSUED DATE: 03/10/97
		REVISION DATE: 07/31/98
		GE User



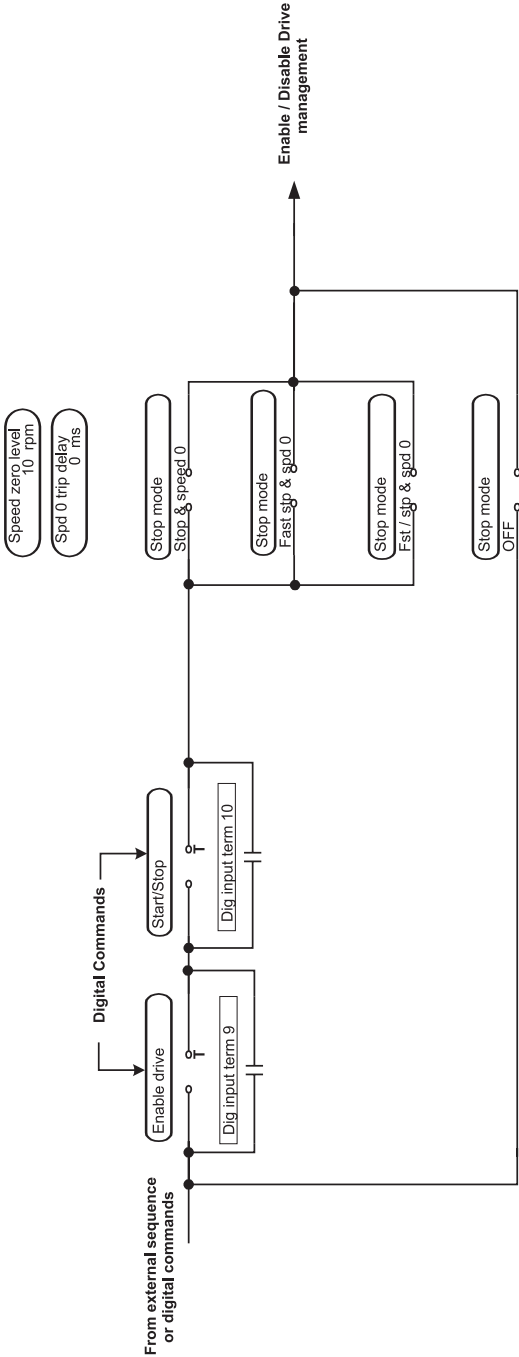
Start and Stop management

NAVIGATION

Go to functions

AVI_Ovw

AVI_Funct



GE  Motors and Industrial Systems Salem, Va. USA		PRODUCT	AVI-STSP_pro.vsd
Proprietary Information Do Not Copy		Firmware Revision:	01.00
		Issued Date — Initials:	03/10/97 -- GE User
		Revision Date — Initials:	09/02/98 -- GE User

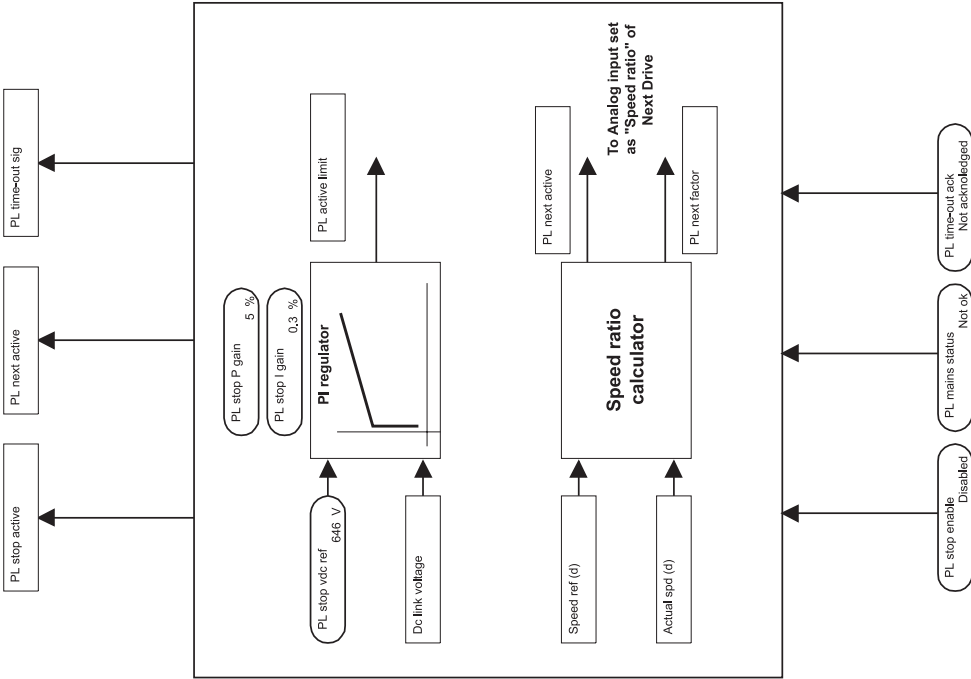
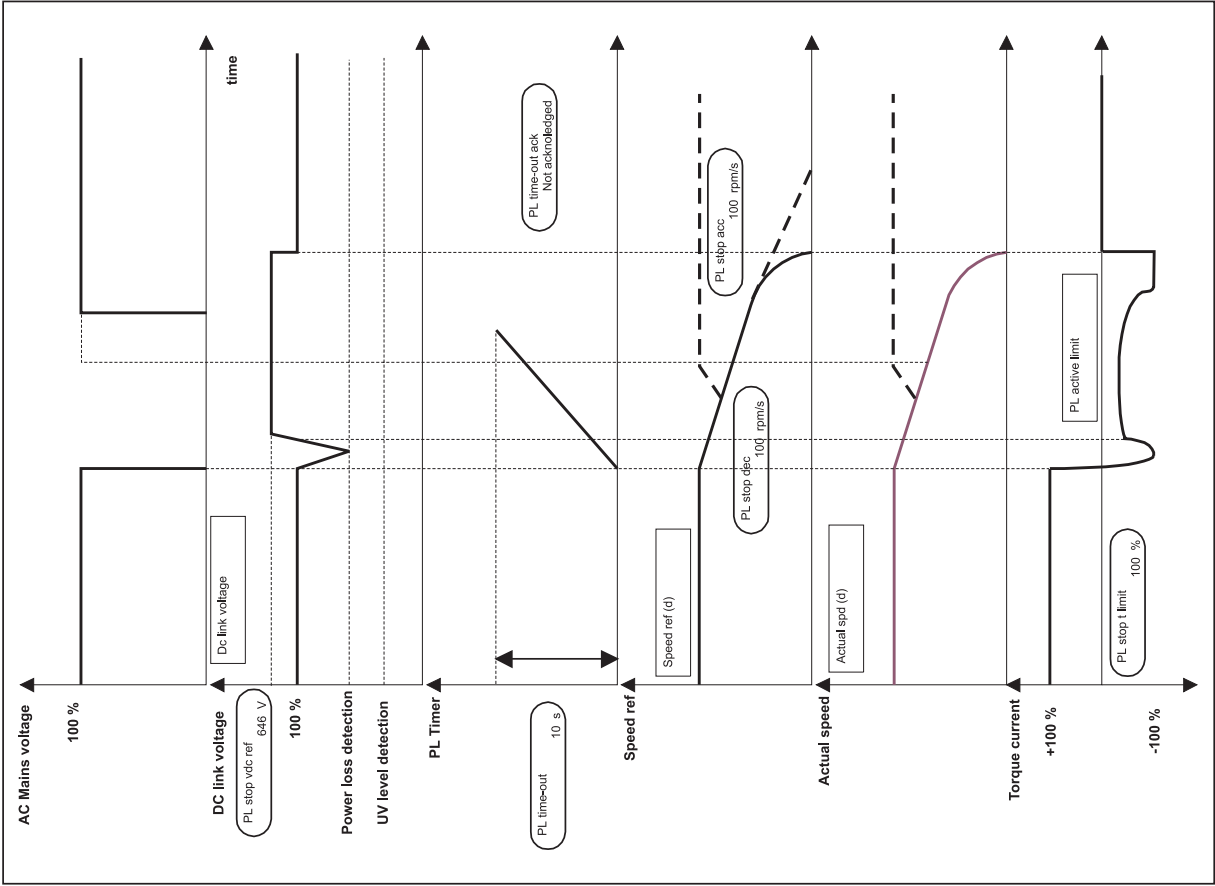
Power loss stop control

NAVIGATION

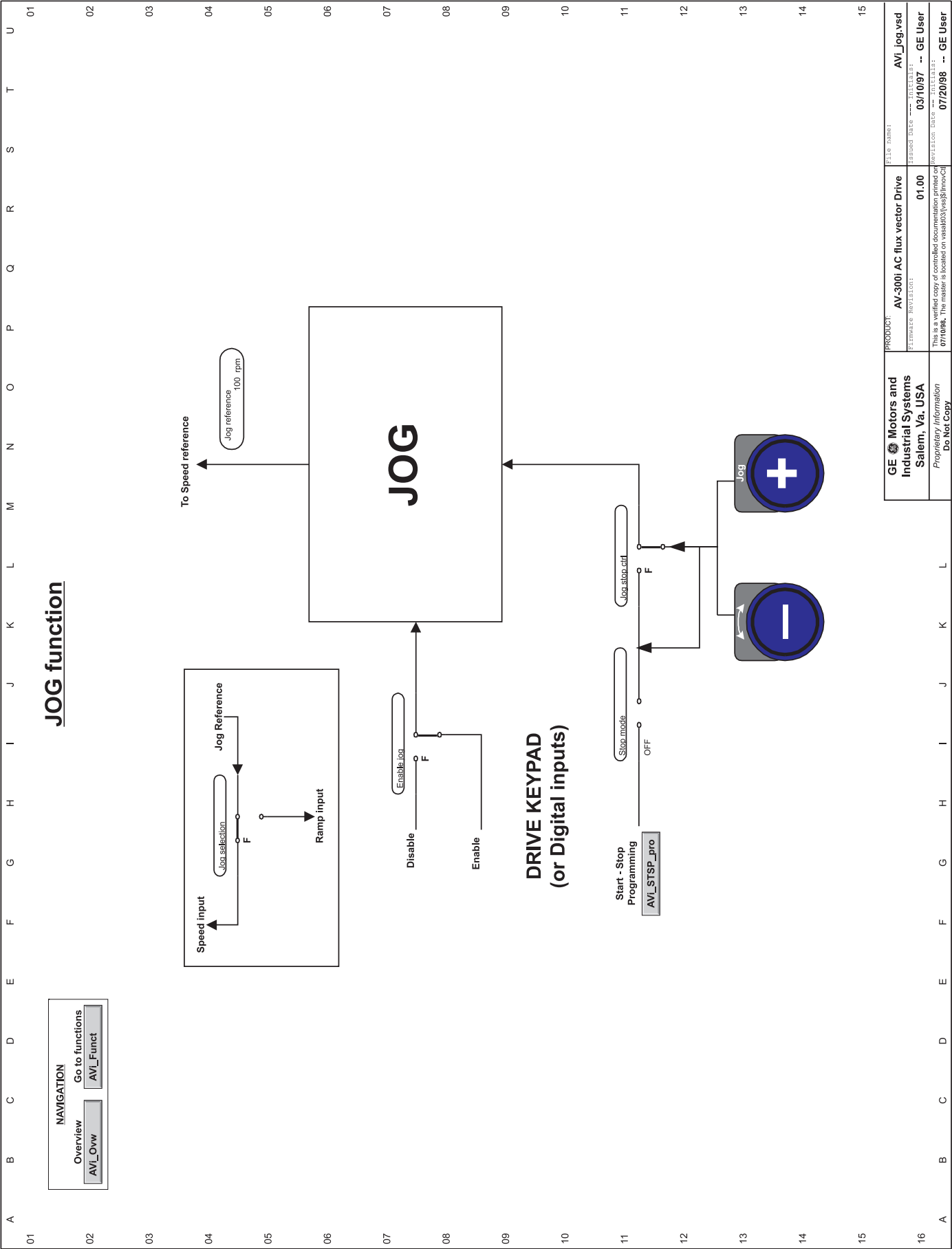
Go to functions

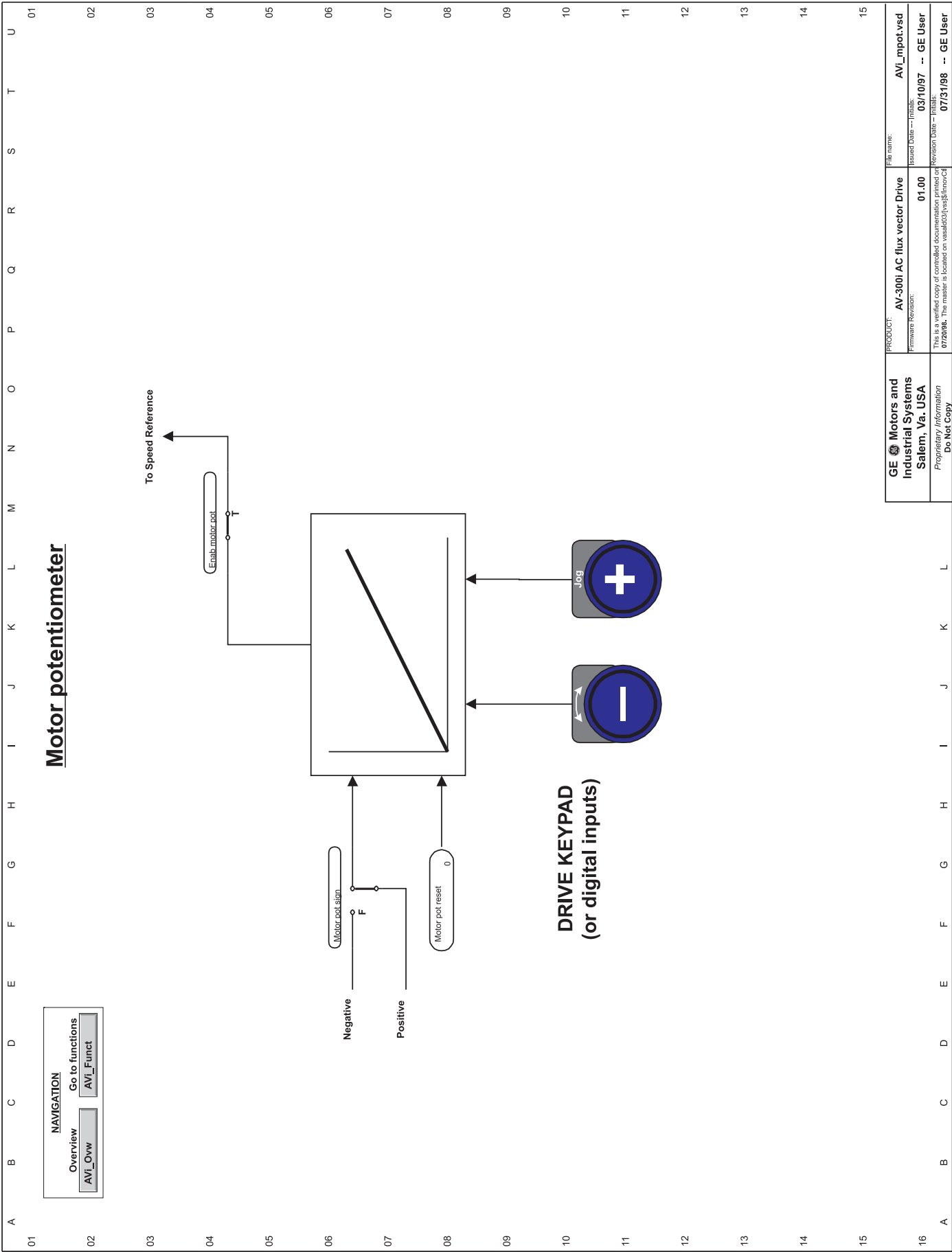
AVI_Ovw

AVI_Funct



GE Motors and Industrial Systems Salem, Va. USA <i>Proprietary Information</i> Do Not Copy	PRODUCT AV-300i AC flux vector Drive	File name:	AVI_pwrloss_ctrl.vsd
		Issued Date — Initials:	03/10/97 -- GE User
		Revision Date — Initials:	08/03/98 -- GE User





NAVIGATION

Overview

Go to functions

AVI_Ovw

AVI_Funct

01

02

03

04

05

06

07

08

09

10

11

12

13

14

15

Multi speed

Enab multi spd Disabled

Multi speed sel 0

Ramp ref (d)

Speed sel 0 Bit 0 Not Selected	Speed sel 1 Bit 1 Not Selected	Speed sel 2 Bit 2 Not Selected	REFERENCE
0	0	0	Ramp ref 1 0 rpm + Ramp ref 2 0 rpm
1	0	0	Multi speed 1 0 rpm
0	1	0	Multi speed 2 0 rpm
1	1	0	Multi speed 3 0 rpm
0	0	1	Multi speed 4 0 rpm
1	0	1	Multi speed 5 0 rpm
0	1	1	Multi speed 6 0 rpm
1	1	1	Multi speed 7 0 rpm

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PRODUCT: AV-300i AC flux vector Drive

GE Motors and Industrial Systems Salem, Va, USA

Proprietary information Do Not Copy

File name: AVI_inspd.vsd

Issued Date -- Initials: 03/10/97 -- GE User

Revision Date -- Initials: 07/31/98 -- GE User

Dual Motor setup

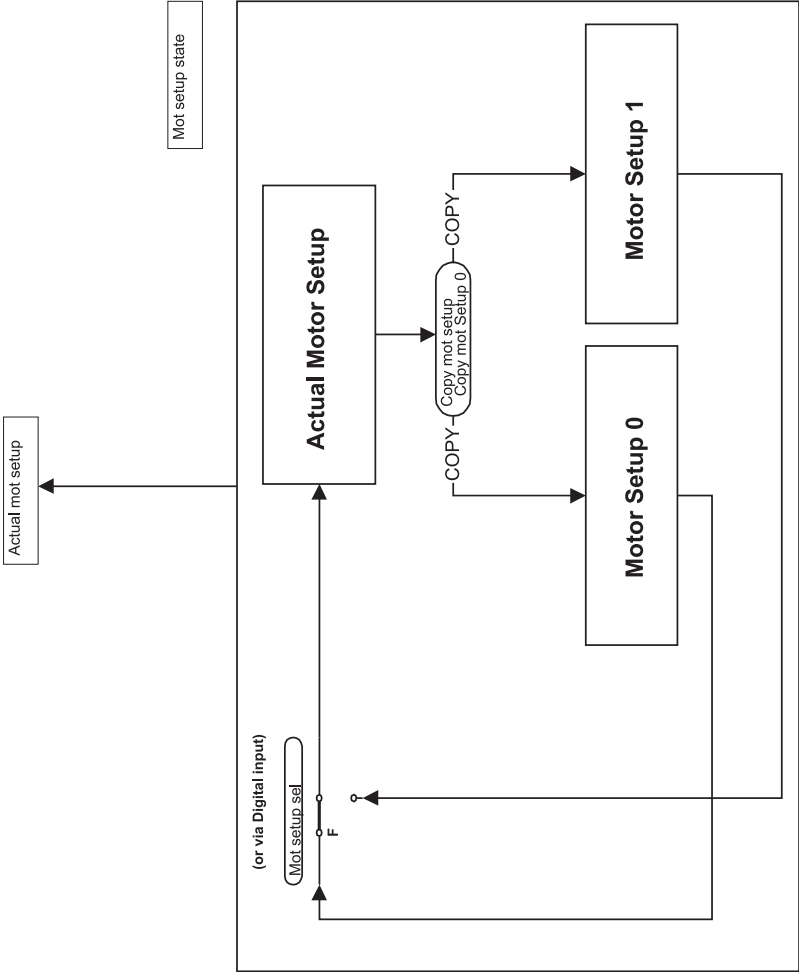
NAVIGATION

Overview

AVI_Ovw

Go to functions

AVI_Funct



GE  Motors and Industrial Systems Salem, Va. USA <i>Proprietary Information</i> Do Not Copy	PRODUCT:	AV-300i AC flux vector Drive	File name:	AVI_motstp.vsd
	Firmware Revision:	01.00	Issued Date -- Initial:	03/10/97 -- GE User
	This is a verified copy of controlled documentation printed on 07/02/96. The master is located on vaal003\res\5\finovc01			
	Revision Date -- Initial:	07/31/98	-- GE User	

Brake unit function

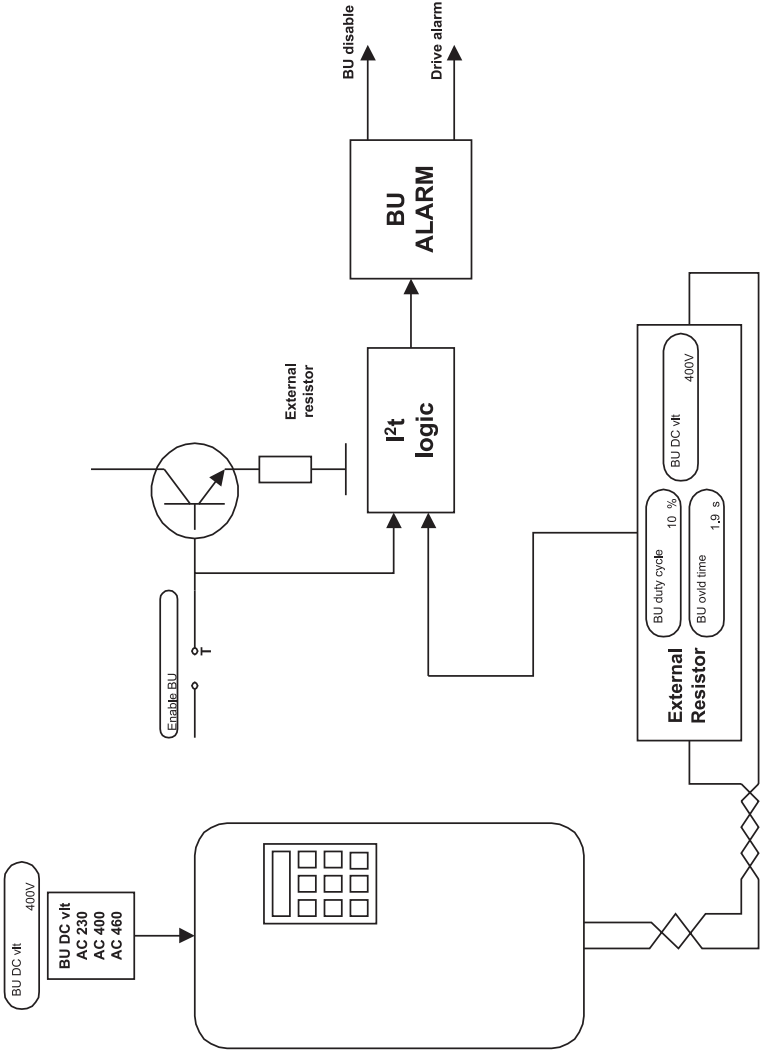
NAVIGATION

Overview

AVI_Ovw

Go to functions

AVI_Funct



GE  Motors and Industrial Systems Salem, Va, USA	PRODUCT: AV-3001 AC Flux vector Drive		File name: AVI_BRU.vsd
	Firmware Version: 01.00		Issued Date -- Initials: 03/10/97 -- GE User
	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vsa003\res\i\innov\CI		Revision Date -- Initials: 07/31/98 -- GE User

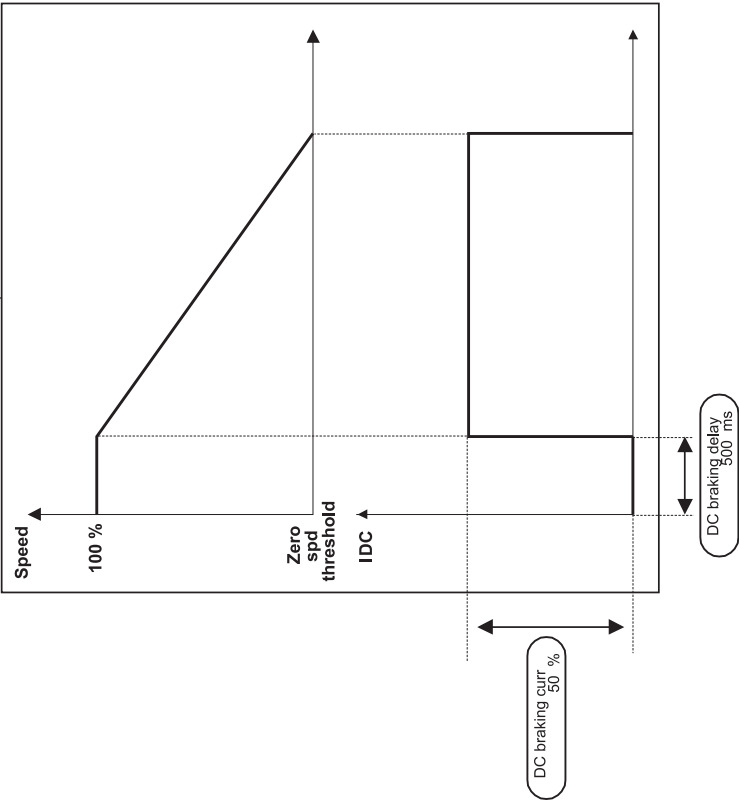
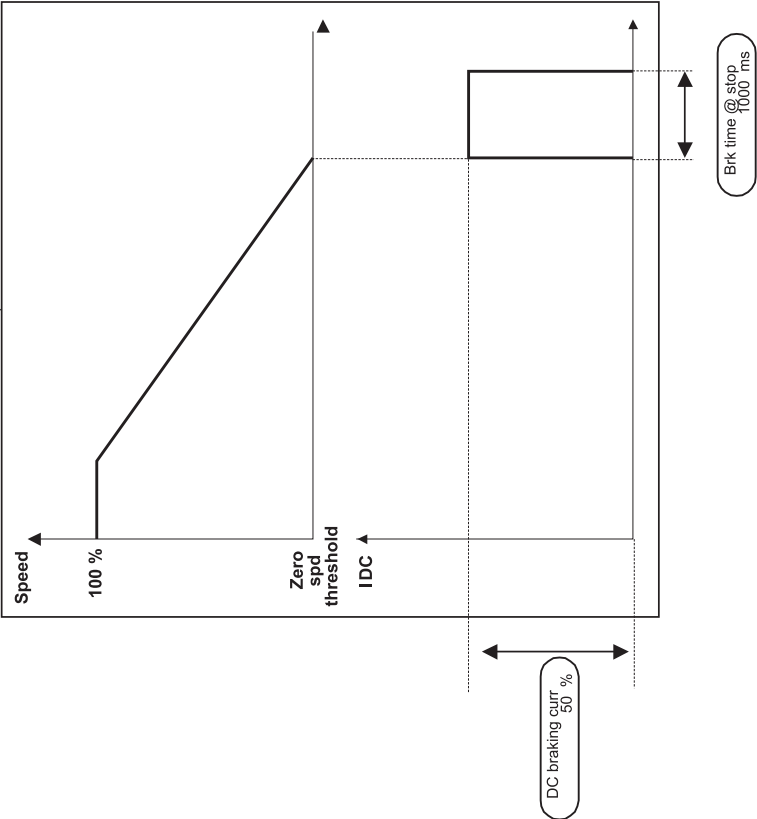
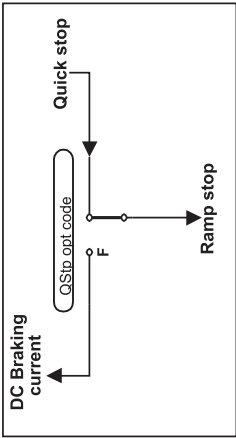
DC Braking function

NAVIGATION

Go to functions

AVI_Ovw

AVI_Funct



DC braking mode

DC Braking mode selection

GE Motors and Industrial Systems Salem, Va. USA <i>Proprietary Information</i> Do Not Copy	PRODUCT: AV-300i AC flux vector Drive Firmware Revision: 01.00	File name: AVI_DCBR.vsd Issued Date -- Initials: 03/10/97 -- GE User Revision Date -- Initials: 07/31/98 -- GE User

NAVIGATION

Overview

AVI_Ovr

Go to functions

AVI_Funct

01

02

03

04

05

06

07

08

09

10

11

12

13

14

15

16

A

B

C

D

E

F

G

H

I

J

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S

R

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F

E

D

C

B

A

Dimension factor

Face value factor

User defined variable

Control variable

Dimension factor

Face value factor

Dim factor num 1

Dim factor den 1

Face value num 1

Face value den 1

rpm

Dim factor text

X

X

GE  Motors and Industrial Systems
Salem, Va. USA

Proprietary Information
Do Not Copy

PRODUCT
AV-3000 AC flux vector Drive
Firmware Revision: 01.00

File name: AVI_tctct.vsd
Issued Date: 03/10/97
Revision Date: 07/31/98

AVI_tctct.vsd
-- GE User
-- GE User

NAVIGATION

Overview

AVI_Ovw

Go to functions

AVI_Funct

01

02

03

04

05

06

07

08

09

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11

12

13

14

15

U

T

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M

L

K

J

I

H

G

F

E

D

C

B

A

Pad 0

0

Pad 1

0

input Analog

output Analog

Pad 2

0

Pad 3

0

input Analog

output Analog

Pad 4

0

Pad 5

0

Pad 6

0

output Analog

Bitword pad A

0000h

input Digital

output Digital

Bitword pad B

0000h

output Digital

General PAD

Pad 7

0

Pad 8

0

Pad 9

0

Pad 10

0

Pad 11

0

Pad 12

0

Pad 13

0

Pad 14

0

Pad 15

0

GE Motors and Industrial Systems
Salem, Va. USA

Proprietary Information
Do Not Copy

PRODUCT: AV-300i AC flux vector Drive

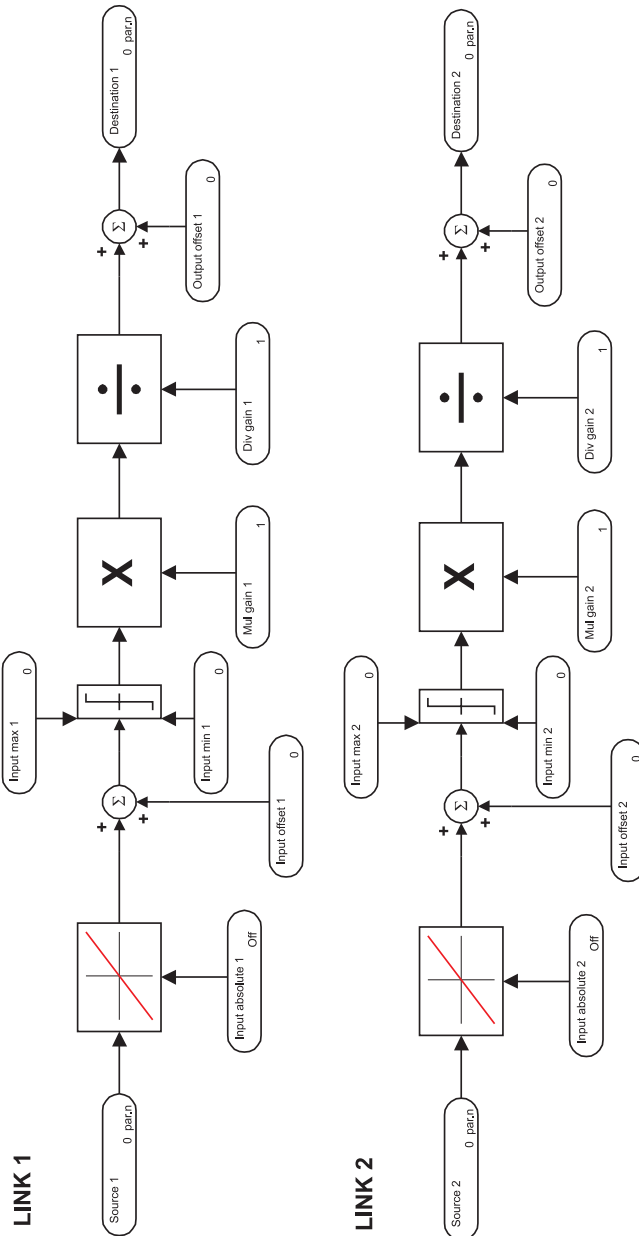
AVI_PAD.vsd

01.00

03/10/97 -- GE User

07/31/98 -- GE User

LINKS Function



GE  Motors and Industrial Systems Salem, Va, USA	PRODUCT: AV-3001 AC flux vector Drive Firmware Revision: 01.00	File name: AVI_Links.vsd
Proprietary Information Do Not Copy	This is a verified copy of controller documentation generated on 07/02/98. The master is located on vsad033\vs35\binoc\	Issued Date -- initials: 03/10/97 -- GE User Revision Date -- initials: 07/02/98 -- GE User

NAVIGATION

Overview

AVI_Ovw

Go to functions

AVI_Funct

Test Generator

Generator output

Time

Gen frequency 1 Hz

Gen amplitude 0 %

Gen offset 0 %

Gen access Not Connected

PRODUCT

AV-300i AC flux vector Drive

Firmware Revision: 01.00

GE Motors and Industrial Systems

Salem, Va. USA

Proprietary Information

Do Not Copy

File name: AVI_Test_gen.vsd

Issued Date -- Initials: 03/10/97 -- GE User

Revision Date -- Initials: 07/31/98 -- GE User

9-31

Alarm mapping														
NAVIGATION Overview AVI_Ovw														
BU Overload														
Undervoltage														
Overvoltage														
Heatsink														
Overtemp motor														
External fault														
Heatsink / Air OT														
Module overtemp														
Overcurrent														
Output stages														
OPT2 failure														
Bus loss														
Hw opt1 failure														
Enable seq err														
Regulation OT														
Failure text														
Failure hour														
Pointer														
Failure code														
PRODUCT														
GE Motors and Industrial Systems														
Salem, Va. USA														
Proprietary information														
Do Not Copy														
FILE name:														
AVI_Alarm_mp.vsd														
REVISION: 03/10/97														
01.00														
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07/31/98														
GE User														

Section 10: Parameters Lists

10.1. List of all Parameters

Explanation of tables:

White text on black background	Menu/submenu
White text on black background in brackets	Menu does not exist in the keypad
Fields with gray background	Function not accessible via keypad. The status of the corresponding parameter is only displayed.
[FF] in the Parameter column	Dimension based on the factor function
"No." column	Parameter number (decimal). The value 2000H (= decimal 8192) must be added to the number given in the "No." column in order to obtain the index to access the parameter via Bus , serial line or Opt2 (DGF card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).
"Format" column	Internal parameter format: I= Integer (Example: I16 = Integer 16 bit) U = Unsigned (Example: U32 = unsigned 32 bit) Float = Floating point
"F" in the "Value" column	The value of this parameter depends on the value of Full Load Curr
"Value" column	Minimum, maximum and factory parameter values. S = set value depending on the size of the device. F = set value depending on the Flt 100 mF [303] parameter
"Factory" column	S = factory set value depending on the size of the device.
"Keypad" column	√ = Parameter available via keypad
"RS485/BUS/Opt2-M" column (Low priority)	Parameter available via RS485, field Bus or via the DGF Card manual communication (see the DGF Card user manual) The numbers indicate what has to be sent via interface line in order to set the single parameters.
"Term." column	Parameter addressable to one of the analog or digital input/output terminals.

“Opt2-A” (Low Priority)

“PDC” (High Priority)

Parameter available via the DGF Card asynchronous communication (see the DGF Card user manual) and/or the Process Data Channel (PDC) of the Field bus.

NOTE: When field Bus interface parameters whose range is [min=0; max=1] can be assigned to either virtual digital inputs (if “w” access code exists) and/or virtual digital outputs (if “R” access code exists).

IA, QA, ID, QD in the "Term." column

The function can be accessed via a freely programmable analog or digital input or output.

IA = analog input

QA = analog output

ID = digital input

QD = digital output.

The present number is the one by which the terminal is identified.

H, L in the "Term." column

Level of the terminal signals (H=high, L=low) which enables the single function.

R/W/Z/C

Access possibilities via the serial interface, Bus or Opt2 manual or asynchronous communication :

R = Read, W = Write, Z = Write only when drive disabled, C=Command parameter (the writing of any value causes the execution of a command).

X · Pyy

The value of this parameter can correspond to min/max X times the value of the yy parameter.

Note !

The parameter number shown in the following table is a base number. The value 2000H (=8192 decimal) must be added to the number given in the “No.” column in order to obtain the index to access the parameter via Bus, serial line or Opt2 (DGF card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).

* When the parameter is accessed by Opt2-A/PDC the format is U16

** When the parameter is accessed by Opt2-A/PDC the format is I16

*** When the parameter is accessed by Opt2-A/PDC the lower word of the parameter is considered

AV-300i™ USER'S GUIDE

Parameter	No	Format	Value			Access via			
			min	max	Factory	Key.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Drive ready Drive ready Drive not ready	380	U16	0	1	-	-	R 1 0	QD H L	R
Quick stop Quick stop No Quick stop	343	U16	0	1	No quick stop (1)	-	R/W 0 1	ID L H	R/W
Fast stop Fast Stop No Fast Stop	316	U16	0	1	No fast stop (1)	-	R/W 0 1	14 L H	R/W
BASIC MENU									
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	√	R/W 1 0	12 H L	R/W
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)	√	R/W 1 0	13 H L	R/W
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Motor current [A]	231	Float	0	S	-	√	R	QA	-
BASIC MENU \ Drive type									
Mains voltage 230 V 400 V 460 V	333	U16	0	2	460 V (2)	√	R/Z 0 1 2	-	-
Ambient temp [°C] 50°C (122°F) 40°C (104°F)	332	U16	0	1	40°C (1)	√	R/Z 0 1	-	-
Rated drive curr 7.5 12.6 17.7 24.8 33 47 63 79 93 114 142 185 210 250 324 485 580 2.4 4 5.6 9.6	334	U16	0	16	S	-	R 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	-	R
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Software version	331	Text	-	-	-	√	R	-	-
Drive type (AV-300i)	300	U16	-	-	274	-	R	-	R
BASIC MENU									
Regulation mode Sensorless vect Self-tuning Field oriented V/f control	321	U16	0	3	V/f control (3)	√	R/Z 0 1 2 3	-	-
Acc delta speed [FF]	21	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
Dec delta speed [FF]	29	U32	0	2 ³² -1	100	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Save parameters	256	U16	0	65535	-	√	C	-	-
MONITOR									
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	√	R/W 1 0	12 H L	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)	√	R/W 1 0	13 H L	R/W
MONITOR \ Measurements \ Speed \ Speed in DRC []									
Ramp ref (d) [FF]	109	I16	-32768	32767	-	√	R	-	R
Ramp output (d) [FF]	112	I16	-32768	32767	-	√	R	-	R
Speed ref (d) [FF] (Speed ref var)	115	I16	-32768	32767	-	√	R	-	R
Actual spd (d) [FF] (Act spd value)	119	I16	-32768	32767	-	√	R	-	R
F act spd (d) [FF]	925	I16	-32768	32767	-	√	R	-	R
Act spd filter [s]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm									
Ramp ref (rpm)	110	I16	-32768	32767	-	√	R	QA	R
Ramp outp (rpm)	113	I16	-32768	32767	-	√	R	QA	R
Speed ref (rpm)	118	I16	-32768	32767	-	√	R	QA	R
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Enc1 speed [rpm]	427	I16	-8192	8192	-	√	R	-	R
Enc2 speed [rpm]	420	I16	-8192	8192	-	√	R	-	R
F act spd (rpm)	924	I16	-32768	32767	-	√	R	QA	R
Act spd filter [rpm]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %									
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	√	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-	√	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	√	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-	√	R	-	-
MONITOR \ Measurements									
DC link voltage [V]	227	U16	0	999	-	√	R	QA	-
Active power [%]	229	Float**	-500	500	-	√	R	QA	R
Output voltage [V]	233	Float**	0	500	-	√	R	QA	R
Output frequency [Hz]	324	Float	0.0	500.0	-	√	R	-	-
Motor current [A]	231	Float	0.00	S	-	√	R	QA	-
Torque [%]	230	Float	-500	500	-	√	R	QA	-
T current ref [%]	41	I16	-500	500	-	√	R	QA	R
T curr (%)	927	I16	-500	500	-	√	R	QA	R
F T curr (%)	928	I16	-500	500	-	√	R	QA	R
T curr filter [s]	926	Float	0.001	0.250	0.100	√	R/W	-	-
Flux [%]	234	Float*	0.00	100.00	-	√	R	QA	R
Heatsink temp [°C]	881	I16	-	-	-	√	R	-	-
Regulation temp [°C]	1147	I16	-	-	-	√	R	-	-
Intake air temp [°C]	914	U16	-	-	-	√	R	QA	-
MONITOR \ I/O									
Digital I/Q	-				-	√	R	-	-
Dig input term	564	U16	0	65535	-	-	R	-	R
Dig input term 1	565	U16	0	1	-	-	R	-	R
Dig input term 2	566	U16	0	1	-	-	R	-	R
Dig input term 3	567	U16	0	1	-	-	R	-	R
Dig input term 4	568	U16	0	1	-	-	R	-	R
Dig input term 5	569	U16	0	1	-	-	R	-	R
Dig input term 6	570	U16	0	1	-	-	R	-	R
Dig input term 7	571	U16	0	1	-	-	R	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dig input term 8	572	U16	0	1	-	-	R	-	R
Dig input term 9	573	U16	0	1	-	-	R	-	R
Dig input term 10	574	U16	0	1	-	-	R	-	R
Dig input term 11	575	U16	0	1	-	-	R	-	R
Dig input term 12	576	U16	0	1	-	-	R	-	R
Dig input term 13	577	U16	0	1	-	-	R	-	R
Dig input term 14	578	U16	0	1	-	-	R	-	R
Dig input term 15	579	U16	0	1	-	-	R	-	R
Dig input term 16	580	U16	0	1	-	-	R	-	R
Dig output term	581	U16	0	65535	-	-	R	-	R
Virtual dig inp	582	U16	0	65535	-	√	R/W	-	R/W
Virtual dig out	583	U16	0	65535	-	√	R	-	R
DRIVE PARAMETER \ Mot plate data									
Nominal voltage [V]	161	Float	1	999	400	√	R/Z	-	-
Nominal speed [rpm]	162	Float**	1	99999	S	√	R/Z	-	-
Nom frequency [Hz]	163	Float	1	999	60	√	R/Z	-	-
Nominal current [A]	164	Float	0.10	999.00	S	√	R/Z	-	-
Cos phi	371	Float	0.1	0.99	S	√	R/Z	-	-
Base voltage [V]	167	Float	1	999	460	√	R/Z	-	-
Base frequency [Hz]	168	Float	1	999	60	√	R/Z	-	-
Take motor par	694	U16	0	1	-	√	C	-	-
DRIVE PARAMETER \ Motor Parameter									
Magnetizing cur [A]	165	Float	0.10	999.00	S	√	R/W	-	-
Magn working cur [A]	726	Float	0.10	999.00	S	√	R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S	√	R/W	-	-
Load motor par	251	U16	0	1	Std400V (0)	√	Z 0 1	-	-
Std for 400V									
Std for 460V									
DRIVE PARAMETER \ Motor Parameter \ Self-tuning									
Self tune state	705	U16	0	65535	-	-	R	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1									
Start part 1	676	U16	0	65535	-	√	C	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Stator resist Nw [Ohm]	683	Float	S	S	-	√	R	-	-
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Volt comp lim Nw [V]	685	Float	0.1	30.0	-	√	R	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-
Comp slope Nw [V/A]	686	Float	0.1	50.0	-	√	R	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S	√	R/W	-	-
Lkg inductance Nw [H]	684	Float	S	S	-	√	R	-	-
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current P Nw [%]	687	Float	S	S	-	√	R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	-	-
Rotor resist Nw [Ohm]	682	Float	S	S	-	√	R	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
Current I Nw [%]	688	Float	S	S	-	√	R	-	-
Take val part 1	677	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a									
Start part 2a	678	U16	0	65535	-	√	C	-	-
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S	√	R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage P [%]	1022	Float	0	100.00	15.00	√	RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2a	679	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b									
Start part 2b	680	U16	0	65535	-	√	C	-	-
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S	√	R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2b	681	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3									
Fwd-Rev spd tune	1029	U16	1	2	Fwd direction (1)	√	R/Z	-	-
Fwd direction							1		
Rev direction							2		
Test T curr lim [%]	1048	U16	0	S	20	√	R/Z	-	-
Start part 3	1027	U16	0	65535	-	√	C	-	-
Inertia [kg*m*m*]	1014	Float	0.0010	999.9990	S	√	R/W	-	-
Inertia Nw [kg*m*m*]	1030	Float	0.0010	999.9990	-	√	R	-	-
Friction [N*m]	1015	Float	0.000	99.99	S	√	R/W	-	-
Friction Nw [N*m]	1031	Float	0.000	99.99	-	√	R	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-	√	R	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-	√	R	-	-
Take val part 3	1028	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Sensorless									
Low speed factor	646	I16	0	32000	5000	√	R/W	-	-
Sl speed filter [s]	643	Float	0.01	0.50	0.01	√	R/W	-	-
Flux corr factor	647	Float	0.50	1.0	0.90	√	R/W	-	-
DRIVE PARAMETER \ V/f control									
V/f shape	712	U16	0	3	$V = k \cdot f^{1.0}$ (0)	√	R/Z	-	-
$V = k \cdot f^{1.0}$							0		
$V = k \cdot f^{1.5}$							1		
$V = k \cdot f^{1.7}$							2		
$V = k \cdot f^{2.0}$							3		
DRIVE PARAMETER \ V/f control \ Voltage boost									
Vlt boost type	709	U16	0	1	Manual (0)	√	R/Z	-	-
Manual							0		
Automatic							1		
Manual boost [%]	710	Float	0.0	10.0	1.0	√	R/W	-	-
Actual boost [%]	711	Float	0.0	100.0	-	√	R	-	-
DRIVE PARAMETER \ V/f control \ Slip compens									
Slip comp type	722	U16	0	1	Manual (0)	√	R/Z	-	-
Manual							0		
Automatic							1		
Manual slip comp [rpm]	723	I16	0	200	0	√	R/W	-	-
Actual slip comp [rpm]	724	I16	-400	400	0	√	R	-	-
Slip comp filt [s]	725	Float	0.003	0.300	0.030	√	R/W	-	-
Motor losses %	727	Float	0.0	20.0	0	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ V/f spd search									
Spd srch time [s]	893	Float	0.01	10.00	10.00	√	R/W	-	-
Flux srch time [s]	894	Float	0.01	20.00	1.00	√	R/W	-	-
Spd autocapture [FF]	895	I16	-32768	32767	1500	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Delay auto cap [ms]	896	U16	0	10000	1000	√	R/W	-	-
Delay retrying [ms]	897	U16	0	10000	1000	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ Energy save									
Enable save eng Enabled Disabled	898	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock save eng OFF ON	899	U16	0	1	OFF (0)	√	R/W 0 1	ID L H	R/W
V/f flux level [%]	900	U16	0	100	100	√	R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 1									
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 2									
Ramp ref 2 [FF]	48	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 1									
Speed ref 1 [FF]	42	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Speed ref 1 (%)	378	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 2									
Speed ref 2 [FF]	43	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ T current ref									
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
LIMITS \ Speed limits \ Speed amount									
Speed min amount [FF]	1	U32	0	2 ³² -1	0	√	R/Z	-	-
Speed max amount [FF]	2	U32	0	2 ³² -1	2000	√	R/Z	-	-
LIMITS \ Speed limits \ Speed min/max									
Speed min pos [FF]	5	U32	0	2 ³² -1	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2 ³² -1	2000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2 ³² -1	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2 ³² -1	2000	√	R/Z	-	-
Speed limited Speed not limited Speed limited	372	U16	0	1		-	R 0 1	QD L H	R
LIMITS \ Current limits									
T curr lim type T lim + / - T lim mot gen	715	U16	0	1	T lim +/- (0)	√	R/Z 0 1	-	-
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Curr limit state Curr. limit not reached Curr. limit reached	349	U16	0	1		-	R 0 1	QD L H	R
In use Tcur lim+ [%]	10	U16	0	F		√	R	-	R
In use Tcur lim- [%]	11	U16	0	F		√	R	-	R
Current lim red [%]	13	U16	0	F	100	√	R/W	-	R/W
Torque reduct Not activated activated	342	U16	0	1	Not act. (0)	√	R/W 0 1	ID L H	R/W
LIMITS \ Flux limits									
Flux level [%]	467	U16	10	100	100	√	R/W	IA QA	R/W
LIMITS \ Voltage limits									
Dynam vlt margin [%]	889	Float	10.00	10.00	1.00	√	R/W	-	-
RAMP \ Acceleration									
Acc delta speed [FF]	21	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
RAMP \ Deceleration									
Dec delta speed [FF]	29	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
RAMP \ Quick stop									
QStp delta speed [FF]	37	U32	0	2 ³² -1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0		1	√	R/W	-	-
RAMP									
Ramp shape Linear S-Shaped	18	U16	0	1	Linear (0)	√	R/Z 0 1	-	-
S shape t const [ms]	19	Float	100	3000	500	√	R/W	-	-
S acc t const [ms]	663	Float	100	3000	500	√	R/W	-	-
S dec t const [ms]	664	Float	100	3000	500	√	R/W	-	-
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W		-
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	Fwd (1)	√	R/W 0 1 2 3	-	R/W
Forward sign FWD selected FWD not selected	293	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
Reverse sign REV selected REV not selected	294	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
Enable ramp Enabled Disabled	245	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Ramp out = 0 Activated Not Activated	344	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp in = 0 Activated Not Activated	345	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Freeze ramp Activated Not Activated	373	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp + Acc. clockwise + Dec. counter-clockwise Other states	346	U16	0	1	-	-	R 1 0	QD H L	R
Ramp - Acc. counter-clockwise + Dec. clockwise Other states	347	U16	0	1	-	-	R 1 0	QD H L	R
SPEED REGULAT.									
Speed ref [rpm]	118	I16	-32768	32767	-	√	R	QA	R
Speed reg output [%]	236	I16	-	-	-	√	R	QA	R
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Lock speed l Activated Not Activated	348	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Aux spd fun sel Speed up Inertia-loss cp	1016	U16	0	1	Speed up (0)	√	R/Z 0 1	-	-
Prop. filter [ms]	444	U16	0	1000	0	√	R/W	-	-

Parameter	No	Format	Value			Access via				
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC	
SPEED REGULAT\Spd zero logic										
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-	
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-	
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-	
Enable lck sls Enabled Disabled	422	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-	
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00	√	R/W	-	-	
Ref 0 level [FF]	106	U16	1	32767	10	√	R/W	-	-	
Enable zero pos Enabled Disabled	890	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-	
Lock zero pos ON OFF	891	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W	
Zero pos gain [%]	892	U16	0	100	10	√	R/W	-	-	
SPEED REGULAT\Speed up										
Speed up gain [%]	445	Float	0.00	100.00	0.00	√	R/W	-	-	
Speed up base [ms]	446	Float	0	16000	1000	√	R/W	-	-	
Speed up filter [ms]	447	U16	0	1000	0	√	R/W	-	-	
SPEED REGULAT\Droop function										
Droop gain [%]	696	Float	0.00	100.00	0.00	√	R/W	-	-	
Droop filter [ms]	697	U16	0	1000	0	√	R/W	-	-	
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W	
Droop limit [FF]	700	U16	0	2 x P45	1500	√	R/W	-	-	
Enable droop Enabled Disabled	699	U16	0	1	Disabled (0)	√	R/W 1 0	ID H L	R/W	
SPEED REGULAT\Inertia/loss cp										
Inertia [kg*m*m]	1014	Float	0.001	999.999	S	√	R/W	-	-	
Friction [N*m]	1015	Float	0.000	99.999	S	√	R/W	-	-	
Torque const [N*m/A]	1013	Float	0.01	99.99	S	√	R	-	-	
Inertia c filter [ms]	1012	U16	0	1000	0	√	R/W	-	-	
CURRENT REGULAT										
Current norm	267	Float	0.00	9999.99	S	-	R	-	-	
Torque current	350	Float	S	S	S	-	R	QA	-	
Flux current	351	Float	S	S	S	-	R	QA	-	
F current ref	352	Float	S	S	S	-	R	QA	-	
Zero torque Activated Not Activated	353	U16	0	1	Not Act. (1)	√	R/W 0 1	ID L H	R/W	
FLUX REGULATION										
Flux reg mode Constant current Voltage control	469	U16	0	1	Volt.control (1)	√	R/Z 0 1	-	-	
Flux reference	500	Float*	0.0	100.0	-	√	R	QA	R	
Flux	234	Float*	0.00	100.00	-	√	R	QA	R	
Out vlt level [%]	921	Float*	0.0	100.0	100.0	√	R/W	IA,QA	R/W	
REG PARAMETERS \Percent values \Speed regulator										
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-	
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-	
REG PARAMETERS \Percent values \Current reg										
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-	
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-	
REG PARAMETERS \Percent values \Current regDead time comp										
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-	
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-	

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
REG PARAMETERS \ Percent values \ Flux regulator									
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Voltage reg									
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
REG PARAMETERS \ Base values \ Speed regulator									
Speed P base [A/rpm]	93	Float	0.001	99.999	S	√	R/Z	-	-
Speed I base[A/rpm_ms]	94	Float	0.001	99.999	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Current reg									
Current P base [V/A]	95	Float	0.1	9999.9	S	√	R/Z	-	-
Current I base [V/A_ms]	96	Float	0.1	9999.9	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Flux regulator									
Flux P base [A/Vs]	97	Float	0.1	9999.9	S	√	R/Z	-	-
Flux I base [A/Vs_ms]	98	Float	0.01	999.99	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Voltage reg									
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S	√	R/W	-	-
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S	√	R/W	-	-
REG PARAMETERS \ In use values									
Speed P in use [%]	99	Float	0.00	100.00	S	√	R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S	√	R	-	-
CONFIGURATION									
Main commands Terminals Digital	252	U16	0	1	Digitals (1)	√	R/Z 0 1	-	-
Control mode Local Bus	253	U16	0	1	Local (0)	√	R/Z 0 1	-	-
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Regulation mode Sensorless vect Self-tuning Field oriented V/f control	321	U16	0	3	V/f control (3)	√	R/Z 0 1 2 3	-	-
Full load curr [A]	179	Float	0.10	999.00	S	√	R/Z	-	-
Flt_100_mf	303	I16	0	32767	S	-	R	-	R
Magn ramp time [s]	675	Float	0.01	5.00	1.00	√	R/Z	-	-
Magn boost curr [%]	413	U16	10	136	30	√	R/Z	-	-
Ok relay funct Drive healthy Ready to start	412	I16	0	1	Drive healthy (0)	√	R/Z 0 1	-	-
Switching freq 4 KHz 8 KHz 16 KHz 2 KHz	240	U16	S	S	S	√	R/Z 0 1 2 3	-	-
Qstp opt code Ramp stop DC braking	713	I16	-2	-1	Ramp stop (1)	√	R/Z 1 2	-	-
CONFIGURATION \ Motor spd fbk									
Speed fbk sel Encoder 1 Encoder 2	414	U16	0	1	Enc.1 (1)	√	R/Z 1 0	ID H L	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Enc1 supply vlt 5.41 V 5.68 V 5.91 V 6.18 V	1146	U16	0	3	5.41 V (0)	√	R/Z 0 1 2 3	-	-
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Encoder repeat Encoder 2 Encoder 1	1054	U16	0	1	Encoder 1 (1)	√	R/Z 0 1	-	-
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	U16	0	1	-	-	R 1 0	QD H L	R
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Enable ind store Enabled Disabled	911	U16	0	1	Disabled (0)	√	R/W 1 0	-	R/W
Ind store ctrl	912	U16	0	65535	0	-	R/W	-	R/W
Index storing	913	U32	0	$2^{32}-1$	-	-	R	-	R
CONFIGURATION \ Drive type									
Mains voltage 230 V 400 V 460 V	333	U16	S	2	460 V (2)	√	R/Z 0 1 2	-	-
Ambient temp [°C] 50°C (122°F) 40°C (104°F)	332	U16	0	1	40°C (1)	√	R/Z 0 1	-	-
Rated drive curr 7.5 12.6 17.7 24.8 33 47 63 79 93 114 142 185 210 250 324 485 580 2.4 4 5.6 9.6	334	U16	0	16	S	-	R 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	-	R
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Software version	331	Text				√	R	-	-
Drive type (AVy)	300	U16	-	-	274	-	R	-	R
CONFIGURATION \ Dimension fact									
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	$2^{32}-1$	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
CONFIGURATION \ Face value fact									
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Face value den	53	I16	1	32767	1	√	R/Z	-	R
CONFIGURATION \ Prog alarms \ Undervoltage									
Latch ON OFF	357	U16	0	1	ON (1)	√	R/Z 1 0	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OK relay open ON OFF	358	I16	0	1	ON (1)	√	R/W 1 0	-	-
Restart time [ms]	359	U16	0	65535	1000	√	R/W	-	-
N of attempts	360	U16	0	100	1	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Overvoltage									
Latch ON OFF	361	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	362	I16	0	1	ON (1)	√	R/W 1 0	-	-
CONFIGURATION \ Prog alarms \ Heatsink sensor									
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	368	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	369	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	370	I16	0	1	ON (1)	√	R/W 1 0	-	-
CONFIGURATION \ Prog alarms \ Heatsink ot									
Ok relay open ON OFF	1152	I16	0	1	ON (1)	√	R/W 1 0	-	-
CONFIGURATION \ Prog alarms \ Intake air ot									
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	1140	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	1141	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1142	I16	0	1	ON (1)	√	R/W 1 0	-	-
CONFIGURATION \ Prog alarms \ Regulation ot									
Activity Ignore Warning	1148	U16	0	1	Warning (1)	√	R/Z 0 1	-	-
Latch ON OFF	1149	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1150	I16	0	1	ON (1)	√	R/W 1 0	-	-
CONFIGURATION \ Prog alarms \ Module overtemp									
Ok relay open ON OFF	1151	I16	0	1	ON (1)	√	R/W 1 0	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
CONFIGURATION \ Prog alarms \ Overtemp motor									
Activity	365	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	366	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	367	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ External fault									
Activity	354	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	355	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	356	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Overcurrent									
Latch	363	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	364	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Output stages									
Latch	210	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	211	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Opt2 failure									
Activity	639	U16	2	5	Disabled drive (2)	√	R/Z	-	-
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	640	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Bus loss									
Activity	634	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	633	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	635	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Hold off time [ms]	636	U16	0	10000	0	√	R/W	-	-
Restart time [ms]	637	U16	0	10000	0	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Hw opt1 failure									
Activity	386	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	387	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Enable seq err									
Activity	728	U16	0	2	Disabled drive (2)	√	R/Z	-	-
Ignore							0		
Disable drive							2		
Latch	729	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	730	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ BU overload									
Activity	737	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	738	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION									
Device address	319	U16	0	127	0	√	R/Z	-	-
Ser answer delay [ms]	408	U16	0	900	0	√	R/W	-	-
Pword 1 :	85	I32	00000	99999	Disabled (0)	√	W	-	-
Enabled							1		
Disabled							0		
I/O CONFIG \ Analog outputs \ Analog output 1									
Select output 1	66	U16	0	84	Actual speed (8)	√	R/Z	-	-
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		
Output voltage							20		
Voltage U							21		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Scale output 1	62	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 2									
Select output 2 (Select like output 1)	67	U16	0	84	T current (14)	√	R/Z	-	-
Scale output 2	63	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 3									
Select output 3 (Select like output 1)	68	U16	0	84	Current U (17)	√	R/Z	-	-
Scale output 3	64	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 4									
Select output 4 (Select like output 1)	69	U16	0	84	Motor current (16)	√	R/Z	-	-
Scale output 4	65	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 1									
Select input 1	70	U16	0	28	Ramp ref 1 (4)	√	R/Z	-	-
OFF							0		
Jog reference							1		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
T current ref 1							6		
T current ref 2							7		
Adap reference							8		
T current lim							9		
T current lim +							10		
T current lim -							11		
Pad 0							12		
Pad 1							13		
Pad 2							14		
Pad 3							15		
Load comp							19		
PID offset 0							21		
Pl central v3							22		
PID feed-back							23		
V/f flux level							24		
Flux level							25		
Out vlt level							26		
Speed ratio							28		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
An in 1 target Assigned Not assigned	295	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 1	72	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 1	73	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 1 Auto tune	259	U16	0	65535	-	√	C 1	-	-
Input 1 filter [ms]	792	U16	0	1000	0	√	R/W	-	-
Input 1 compare	1042	I16	-10000	10000	0	√	R/W	-	-
Input 1 cp error	1043	U16	0	10000	0	√	R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0	√	R/W	-	-
Input 1 cp match Input 1 not thr.val. Input 1=thr.val	1045	U16	0	1	-	-	R 0 1	QD L H	R
Offset input 1	74	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 2									
Select input 2 (Select like Input 1)	75	U16	0	28	OFF (0)	√	R/Z	-	-
An in 2 target Assigned Not assigned	296	U16	0	1	Assign.(0)	√	R/W 0 1	ID L H	R/W
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 2	77	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 2	78	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 2 Auto tune	260	U16	0	65535	-	√	C 1	-	-
Offset input 2	79	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 3									
Select input 3 (Select like Input 1)	80	U16	0	28	OFF (0)	√	R/Z	-	-
An in 3 target Assigned Not assigned	297	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 3	82	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 3	83	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 3 Auto tune	261	U16	0	65535	-	√	C 1	-	-
Offset input 3	84	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Digital outputs									
Digital output 1 OFF Speed zero thr Spd threshold	145	U16	0	49	Ramp + (8)	√	R/Z 0 1 2	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Set speed							3		
Curr limit state							4		
Drive ready							5		
Overld available							6		
Ramp +							8		
Ramp -							9		
Speed limited							10		
Undervoltage							11		
Overvoltage							12		
Heatsink sensor							13		
Overcurrent							14		
Overtemp motor							15		
External fault							16		
Failure supply							17		
Pad A bit							18		
Pad B bit							19		
Virt dig input							20		
Speed fbk loss							25		
Bus loss							26		
Output stages							27		
Hw opt 1 failure							28		
Opt 2 failure							29		
Encoder 1 state							30		
Encoder 2 state							31		
Ovld mot state							32		
Enable seq err							35		
BU overload							36		
Diameter calc st							38		
Mot setup state							46		
Input 1 cp match							49		
Overload 200%							51		
PL stop active							52		
PL next active							53		
PL time-out sig							54		
Regulation ot							55		
Module overtemp.							56		
Heatsink ot							57		
Intake air ot							62		
Digital output 2 (Select like output 1)	146	U16	0	49	Ramp - (9)	√	R/Z	-	
Digital output 3 (Select like output 1)	147	U16	0	49	Spd threshold (2)	√	R/Z	-	
Digital output 4 (Select like output 1)	148	U16	0	49	Overld available (6)	√	R/Z	-	-
Digital output 5 (Select like output 1)	149	U16	0	49	Curr limit state (4)	√	R/Z	-	-
Digital output 6 (Select like output 1)	150	U16	0	49	Over-voltage (12)	√	R/Z	-	-
Digital output 7 (Select like output 1)	151	U16	0	49	Under-voltage (11)	√	R/Z	-	-
Digital output 8 (Select like output 1)	152	U16	0	49	Over-current (14)	√	R/Z	-	-
Relay 2 (Select like output 1)	629	U16	0	49	Speed zero thr (1)	√	R/Z	83-85	-
I/O CONFIG \ Digital inputs									
Digital input 1	137	U16	0	62	OFF (0)	√	R/Z	-	-
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Jog -							7		
Failure reset							8		
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed l							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign -							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ack							67		
Digital input 2 (Select like input 1)	138	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 3 (Select like input 1)	139	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 4 (Select like input 1)	140	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 5 (Select like input 1)	141	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 6 (Select like input 1)	142	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 7 (Select like input 1)	143	U16	0	62	OFF (0)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 8 (Select like input 1)	144	U16	0	62	OFF (0)	√	R/Z	-	-
I/O CONFIG \ Encoder inputs									
Select enc 1 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1020	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	-	-
Select enc 2 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1021	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	-	-
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
ADD SPEED FUNCT									
Auto capture ON OFF	388	U16	0	1	OFF (0)	√	R/W 1 0	ID H L	-
ADD SPEED FUNCT \ Adap spd reg									
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Sel adap type Speed Adap reference	182	U16	0	1	Speed (0)	√	R/Z 0 1	-	-
Adap reference [FF]	183	I16	-32768	32767	1000	√	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3	√	R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7	√	R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1	√	R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1	√	R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00	√	R/W	-	-
ADD SPEED FUNCT \ Speed control									
Spd threshold + [FF]	101	U16	1	32767	1000	√	R/W	-	-
Spd threshold - [FF]	102	U16	1	32767	1000	√	R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100	√	R/W	-	-
Spd threshold Speed exceeded Speed not exceeded	393	U16	0	1		-	R 0 1	QD L H	R
Set error [FF]	104	U16	1	32767	100	√	R/W	-	-
Set delay [ms]	105	U16	0	65535	100	√	R/W	-	-
Set speed Speed not ref. val. Speed = ref. val.	394	U16	0	1		-	R 0 1	QD L H	R
ADD SPEED FUNCT \ Speed zero									
Speed zero level [FF]	107	U16	1	32767	10	√	R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Spd zero thr Drive not rotating Drive rotating	395	U16	0	1		-	R 0 1	QD L H	R
FUNCTIONS \ Motor pot									
Enab motor pot Enabled Disabled	246	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Motor pot oper	-					√	-	-	-
Motor pot sign Positive Negative	248	I16	0	1	Positive (1)		R/W 1 0	ID	-
Motor pot reset	249	U16	0	65535		√	Z/C	ID H=reset	-
Motor pot up No acceleration Acceleration	396	U16	0	1	No acc. (0)	-	R/W 0 1	ID L H	R/W
Motor pot down No deceleration Deceleration	397	U16	0	1	No dec. (0)	-	R/W 0 1	ID L H	R/W
FUNCTIONS \ Jog function									
Enable jog Enabled Disabled	244	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Jog operation	-					√	-	-	-
Jog selection Speed input Ramp input	375	U16	0	1	Spd inp. (0)	√	R/Z 0 1	-	-
Jog reference [FF]	266	I16	0	32767	100	√	R/W	IA	-
Jog + No jog forward Forward jog	398	U16	0	1	No jog+ (0)	-	R/W 0 1	ID L H	R/W
Jog - No backward jog Backward jog	399	U16	0	1	No jog- (0)	-	R/W 0 1	ID L H	R/W
FUNCTIONS \ Multi speed fct									
Enab multi spd Enabled Disabled	153	I16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Multi speed sel	208	U16	0	7	0	√	R/W	-	R/W
Multi speed 1 [FF]	154	I16	-32768	32767	0	√	R/W	-	-
Multi speed 2 [FF]	155	I16	-32768	32767	0	√	R/W	-	-
Multi speed 3 [FF]	156	I16	-32768	32767	0	√	R/W	-	-
Multi speed 4 [FF]	157	I16	-32768	32767	0	√	R/W	-	-
Multi speed 5 [FF]	158	I16	-32768	32767	0	√	R/W	-	-
Multi speed 6 [FF]	159	I16	-32768	32767	0	√	R/W	-	-
Multi speed 7 [FF]	160	I16	-32768	32767	0	√	R/W	-	-
Speed sel 0 Value 2 ⁰ not selected Value 2 ⁰ selected	400	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 1 Value 2 ¹ not selected Value 2 ¹ selected	401	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 2 Value 2 ² not selected Value 2 ² selected	402	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
FUNCTIONS \ Multi ramp fct									
Enab multi rmp Enabled Disabled	243	I16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Multi ramp sel	202	U16	0	3	0	√	R/W	-	R/W
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0									
Acc delta speed0 [FF]	659	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0									
Dec delta speed0 [FF]	661	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1									
Acc delta speed1 [FF]	23	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1									
Dec delta speed1 [FF]	31	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2									
Acc delta speed2 [FF]	25	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2									
Dec delta speed2 [FF]	33	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3									
Acc delta speed3 [FF]	27	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3									
Dec delta speed3 [FF]	35	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	-	-
Ramp sel 0	403	U16	0	1	Not sel. (0)	-	R/W	ID L H	R/W
Value 2° not selected							0		
Value 2° selected							1		
Ramp sel 1	404	U16	0	1	Not sel. (0)	-	R/W	ID L H	R/W
Value 2° not selected							0		
Value 2° selected							1		
FUNCTIONS \ Stop control									
Stop mode	626	U16	0	3	1	√	R/Z	-	-
OFF							0		
Stop & Speed 0							1		
Fast stp & Spd 0							2		
Fst / stp & spd 0							3		
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	-	-
Jog stop control	630	U16	0	1	OFF (0)	√	R/Z	-	-
ON							1		
OFF							0		
FUNCTIONS \ Speed draw									
Speed ratio	1017	I16	0	32767	10000	√	R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	-	√	R	QA	R
Spd draw out (%)	1019	Float	-200.0	+200.0	-	√	R	-	-
FUNCTIONS \ Motor setup									
Mot setup sel	943	U16	0	1	Setup 0 (0)	√	R/Z	-	R/W
Setup 0							0		
Setup 1							1		
Mot setup sel 0	940	U16	0	1	Not sel (0)	-	R/Z	ID L H	R/W
Value 2° not sel							0		
Value 2° sel							1		
Copy mot setup	941	U16	0	1	Setup 0 (0)	√	R/Z	-	-
Setup 0							0		
Setup 1							1		
Mot setup state	944	U16	0	1	0	-	R	QD L H	R
Not running							0		
Running							1		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Actual mot setup Setup 0 Setup 1	942	U16	0	1	Setup 0 (0)	÷	R 0 1	-	R
FUNCTIONS \ Overload contr \ Ovld mot contr									
Motor cont curr [%]	656	U16	50	100	100	÷	R/W	-	-
Trip time 50% [s]	657	U16	0	120	60	÷	R/W	-	-
Ovld mot state Overload Not overload	658	U16	0	1	Not ovrl (1)	-	R 0 1	QD L H	R
FUNCTIONS \ Overload contr \ Ovld drv contr									
I_sqrt_t_accum [%]	655	U16	0	100	0	÷	R	-	R
Ovld Available Overload not possible Overload possible	406	U16	0	1	-	-	R 0 1	QD L H	R
Overload 200% Overload not possible Overload possible	1139	U16	0	1	-	-	R 0 1	QD L H	R
FUNCTIONS \ Brake unit									
Enable BU Enabled Disabled	736	U16	0	1	Disabled (0)	÷	R/W 1 0	-	-
BU ovld time [s]	740	Float	0.10	50.00	S	÷	R/W		
BU duty cycle [%]	741	U16	1	75	S	÷	R/W	-	-
BU DC vlt [V] 230 400 460	801	U16	0	2	1	÷	R/W 0 1 2	-	-
FUNCTIONS \ Pwr loss stop f									
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	U16	0	2	0	0	R/W 0 1 2	-	-
PL stop t limit [%]	1082	U16	0	F	100	÷	R/W	-	-
PL stop acc [rpm/s]	1080	U32	0	99999999	100	÷	R/W	-	-
PL stop dec [rpm/s]	1081	U32	0	10000	10000	÷	R/W	-	-
PL stop vdc ref [V]	1084	U16	646	800	800	÷	R/W	-	-
PL time-out [s]	1087	U16	0	65535	10	÷	R/W	-	-
PL stop P Gain [%]	1086	Float	0.00	100.00	5.00	÷	R/W	-	-
PL stop I Gain [%]	1085	Float	0.00	100.00	0.30	÷	R/W	-	-
PL stop active Not active Active	1088	U16	0	1	Not active (0)	÷	R 0 1	-	R
PL active limit [%]	1089	U16	-	-	-	÷	R	-	-
PL next active Not active Active	1090	U16	0	1	Not active (0)	÷	R 0 1	-	R
PL next factor	1091	U16	0	32767	10000	÷	R	-	R
PL time-out sig Not active Active	1093	U16	0	1	Not active (0)	÷	R 0 1	-	R
PL time-out ack Not acknowledged Acknowledged	1094	U16	0	1	Not acknowledged (0)	÷	R/W 0 1	-	R/W
PL mains status Not ok Ok	1092	U16	0	1	Not ok (0)	÷	R/W 0 1	-	R/W
SPEC FUNCTIONS \ Test generator									
Gen access Not connected F current ref T current ref Flux ref Ramp ref	58	U16	0	4	Not conn. (0)	÷	R/Z 0 1 2 3 4	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Gen frequency [Hz]	59	Float	0.1	62.5	1.0	√	R/W	-	-
Gen amplitude [%]	60	Float	0.00	200.00	0.00	√	R/W	-	-
Gen offset [%]	61	Float	-200.00	200.00	0.00	√	R/W	-	-
SPEC FUNCTIONS									
Enable rr adap Enabled Disabled	435	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Save parameters	256	U16	0	65535		√	C	-	-
Load default	258	U16	0	65535		√	Z/C	-	-
Life time [h.min]	235	Float	0.00	65535.00		√	R	-	-
Failure register	-					√	R	-	-
Failure text	327	Text				-	R	-	-
Failure hour	328	U16	0	65535		-	R	-	-
Failure min	329	U16	0	59		-	R	-	-
Failure code No failure Overcurrent Overvoltage Undervoltage Heatsink sensor Heatsink /Air ot Regulation ot Module overtemp Intake air ot Overtemp motor Failure supply Curr fbk loss Output stages DSP error Interrupt error BU overload Speed fbk loss Opt2 Hw Opt 1failure Bus loss External fault Enable seq err	417	U16	0	65535		-	R 0000h 2300h 3210h 3220h 4210h 4211h 4212h 4213h 4214h 4310h 5100h 5210h 5410h 6110h 6120h 7110h 7301h 7400h 7510h 8110h 9000h 9009h	-	-
Pointer	330	U16	1	10	10	-	R/W	-	-
Failure reset	262	U16	0	65535		√	Z/C	ID H=reset	-
Failure reg del	263	U16	0	65535		√	C	-	-
SPEC FUNCTIONS \ DC braking									
DC braking mode Enabled Disabled	904	U16	0	1	0	√	R/Z 1 0	-	-
Brk time @ stop [ms]	905	U16	0	30000	1000	√	R/W	-	-
DC braking curr [%]	717	U16	0	100	50	√	R/W	-	-
DC braking delay [ms]	716	U16	0	65535	500	√	R/W	-	-
SPEC FUNCTIONS \ Links \ Link 1									
Source	484	U16	0	65535	0	√	R/W	-	-
Destination	485	U16	0	65535	0	√	R/W	-	-
Mul.Gain	486	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	487	Float	-10000	10000	1	√	R/W	-	-
Input max	488	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input min	489	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input offset	490	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Output offset	491	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input absolute ON OFF	492	U16	0	1	OFF (0)	√	R/W 1 0	-	-
SPEC FUNCTIONS \ Links \ Link 2									
Source	553	U16	0	65535	0	√	R/W	-	-
Destination	554	U16	0	65535	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Mul.Gain	555	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	556	Float	-10000	10000	1	√	R/W	-	-
Input max	557	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input min	558	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input offset	559	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Output offset	560	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	-	-
Input absolute	561	U16	0	1	OFF (0)	√	R/W	-	-
ON							1		
OFF							0		
SPEC FUNCTIONS \ Pad Parameters									
Pad 0	503	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0	√	R/W	-	R/W
Pad 8	511	I16	-32768	32767	0	√	R/W	-	R/W
Pad 9	512	I16	-32768	32767	0	√	R/W	-	R/W
Pad 10	513	I16	-32768	32767	0	√	R/W	-	R/W
Pad 11	514	I16	-32768	32767	0	√	R/W	-	R/W
Pad 12	515	I16	-32768	32767	0	√	R/W	-	R/W
Pad 13	516	I16	-32768	32767	0	√	R/W	-	R/W
Pad 14	517	I16	-32768	32767	0	√	R/W	-	R/W
Pad 15	518	I16	-32768	32767	0	√	R/W	-	R/W
Bitword Pad A	519	U16	0	65535	0	√	R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0	-	R/W	QD*	-
Bitword Pad B	536	U16	0	65535	0	√	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 13	550	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0	-	R/W	QD*	-
OPTIONS \ Option 1									
Menu	Accessible only with optional Field bus card								

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OPTIONS \ Option 1 \ PDC config \ PDC inputs									
Pdc in 0	1095	U16	0	65535	0	√	R/W	-	-
Pdc in 1	1096	U16	0	65535	0	√	R/W	-	-
Pdc in 2	1097	U16	0	65535	0	√	R/W	-	-
Pdc in 3	1098	U16	0	65535	0	√	R/W	-	-
Pdc in 4	1099	U16	0	65535	0	√	R/W	-	-
Pdc in 5	1100	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1 \ PDC config \ PDC outputs									
Pdc out 0	1101	U16	0	65535	0	√	R/W	-	-
Pdc out 1	1102	U16	0	65535	0	√	R/W	-	-
Pdc out 2	1103	U16	0	65535	0	√	R/W	-	-
Pdc out 3	1104	U16	0	65535	0	√	R/W	-	-
Pdc out 4	1105	U16	0	65535	0	√	R/W	-	-
Pdc out 5	1106	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1 \ PDC config \ Virt dig in									
Virt dig in 0	1107	U16	0	65535	0	√	R/W	-	-
Virt dig in 1	1108	U16	0	65535	0	√	R/W	-	-
Virt dig in 2	1109	U16	0	65535	0	√	R/W	-	-
Virt dig in 3	1110	U16	0	65535	0	√	R/W	-	-
Virt dig in 4	1111	U16	0	65535	0	√	R/W	-	-
Virt dig in 5	1112	U16	0	65535	0	√	R/W	-	-
Virt dig in 6	1113	U16	0	65535	0	√	R/W	-	-
Virt dig in 7	1114	U16	0	65535	0	√	R/W	-	-
Virt dig in 8	1115	U16	0	65535	0	√	R/W	-	-
Virt dig in 9	1116	U16	0	65535	0	√	R/W	-	-
Virt dig in 10	1117	U16	0	65535	0	√	R/W	-	-
Virt dig in 11	1118	U16	0	65535	0	√	R/W	-	-
Virt dig in 12	1119	U16	0	65535	0	√	R/W	-	-
Virt dig in 13	1120	U16	0	65535	0	√	R/W	-	-
Virt dig in 14	1121	U16	0	65535	0	√	R/W	-	-
Virt dig in 15	1122	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1 \ PDC config \ Virt dig out									
Virt dig out 0	1123	U16	0	65535	0	√	R/W	-	-
Virt dig out 1	1124	U16	0	65535	0	√	R/W	-	-
Virt dig out 2	1125	U16	0	65535	0	√	R/W	-	-
Virt dig out 3	1126	U16	0	65535	0	√	R/W	-	-
Virt dig out 4	1127	U16	0	65535	0	√	R/W	-	-
Virt dig out 5	1128	U16	0	65535	0	√	R/W	-	-
Virt dig out 6	1129	U16	0	65535	0	√	R/W	-	-
Virt dig out 7	1130	U16	0	65535	0	√	R/W	-	-
Virt dig out 8	1131	U16	0	65535	0	√	R/W	-	-
Virt dig out 9	1132	U16	0	65535	0	√	R/W	-	-
Virt dig out 10	1133	U16	0	65535	0	√	R/W	-	-
Virt dig out 11	1134	U16	0	65535	0	√	R/W	-	-
Virt dig out 12	1135	U16	0	65535	0	√	R/W	-	-
Virt dig out 13	1136	U16	0	65535	0	√	R/W	-	-
Virt dig out 14	1137	U16	0	65535	0	√	R/W	-	-
Virt dig out 15	1138	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 2									
Menu	Accessible only with optional DGF card (See DGF card user manual)								
Enable OPT2	425	U16	0	1	Disabled (0)	√	R/Z		
Enabled							1		
Disabled							0		
OPTIONS \ PID									
Enable PI PID	769	U16	0	1	Disabled (0)	√	R/W	ID	R/W
Enabled							1		
Disabled							0		
Enable PD PID	770	U16	0	1	Disabled (0)	√	R/W	ID	R/W
Enabled							1		
Disabled							0		
OPTIONS \ PID \ PID source									
PID source	786	U16	0	65535	0	√	R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000	√	R/W	-	-

Parameter	No	Format	Value			Access via				
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC	
OPTIONS \ PID										
Feed-fwd PID	758	I16	-10000	10000	0	√	R	IA	R	
OPTIONS \ PID \ PID references										
PID error	759	I16	-10000	10000	0	√	R	-	R	
PID feed-back	763	I16	-10000	10000	0	√	R/W	IA	R/W	
PID offs. Sel	Offset 0 Offset 1	762	U16	0	1	Offset 0 (0)	√	R/W 0 1	ID	R/W
PID offset 0		760	I16	-10000	10000	0	√	R/W	IA	R/W
PID offset 1	761	I16	-10000	10000	0	√	R/W	-	-	
PID acc time [s]	1046	Float	0.0	900.0	0.0	√	R/W	-	-	
PID dec time [s]	1047	Float	0.0	900.0	0.0	√	R/W	-	-	
PID clamp	757	I16	0	10000	10000	√	R/W	-	-	
OPTIONS \ PID \ PI controls										
PI P gain PID %	765	Float	0.00	100.00	10.00	√	R/W	-	-	
PI I gain PID %	764	Float	0.00	100.00	10.00	√	R/W	-	-	
PI steady thr	695	I16	0	10000	0	√	R/W	-	-	
PI steady delay [ms]	731	U16	0	60000	0	√	R/W	-	-	
P init gain PID %	793	Float	0.00	100.00	10.00	√	R/W	-	-	
I init gain PID %	734	Float	0.00	100.00	10.00	√	R/W	-	-	
PI central v sel	779	U16	0	3	1	√	R/W	ID	R/W	
PI central v1	776	Float	P785	P784	1.00	√	R/W	-	-	
PI central v2	777	Float	P785	P784	1.00	√	R/W	-	-	
PI central v3	778	Float	P785	P784	1.00	√	R/W	IA	-	
PI top lim	784	Float	P785	10.00	10.00	√	R/W	-	-	
PI bottom lim	785	Float	-10.00	P784	0	√	R/W	-	-	
PI integr freeze	ON OFF	783	U16	0	1	0	√	R/W 1 0	ID	R/W
OPTIONS \ PID										
PI output PID	771	I16	0	1000 x P784	1000	√	R	-	R	
Real FF PID	418	I16	-10000	10000	0	√	R	-	R	
OPTIONS \ PID \ PD controls										
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00	√	R/W	-	-	
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00	√	R/W	-	-	
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00	√	R/W	-	-	
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00	√	R/W	-	-	
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00	√	R/W	-	-	
PD D gain 3 PID [%]	791	Float	0.00	100.00	1.00	√	R/W	-	-	
PD D filter PID [ms]	767	U16	0	1000	0	√	R/W	-	-	
OPTIONS \ PID										
PD output PID	421	I16	-10000	10000	0	√	R	-	R	
PID out sign PID	Positive Bipolar	772	U16	0	1	1	√	R/W 0 1	-	-
PID output		774	I16	-10000	10000	0	√	R	QA	R
OPTIONS \ PID \ PID target										
PID target	782	U16	0	65535	0	√	R/W	-	-	
PID out scale	773	Float	-100.000	100.000	1.000	√	R/W	-	-	
OPTIONS \ PID \ Diameter calc										
Diameter calc	Enabled Disabled	794	U16	0	1	0	√	Z/R 1 0	ID	R/W
Positioning spd [rpm]		795	I16	-100	100	0	√	R/W	-	-
Max deviation	796	I16	-10000	10000	8000	√	R/W	-	-	
Gear box ratio	797	Float	0.001	1.000	1.000	√	R/W	-	-	
Dancer constant [mm]	798	U16	1	10000	1	√	R/W	-	-	
Minimum diameter [cm]	799	U16	1	2000	1	√	R/W	-	-	
OPTIONS \ PID										
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W	
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W	
Diameter calc st	800	U16	0	1	0	-	R	QD	R	

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
DRIVECOM									
Malfunction code	57	U16	0	65535		√	R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Control Word	55	U16	0	65535	S	√	R/W	-	R/W
Status word	56	U16	0	65535	-	√	R	-	R
Speed input var [FF]	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	
(Ramp ref 1)									
Speed ref var [FF]	115	I16	-32768	32767		√	R	-	R
(Speed ref)									
Act speed value [FF]	119	I16	-32768	32767		√	R	-	R
(Actual spd)									
DRIVECOM \ Speed amount									
Speed min amount [FF]	1	U32	0	2 ³² -1	0	√	R/Z	-	
Speed max amount [FF]	2	U32	0	2 ³² -1	2000	√	R/Z	-	-
DRIVECOM \ Speed min/max									
Speed min pos [FF]	5	U32	0	2 ³² -1	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2 ³² -1	2000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2 ³² -1	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2 ³² -1	2000	√	R/Z	-	-
DRIVECOM \ Acceleration									
Acc delta speed [FF]	21	U32	0	2 ³² -1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Deceleration									
Dec delta speed [FF]	29	U32	0	2 ³² -1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Quick stop									
QStp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z		-
Ramp stop							1		
DC braking curr							2		
QStp delta speed [FF]	37	U32	0	2 ³² -1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Face value fact									
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Face value den	53	I16	1	32767	1	√	R/Z	-	R
DRIVECOM \ Dimension fact									
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	2 ³² -1	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
DRIVECOM									
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	-	R/W
Percent ref var [%]	116	I16	-32768	32767	0	√	R	-	R
Act percentage [%]	120	I16	-32768	32767	0	√	R	-	R
SERVICE									
Password 2	86			Service		√	W	-	-

10.2. List of all parameters in numeric order

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital I/Q	–				–	√	R	–	–
Motor pot oper	–					√	–	–	–
Jog operation	–					√	–	–	–
Failure register	–					√	R	–	–
Speed min amount [FF]	1	U32	0	$2^{32}-1$	0	√	R/Z	–	–
Speed max amount [FF]	2	U32	0	$2^{32}-1$	2000	√	R/Z	–	–
Speed max pos [FF]	3	U32	0	$2^{32}-1$	2000	√	R/Z	–	–
Speed max neg [FF]	4	U32	0	$2^{32}-1$	2000	√	R/Z	–	–
Speed min pos [FF]	5	U32	0	$2^{32}-1$	0	√	R/Z	–	–
Speed min neg [FF]	6	U32	0	$2^{32}-1$	0	√	R/Z	–	–
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
In use Tcur lim + [%]	10	U16	0	F		√	R	–	R
In use Tcur lim - [%]	11	U16	0	F		√	R	–	R
Current lim red [%]	13	U16	0	F	100	√	R/W	–	R/W
Ramp shape	18	U16	0	1	Linear (0)	√	R/Z 0 1	–	–
Linear									
S-Shaped									
S shape t const [ms]	19	Float	100	3000	500	√	R/W	–	–
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W	–	–
Acc delta speed [FF]	21	U32	0	$2^{32}-1$	100	√	R/W	–	–
Acc delta time [s]	22	U16	0	65535	1	√	R/W	–	–
Acc delta speed1 [FF]	23	U32	0	$2^{32}-1$	100	√	R/W	–	–
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	–	–
Acc delta speed 2 [FF]	25	U32	0	$2^{32}-1$	100	√	R/W	–	–
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	–	–
Acc delta speed 3 [FF]	27	U32	0	$2^{32}-1$	100	√	R/W	–	–
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	–	–
Dec delta speed [FF]	29	U32	0	$2^{32}-1$	100	√	R/W	–	–
Dec delta time [s]	30	U16	0	65535	1	√	R/W	–	–
Dec delta speed 1 [FF]	31	U32	0	$2^{32}-1$	100	√	R/W	–	–
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	–	–
Dec delta speed2 [FF]	33	U32	0	$2^{32}-1$	100	√	R/W	–	–
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	–	–
Dec delta speed 3 [FF]	35	U32	0	$2^{32}-1$	100	√	R/W	–	–
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	–	–
QStp delta speed [FF]	37	U32	0	$2^{32}-1$	1000	√	R/W	–	–
QStp delta time [s]	38	U16	0	65535	1	√	R/W	–	–
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref [%]	41	I16	-500	500	–	√	R	QA	R
Speed ref 1 [FF]	42	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Speed ref 2 [FF]	43	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 [FF]	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
(Speed input var)									
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	–	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	–	R/W
Ramp ref 1 (%)	47	Float	-200	200	0	√	R/W	–	–
Ramp ref 2 [FF]	48	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200	200	0	√	R/W	–	–
Dim factor num	50	I32***	1	65535	1	√	R/Z	–	R
Dim factor den	51	I32***	1	$2^{32}-1$	1	√	R/Z	–	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dim factor text	52	Text			rpm	√	R/Z	–	–
Face value den	53	I16	1	32767	1	√	R/Z	–	R
Face value num	54	I16	1	32767	1	√	R/Z	–	R
Control word	55	U16	0	65535	S	√	R/W	–	R/W
Status word	56	U16	0	65535	–	√	R	–	R
Malfunction code	57	U16	0	65535		√	R	–	–
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
External fault							9000h		
Enable seq err							9009h		
Gen access	58	U16	0	4	Not conn. (0)	√	R/Z	–	–
Not connected							0		
F current ref							1		
T current ref							2		
Flux ref							3		
Ramp ref							4		
Gen frequency [Hz]	59	Float	0.1	62.5	1	√	R/W	–	–
Gen amplitude [%]	60	Float	0	200	0	√	R/W	–	–
Gen offset [%]	61	Float	-200	200	0	√	R/W	–	–
Scale output 1	62	Float	-10	10	1	√	R/W	–	–
Scale output 2	63	Float	-10	10	1	√	R/W	–	–
Scale output 3	64	Float	-10	10	1	√	R/W	–	–
Scale output 4	65	Float	-10	10	1	√	R/W	–	–

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Select output 1	66	U16	0	84	Actual speed (8)	√	R/Z	—	—
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		
Output voltage							20		
Voltage U							21		
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Select output 2 (Select like output 1)	67	U16	0	84	T current (14)	√	R/Z	—	—
Select output 3 (Select like output 1)	68	U16	0	84	Current U (17)	√	R/Z	—	—
Select output 4 (Select like output 1)	69	U16	0	84	Motor current (16)	√	R/Z	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Select input 1 OFF Jog reference Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2 T current ref 1 T current ref 2 Adap reference T current lim T current lim + T current lim - Pad 0 Pad 1 Pad 2 Pad 3 Load comp PID offset 0 PI central v3 PID feed-back V/f flux level Flux level Out vlt level Speed ratio	70	U16	0	28	Ramp ref 1 (4)	√	R/Z 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 19 21 22 23 24 25 26 28	—	—
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	—	—
Scale input 1	72	Float	-10000	10	1	√	R/W	—	—
Tune value inp 1	73	Float	0.1	10	1	√	R/W	—	—
Offset input 1	74	I16	-32768	32767	0	√	R/W	—	—
Select input 2 (Select like Input 1)	75	U16	0	28	OFF (0)	√	R/Z	—	—
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	—	—
Scale input 2	77	Float	-10000	10	1	√	R/W	—	—
Tune value inp 2	78	Float	0.1	10	1	√	R/W	—	—
Offset input 2	79	I16	-32768	32767	0	√	R/W	—	—
Select input 3 (Select like Input 1)	80	U16	0	28	OFF (0)	√	R/Z	—	—
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	—	—
Scale input 3	82	Float	-10000	10	1	√	R/W	—	—
Tune value inp 3	83	Float	0.1	10	1	√	R/W	—	—
Offset input 3	84	I16	-32768	32767	0	√	R/W	—	—
Pword 1 : Enabled Disabled	85	I32	0	99999	Disabled (0)	√	W 1 0	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Password 2	86	Service				√	W	–	–
Speed P [%]	87	Float	0	100	S	√	R/W	–	–
Speed I [%]	88	Float	0	100	S	√	R/W	–	–
Current P [%]	89	Float	0	100	S	√	R/W	–	–
Current I [%]	90	Float	0	100	S	√	R/W	–	–
Flux P [%]	91	Float	0	100	S	√	R/W	–	–
Flux I [%]	92	Float	0	100	S	√	R/W	–	–
Speed P base [A/rpm]	93	Float	0.001	99.999	S	√	R/Z	–	–
Speed I base[A/rpm x ms]	94	Float	0.001	99.999	S	√	R/Z	–	–
Current P base [V/A]	95	Float	0.1	99999.9	S	√	R/Z	–	–
Current I base [V/A x ms]	96	Float	0.1	9999.9	S	√	R/Z	–	–
Flux P base [A/Vs]	97	Float	0.1	9999.9	S	√	R/Z	–	–
Flux I base [A/Vs x ms]	98	Float	0.01	999.99	S	√	R/Z	–	–
Speed P in use [%]	99	Float	0	100	S	√	R	–	–
Speed I in use [%]	100	Float	0	100	S	√	R	–	–
Spd threshold + [FF]	101	U16	1	32767	1000	√	R/W	–	–
Spd threshold - [FF]	102	U16	1	32767	1000	√	R/W	–	–
Threshold delay [ms]	103	U16	0	65535	100	√	R/W	–	–
Set error [FF]	104	U16	1	32767	100	√	R/W	–	–
Set delay [ms]	105	U16	0	65535	100	√	R/W	–	–
Ref 0 level [FF]	106	U16	1	32767	10	√	R/W	–	–
Speed zero level [FF]	107	U16	1	32767	10	√	R/W	–	–
Speed zero delay [ms]	108	U16	0	65535	100	√	R/W	–	–
Ramp ref (d) [FF]	109	I16	-32768	32767	–	√	R	–	R
Ramp ref (rpm)	110	I16	-32768	32767	–	√	R	QA	R
Ramp ref (%)	111	Float	-200	+200	–	√	R	–	–
Ramp output (d) [FF]	112	I16	-32768	32767	–	√	R	–	R
Ramp outp (rpm)	113	I16	-32768	32767	–	√	R	QA	R
Ramp output (%)	114	Float	-200	200	–	√	R	–	–
Speed ref var [FF]	115	I16	-32768	+200		√	R	–	R
(Speed ref)									
Percent ref var [%]	116	I16	-32768	32767	0	√	R	–	R
Speed ref (%)	117	Float	-200	+200	–	√	R	–	–
Speed ref [rpm]	118	I16	-32768	32767	–	√	R	QA	R
Act speed value [FF]									
(Actual spd)									
Act percentage [%]	120	I16	-32768	32767	0	√	R	–	R
Actual spd (%)	121	Float	-200	+200	–	√	R	–	–
Actual spd (rpm)	122	I16	-8192	8192	–	√	R	QA	R
Enable spd=0 I	123	U16	0	1	Disabled (0)	√	R/Z	–	–
Enabled Disabled							1 0		
Enable spd=0 R	124	U16	0	1	Disabled (0)	√	R/Z	–	–
Enabled Disabled							1 0		
Enable spd=0 P	125	U16	0	1	Disabled (0)	√	R/Z	–	–
Enabled Disabled							1 0		
Spd=0 P gain [%]	126	Float	0	100	10	√	R/W	–	–

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 1	137	U16	0	62	OFF (0)	√	R/Z	—	—
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		
Jog -							7		
Failure reset							8		
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed l							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign -							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ac							67		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 2 (Select like input 1)	138	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 3 (Select like input 1)	139	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 4 (Select like input 1)	140	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 5 (Select like input 1)	141	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 6 (Select like input 1)	142	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 7 (Select like input 1)	143	U16	0	62	OFF (0)	√	R/Z	—	—
Digital input 8 (Select like input 1)	144	U16	0	62	OFF (0)	√	R/Z	—	—
Digital output 1	145	U16	0	49	Ramp + (8)	√	R/Z	—	—
OFF							0		
Speed zero thr							1		
Spd threshold							2		
Set speed							3		
Curr limit state							4		
Drive ready							5		
Overld available							6		
Ramp +							8		
Ramp -							9		
Speed limited							10		
Undervoltage							11		
Overvoltage							12		
Heatsink sensor							13		
Overcurrent							14		
Overtemp motor							15		
External fault							16		
Failure supply							17		
Pad A bit							18		
Pad B bit							19		
Virt dig input							20		
Speed fbk loss							25		
Bus loss							26		
Output stages							27		
Hw opt 1 failure							28		
Opt 2 failure							29		
Encoder 1 state							30		
Encoder 2 state							31		
Ovld mot state							32		
Enable seq err							35		
BU overload							36		
Diameter calc st							38		
Mot setup state							46		
Input 1 cp match							49		
Overload 200%							51		
PL stop active							52		
PL next active							53		
PL time-out sig							54		
Regulation ot							55		
Module overtemp.							56		
Heatsink ot							57		
Intake air ot							62		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital output 2 (Select like output 1)	146	U16	0	49	Ramp - (9)	√	R/Z	—	
Digital output 3 (Select like output 1)	147	U16	0	49	Spd threshold (2)	√	R/Z	—	
Digital output 4 (Select like output 1)	148	U16	0	49	Overld available (6)	√	R/Z	—	—
Digital output 5 (Select like output 1)	149	U16	0	49	Curr limit state (4)	√	R/Z	—	—
Digital output 6 (Select like output 1)	150	U16	0	49	Over-voltage (12)	√	R/Z	—	—
Digital output 7 (Select like output 1)	151	U16	0	49	Under-voltage (11)	√	R/Z	—	—
Digital output 8 (Select like output 1)	152	U16	0	49	Over-current (14)	√	R/Z	—	—
Enab multi spd Enabled Disabled	153	I16	0	1	Disabled (0)	√	R/Z 1 0	—	—
Multi speed 1 [FF]	154	I16	-32768	32767	0	√	R/W	—	—
Multi speed 2 [FF]	155	I16	-32768	32767	0	√	R/W	—	—
Multi speed 3 [FF]	156	I16	-32768	32767	0	√	R/W	—	—
Multi speed 4 [FF]	157	I16	-32768	32767	0	√	R/W	—	—
Multi speed 5 [FF]	158	I16	-32768	32767	0	√	R/W	—	—
Multi speed 6 [FF]	159	I16	-32768	32767	0	√	R/W	—	—
Multi speed 7 [FF]	160	I16	-32768	32767	0	√	R/W	—	—
Nominal voltage [V]	161	Float	1	999	400	√	R/Z	—	—
Nominal speed [rpm]	162	Float**	1	99999	S	√	R/Z	—	—
Nom frequency [Hz]	163	Float	1	999	60	√	R/Z	—	—
Nominal current [A]	164	Float	0.1	999	S	√	R/Z	—	—
Magnetizing curr [A]	165	Float	0.1	999	S	√	R/W	—	—
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	—	—
Base voltage [V]	167	Float	1	999	460	√	R/Z	—	—
Base frequency [Hz]	168	Float	1	999	60	√	R/Z	—	—
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	—	R
P1 flux model	176	Float	0	1	S	√	R/W	—	—
Full load curr [A]	179	Float	0.1	999	S	√	R/Z	—	—
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)	√	R/Z 1 0	—	—
Sel adap type Speed Adap reference	182	U16	0	1	Speed (0)	√	R/Z 0 1	—	—
Adap reference [FF]	183	I16	-32768	32767	1000	√	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0	200	20.3	√	R/W	—	—
Adap speed 2 [%]	185	Float	0	200	40.7	√	R/W	—	—
Adap joint 1 [%]	186	Float	0	200	6.1	√	R/W	—	—
Adap joint 2 [%]	187	Float	0	200	6.1	√	R/W	—	—
Adap P gain 1 [%]	188	Float	0	100	10	√	R/W	—	—
Adap I gain 1 [%]	189	Float	0	100	1	√	R/W	—	—
Adap P gain 2 [%]	190	Float	0	100	10	√	R/W	—	—
Adap I gain 2 [%]	191	Float	0	100	1	√	R/W	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Adap P gain 3 [%]	192	Float	0	100	10	√	R/W	–	–
Adap I gain 3 [%]	193	Float	0	100	1	√	R/W	–	–
Multi ramp sel	202	U16	0	3	0	√	R/W	–	R/W
Multi speed sel	208	U16	0	7	0	√	R/W	–	R/W
Latch ON OFF	210	U16	0	1	ON (1)	√	R/Z 1 0	–	–
OK relay open ON OFF	211	I16	0	1	ON (1)	√	R/W 1 0	–	–
DC link voltage [V]	227	U16	0	999	–	√	R	QA	–
Active power [%]	229	Float**	-500	500	–	√	R	QA	R
Torque [%]	230	Float	-500	500	–	√	R	QA	–
Motor current [A]	231	Float	0	S	–	√	R	QA	–
Output voltage [V]	233	Float**	0	500	–	√	R	QA	R
Flux [%]	234	Float*	0	100	–	√	R	QA	R
Life time [h.min]	235	Float	0	65535	–	√	R	–	–
Speed reg output [%]	236	I16	–	–	–	√	R	QA	R
Switching freq 4 KHz 8 KHz 16 KHz 2 KHz	240	U16	S	S	S	√	R/Z 0 1 2 3	–	–
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)	√	R/Z 1 0	–	–
Enab multi rmp Enabled Disabled	243	I16	0	1	Disabled (0)	√	R/Z 1 0	–	–
Enable jog Enabled Disabled	244	I16	0	1	Enabled (1)	√	R/Z 1 0	–	–
Enable ramp Enabled Disabled	245	I16	0	1	Enabled (1)	√	R/Z 1 0	–	–
Enab motor pot Enabled Disabled	246	I16	0	1	Enabled (1)	√	R/Z 1 0	–	–
Motor pot sign Positive Negative	248	I16	0	1	Positive (1)		R/W 1 0	ID	–
Motor pot reset	249	U16	0	65535	–	√	Z/C	ID H=reset	–
Load motor par Std for 400V Std for 460V	251	U16	0	1	Std400V (0)	√	Z 0 1	–	–
Main commands Terminals Digital	252	U16	0	1	Digital (1)	√	R/Z 0 1	–	–
Control mode Local Bus	253	U16	0	1	Local (0)	√	R/Z 0 1	–	–
Save parameters	256	U16	0	65535	–	√	C	–	–
Load default	258	U16	0	65535	–	√	Z/C	–	–

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Auto tune inp 1 Auto tune	259	U16	0	65535	—	√	C 1	—	—
Auto tune inp 2 Auto tune	260	U16	0	65535	—	√	C 1	—	—
Auto tune inp 3 Auto tune	261	U16	0	65535	—	√	C 1	—	—
Failure reset	262	U16	0	65535		√	Z/C	ID H=reset	—
Failure reg del	263	U16	0	65535		√	C	—	—
Jog reference [FF]	266	I16	0	32767	100	√	R/W	IA	—
Current norm	267	Float	0	9999.99	S	—	R	—	—
Forward sign FWD selected FWD not selected	293	U16	0	1	not sel (0)	— —	R/W 1 0	ID H L	R/W
Reverse sign REV selected REV not selected	294	U16	0	1	not sel (0)	— —	R/W 1 0	ID H L	R/W
An in 1 target Assigned Not assigned	295	U16	0	1	Assign.(0)	√	R/W 1 0	ID L H	R/W
An in 2 target Assigned Not assigned	296	U16	0	1	Assign.(0)	√	R/W 0 1	ID L H	R/W
An in 3 target Assigned Not assigned	297	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Drive type (AV-300i)	300	U16	—	—	274	—	R	—	R
Flt_100_mf	303	I16	0	32767	S	—	R	—	R
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	√	R/W 1 0	12 H L	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)	√	R/W 1 0	13 H L	R/W
Fast stop Fast Stop No Fast Stop	316	U16	0	1	No fast stop (1)	— —	R/W 0 1	14 L H	R/W
Device address	319	U16	0	127	0	√	R/Z	—	—
Regulation mode Sensorless vect Self-tuning Field oriented V/f control	321	U16	0	3	v/f control (3)	√	R/Z 0 1 2 3	—	—
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Output frequency [Hz]	324	Float	0	500	—	√	R	—	—
Failure text	327	Text				—	R	—	—
Failure hour	328	U16	0	65535		—	R	—	—
Failure min	329	U16	0	59		—	R	—	—
Pointer	330	U16	1	10	10	—	R/W	—	—
Software version	331	Text				√	R	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Ambient temp [°C] 50°C (122°F) 40°C (104°F)	332	U16	0	1	40°C (1)	√	R/Z 0 1	—	—
Mains voltage 230 V 400 V 460 V	333	U16	S	2	460 V (2)	√	R/Z 0 1 2	—	—
Rated drive curr 7.5 12.6 17.7 24.8 33 47 63 79 93 114 142 185 210 250 324 485 580 2.4 4 5.6 9.6	334	U16	0	16	S	—	R 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	—	R
Torque reduct Not active active	342	U16	0	1	Not act. (0)	√	R/W 0 1	ID L H	R/W
Quick stop Quick stop No Quick stop	343	U16	0	1	No quick stop (1)	—	R/W 0 1	ID L H	R/W
Ramp out = 0 Active Not active	344	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp in = 0 Active Not active	345	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp + Acc. clockwise + Dec. counter-clockwise Other states	346	U16	0	1	—	—	R 1 0	QD H L	R
Ramp - Acc. counter-clockwise + Dec. clockwise Other states	347	U16	0	1	—	—	R 1 0	QD H L	R
Lock speed I Active Not Active	348	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Curr limit state Curr. limit not reached Curr. limit reached	349	U16	0	1		—	R 0 1	QD L H	R
Torque current	350	Float	S	S		—	R	QA	—
Flux current	351	Float	S	S		—	R	QA	—
F current ref	352	Float	S	S		—	R	QA	R/W
Zero torque Active Not active	353	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	354	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	—	—
Latch ON OFF	355	U16	0	1	ON (1)	√	R/Z 1 0	—	—
OK relay open ON OFF	356	I16	0	1	ON (1)	√	R/W 1 0	—	—
Latch ON OFF	357	U16	0	1	ON (1)	√	R/Z 1 0	—	—
OK relay open ON OFF	358	I16	0	1	ON (1)	√	R/W 1 0	—	—
Restart time [ms]	359	U16	0	65535	1000	√	R/W	—	—
N of attempts	360	U16	0	100	1	√	R/W	—	—
Latch ON OFF	361	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	362	I16	0	1	ON (1)	√	R/W 1 0	—	—
Latch ON OFF	363	U16	0	1	ON (1)	√	R/Z 1 0	—	—
OK relay open ON OFF	364	I16	0	1	ON (1)	√	R/W 1 0	—	—
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	365	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	—	—
Latch ON OFF	366	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	367	I16	0	1	ON (1)	√	R/W 1 0	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	368	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	—	—
Latch ON OFF	369	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	370	I16	0	1	ON (1)	√	R/W 1 0	—	—
Cos phi	371	Float	0.1	0.99	S	√	R/Z	—	—
Speed limited Speed not limited Speed limited	372	U16	0	1		—	R 0 1	QD L H	R
Freeze ramp Active Not active	373	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Jog selection Speed input Ramp input	375	U16	0	1	Spd inp. (0)	√	R/Z 0 1	—	—
Speed ref 1 (%)	378	Float	-200	+200	0	√	R/W	—	—
Speed Ref 2 (%)	379	Float	-200	+200	0	√	R/W	—	—
Drive ready Drive ready Drive not ready	380	U16	0	1	—	—	R 1 0	QD H L	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	386	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	—	—
OK relay open ON OFF	387	I16	0	1	ON (1)	√	R/W 1 0	—	—
Auto capture ON OFF	388	U16	0	1	OFF (0)	√	R/W 1 0	ID H L	—
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	—	R/W
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	—	R/W
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	—	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Spd threshold Speed exceeded Speed not exceeded	393	U16	0	1		–	R 0 1	QD L H	R
Set speed Speed not ref. val. Speed = ref. val.	394	U16	0	1		–	R 0 1	QD L H	R
Spd zero thr Drive not rotating Drive rotating	395	U16	0	1		–	R 0 1	QD L H	R
Motor pot up No acceleration Acceleration	396	U16	0	1	No acc. (0)	–	R/W 0 1	ID L H	R/W
Motor pot down No deceleration Deceleration	397	U16	0	1	No dec. (0)	–	R/W 0 1	ID L H	R/W
Jog + No jog forward Forward jog	398	U16	0	1	No jog+ (0)	–	R/W 0 1	ID L H	R/W
Jog - No backward jog Backward jog	399	U16	0	1	No jog- (0)	–	R/W 0 1	ID L H	R/W
Speed sel 0 Value 2 ⁰ not selected Value 2 ⁰ selected	400	U16	0	1	Not sel. (0)	–	R/W 0 1	ID L H	R/W
Speed sel 1 Value 2 ¹ not selected Value 2 ¹ selected	401	U16	0	1	Not sel. (0)	–	R/W 0 1	ID L H	R/W
Speed sel 2 Value 2 ² not selected Value 2 ² selected	402	U16	0	1	Not sel. (0)	–	R/W 0 1	ID L H	R/W
Ramp sel 0 Value 2 ⁰ not selected Value 2 ⁰ selected	403	U16	0	1	Not sel. (0)	–	R/W 0 1	ID L H	R/W
Ramp sel 1 Value 2 ¹ not selected Value 2 ¹ selected	404	U16	0	1	Not sel. (0)	–	R/W 0 1	ID L H	R/W
Ovld available Overload not possible Overload possible	406	U16	0	1	–	–	R 0 1	QD L H	R
Ser answer delay [ms]	408	U16	0	900	0	√	R/W	–	–
Ok relay funct Drive healthy Ready to start	412	U16	0	1	Drive Healthy (0)	√	R/Z 0 1	–	–
Magn boost curr [%]	413	U16	10	136	30	√	R/Z	–	–
Speed fbk sel Encoder 1 Encoder 2	414	U16	0	1	Enc.1 (1)	√	R/Z 1 0	ID H L	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Sinus. (0)	√	R/Z 0 1	–	–
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	–	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Failure code	417	U16	0	65535		–	R	–	–
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt 2							7400h		
Hw Opt 1 failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Real FF PID	418	I16	-10000	10000	0	√	R	–	R
Enc 2 speed [rpm]	420	I16	-8192	8192	–	√	R	–	R
PD output PID	421	I16	-10000	10000	0	√	R	–	R
Enable lck sls	422	U16	0	1	Disabled (0)	√	R/Z	–	–
Enabled							1		
Disabled							0		
Enable OPT2	425	U16	0	1	Disabled (0)	√	R/Z		
Enabled							1		
Disabled							0		
Enc1 speed [rpm]	427	I16	-8192	8192	–	√	R	–	R
Enable rr adap	435	U16	0	1	Disabled (0)	√	R/W	–	–
Enabled							1		
Disabled							0		
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	–	–
Lkg inductance [H]	437	Float	0.00001	9	S	√	R/W	–	–
Prop. filter [ms]	444	U16	0	1000	0	√	R/W	–	–
Speed up gain [%]	445	Float	0	100	0	√	R/W	–	–
Speed up base [ms]	446	Float	0	16000	1000	√	R/W	–	–
Speed up filter [ms]	447	U16	0	1000	0	√	R/W	–	–
Flux level [%]	467	U16	10	100	100	√	R/W	IA QA	R/W
Flux reg mode	469	U16	0	1	Volt.control (1)	√	R/Z	–	–
Constant current							0		
Voltage control							1		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Source link 1	484	U16	0	65535	0	√	R/W	–	–
Destination link 1	485	U16	0	65535	0	√	R/W	–	–
Mul.Gain link 1	486	Float	-10000	10000	1	√	R/W	–	–
Div.Gain link 1	487	Float	-10000	10000	1	√	R/W	–	–
Input max link 1	488	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	–	–
Input min link 1	489	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	–	–
Input offset link 1	490	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	–	–
Output offset link 1	491	Float	-2 ³¹	2 ³¹ -1	0	√	R/W	–	–
Input absolute link 1	492	U16	0	1	OFF (0)	√	R/W 1 0	–	–
Flux reference	500	Float*	0	100	–	√	R	QA	R
Pad 0	503	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0	√	R/W	–	R/W
Pad 8	511	I16	-32768	32767	0	√	R/W	–	R/W
Pad 9	512	I16	-32768	32767	0	√	R/W	–	R/W
Pad 10	513	I16	-32768	32767	0	√	R/W	–	R/W
Pad 11	514	I16	-32768	32767	0	√	R/W	–	R/W
Pad 12	515	I16	-32768	32767	0	√	R/W	–	R/W
Pad 13	516	I16	-32768	32767	0	√	R/W	–	R/W
Pad 14	517	I16	-32768	32767	0	√	R/W	–	R/W
Pad 15	518	I16	-32768	32767	0	√	R/W	–	R/W
Bitword Pad A	519	U16	0	65535	0	√	R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	–	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 9	529	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 10	530	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 11	531	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 12	532	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 13	533	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 14	534	U16	0	1	0	–	R/W	QD*	–
Pad A Bit 15	535	U16	0	1	0	–	R/W	QD*	–

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Bitword Pad B	536	U16	0	65535	0	√	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	—	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	—	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	—	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	—	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	—	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	—	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	—	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	—	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 9	546	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 10	547	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 11	548	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 12	549	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 13	550	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 14	551	U16	0	1	0	—	R/W	QD*	—
Pad B Bit 15	552	U16	0	1	0	—	R/W	QD*	—
Source link 2	553	U16	0	65535	0	√	R/W	—	—
Destination link 2	554	U16	0	65535	0	√	R/W	—	—
Mul.Gain link 2	555	Float	-10000	10000	1	√	R/W	—	—
Div.Gain link 2	556	Float	-10000	10000	1	√	R/W	—	—
Input max link 2	557	Float	-2 ³¹	-2 ³¹ -1	0	√	R/W	—	—
Input min link 2	558	Float	-2 ³¹	-2 ³¹ -1	0	√	R/W	—	—
Input offset link 2	559	Float	-2 ³¹	-2 ³¹ -1	0	√	R/W	—	—
Output offset link 2	560	Float	-2 ³¹	-2 ³¹ -1	0	√	R/W	—	—
Input absolute link 2 ON OFF	561	U16	0	1	OFF (0)	√	R/W 1 0	—	—
Dig input term	564	U16	0	65535	—	—	R	—	R
Dig input term 1	565	U16	0	1	—	—	R	—	R
Dig input term 2	566	U16	0	1	—	—	R	—	R
Dig input term 3	567	U16	0	1	—	—	R	—	R
Dig input term 4	568	U16	0	1	—	—	R	—	R
Dig input term 5	569	U16	0	1	—	—	R	—	R
Dig input term 6	570	U16	0	1	—	—	R	—	R
Dig input term 7	571	U16	0	1	—	—	R	—	R
Dig input term 8	572	U16	0	1	—	—	R	—	R
Dig input term 9	573	U16	0	1	—	—	R	—	R
Dig input term 10	574	U16	0	1	—	—	R	—	R
Dig input term 11	575	U16	0	1	—	—	R	—	R
Dig input term 12	576	U16	0	1	—	—	R	—	R
Dig input term 13	577	U16	0	1	—	—	R	—	R
Dig input term 14	578	U16	0	1	—	—	R	—	R
Dig input term 15	579	U16	0	1	—	—	R	—	R
Dig input term 16	580	U16	0	1	—	—	R	—	R
Dig output term	581	U16	0	65535	—	—	R	—	R
Virtual dig inp	582	U16	0	65535	—	√	R/W	—	R/W
Virtual dig out	583	U16	0	65535	—	√	R	—	R
Stop mode OFF Stop & Speed 0 Fast stp & Spd 0 Fst / stp & spd 0	626	U16	0	3	1	√	R/Z 0 1 2 3	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	—	—
Relay 2 (Select like output 1)	629	U16	0	49	Speed zero thr (1)	√	R/Z	83–85	—
Jog stop control ON OFF	630	U16	0	1	OFF (0)	√	R/Z 1 0	—	—
Latch ON OFF	633	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	634	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	—	—
OK relay open ON OFF	635	I16	0	1	ON (1)	√	R/W 1 0	—	—
Hold off time [ms]	636	U16	0	10000	0	√	R/W	—	—
Restart time [ms]	637	U16	0	10000	0	√	R/W	—	—
Activity Disable drive Quick stop Normal stop Curr lim stop	639	U16	2	5	Disabled drive (2)	√	R/Z 2 3 4 5	—	—
OK relay open ON OFF	640	I16	0	1	ON (1)	√	R/W 1 0	—	—
Sls speed filter [s]	643	Float	0.01	0.5	0.01	√	R/W	—	—
Voltage comp lim [V]	644	Float	0.1	30	6	√	R/W	—	—
Comp slope [V/A]	645	Float	0.1	50	13	√	R/W	—	—
Low speed factor	646	I16	0	32000	5000	√	R/W	—	—
Flux corr factor	647	Float	0.5	1	0.9	√	R/W	—	—
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	U16	0	1	—	—	R 1 0	QD H L	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	—	—
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	U16	0	1	—	—	R 1 0	QD H L	R
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	—	—
I_sqrt_t_accum [%]	655	U16	0	100	0	√	R	—	R
Motor cont curr [%]	656	U16	50	100	100	√	R/W	—	—
Trip time 50% [s]	657	U16	0	120	60	√	R/W	—	—
Overld mot state Overload Not overload	658	U16	0	1	Not ovrl (1)	—	R 0 1	QD L H	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Acc delta speed0 [FF]	659	U32	0	2 ³² -1	100	√	R/W	–	–
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	–	–
Dec delta speed 0 [FF]	661	U32	0	2 ³² -1	100	√	R/W	–	–
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	–	–
S acc t const [ms]	663	Float	100	3000	500	√	R/W	–	–
S dec t const [ms]	664	Float	100	3000	500	√	R/W	–	–
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	–	–
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	–	–
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	–	–
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	–	–
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	–	–
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	–	–
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	–	–
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	–	–
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	Fwd (1)	√	R/W 0 1 2 3	–	R/W
Magn ramp time [s]	675	Float	0.01	5	1	√	R/Z	–	–
Start part 1	676	U16	0	65535	–	√	C	–	–
Take val part 1	677	U16	0	65535	–	√	Z/C	–	–
Start part 2a	678	U16	0	65535	–	√	C	–	–
Take val part 2a	679	U16	0	65535	–	√	Z/C	–	–
Start part 2b	680	U16	0	65535	–	√	C	–	–
Take val part 2b	681	U16	0	65535	–	√	Z/C	–	–
Rotor resist Nw [Ohm]	682	Float	S	S	–	√	R	–	–
Stator resist Nw [Ohm]	683	Float	S	S	–	√	R	–	–
Lkg inductance Nw [H]	684	Float	S	S	–	√	R	–	–
Volt comp lim Nw [V]	685	Float	0.1	30	–	√	R	–	–
Comp slope Nw [V/A]	686	Float	0.1	50	–	√	R	–	–
Current P Nw [%]	687	Float	S	S	–	√	R	–	–
Current I Nw [%]	688	Float	S	S	–	√	R	–	–
P1 flux model Nw	689	Float	S	S	S	√	R	–	–
P2 flux model Nw	690	U16	S	S	S	√	R	–	–
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	–	–
P2 flux model	692	U16	1	20	S	√	R/W	–	–
Take motor par	694	U16	0	1	–	√	C	–	–
PI steady thr	695	I16	0	10000	0	√	R/W	–	–
Droop gain [%]	696	Float	0	100	0	√	R/W	–	–
Droop filter [ms]	697	U16	0	1000	0	√	R/W	–	–
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W
Enable droop Enabled Disabled	699	U16	0	1	Disabled (0)	√	R/W 1 0	ID H L	R/W
Droop limit [FF]	700	U16	0	2 x P45	1500	√	R/W	–	–
Self tune state	705	U16	0	65535	–	–	R	–	–
Vlt boost type Manual Automatic	709	U16	0	1	Manual (0)	√	R/Z 0 1	–	–
Manual boost [%]	710	Float	0	10	1	√	R/W	–	–
Actual boost [%]	711	Float	0	100	–	√	R	–	–

Parameter	No	Format	Value			Access via			
			min	max	Factory	Key.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PID acc time [s]	1046	Float	0	900	0		R/W	–	–
PID dec time [s]	1047	Float	0	900	0		R/W	–	–
Test T curr lim [%]	1048	U16	0	S	20		R/Z	–	–
Encoder repeat Encoder 2 Encoder 1	1054	U16	0	1	Encoder 1 (1)		R/Z 0 1	–	–
PL stop acc [rpm/s]	1080	U32	0	9999999	100		R/W	–	–
PL stop dec [rpm/s]	1081	U32	0	9999999	10000		R/W	–	–
PL stop t limit [%]	1082	U16	0	F	100		R/W	–	–
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	U16	0	2	0		R/W 0 1 2	–	–
PL stop vdc ref [V]	1084	U16	646	800	800		R/W	–	–
PL stop I Gain [%]	1085	Float	0	100	0.3		R/W	–	–
PL stop P Gain [%]	1086	Float	0	100	5		R/W	–	–
PL time-out [s]	1087	U16	0	65535	10		R/W	–	–
PL stop active Not active Active	1088	U16	0	1	Not active (0)		R 0 1	–	R
PL active limit [%]	1089	U16	–	–	–		R	–	–
PL next active Not active Active	1090	U16	0	1	Not active (0)		R 0 1	–	R
PL next factor	1091	I16	0	32767	10000		R	–	R
PL mains status Not ok Ok	1092	U16	0	1	Not ok (0)		R/W 0 1	–	R/W
PL time-out sig Not active Active	1093	U16	0	1	Not active (0)		R 0 1	–	R
PL time-out ack Not acknowledged Acknowledged	1094	U16	0	1	Not acknowledged 0		R/W 0 1	–	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PID offs. Sel Offset 0 Offset 1	762	U16	0	1	Offset 0 (0)	√	R/W 0 1	ID	R/W
PID feed-back	763	I16	-10000	10000	0	√	R/W	IA	R/W
PI I gain PID %	764	Float	0	100	10	√	R/W	—	—
PI P gain PID %	765	Float	0	100	10	√	R/W	—	—
PD D gain 1 PID [%]	766	Float	0	100	1	√	R/W	—	—
PD D filter PID [ms]	767	U16	0	1000	0	√	R/W	—	—
PD P gain 1 PID [%]	768	Float	0	100	10	√	R/W	—	—
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
PI output PID	771	I16	0	1000 x P784	1000	√	R	—	R
PID out sign PID Positive Bipolar	772	U16	0	1	1	√	R/W 0 1	—	—
PID out scale	773	Float	-100	100	1	√	R/W	—	—
PID output	774	I16	-10000	10000	0	√	R	QA	R
PI central v1	776	Float	P785	P784	1	√	R/W	—	—
PI central v2	777	Float	P785	P784	1	√	R/W	—	—
PI central v3	778	Float	P785	P784	1	√	R/W	IA	—
PI central v sel	779	U16	0	3	1	√	R/W	ID	R/W
PI central vs0	780	U16	0	1	1	—	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	—	R/W	ID	R/W
PID target	782	U16	0	65535	0	√	R/W	—	—
PI integr freeze ON OFF	783	U16	0	1	0	√	R/W 1 0	ID	R/W
PI top lim	784	Float	P785	10	10	√	R/W	—	—
PI bottom lim	785	Float	-10	P784	0	√	R/W	—	—
PID source	786	U16	0	65535	0	√	R/W	—	—
PID source gain	787	Float	-100	100	1	√	R/W	—	—
PD P gain 2 PID [%]	788	Float	0	100	10	√	R/W	—	—
PD D gain 2 PID [%]	789	Float	0	100	1	√	R/W	—	—
PD P gain 3 PID [%]	790	Float	0	100	10	√	R/W	—	—
PD D gain 3 PID [%]	791	Float	0	100	1	√	R/W	—	—
Input 1 filter [ms]	792	U16	0	1000	0	√	R/W	—	—
P init gain PID %	793	Float	0	100	10	√	R/W	—	—
Diameter calc Enabled Disabled	794	U16	0	1	0	√	Z/R 1 0	ID	R/W
Positioning spd [rpm]	795	I16	-100	100	0	√	R/W	—	—
Max deviation	796	I16	-10000	10000	8000	√	R/W	—	—
Gear box ratio	797	Float	0.001	1	1	√	R/W	—	—
Dancer constant [mm]	798	U16	1	10000	1	√	R/W	—	—
Minimum diameter [cm]	799	U16	1	2000	1	√	R/W	—	—
Diameter calc st	800	U16	0	1	0	—	R	QD	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
BU DC vlt [V] 230 400 460	801	U16	0	2	1		R/W 0 1 2	—	—
Continuous curr [A]	802	Float	S	S	S		R	—	—
Heatsink temp [°C]	881	I16	—	—	—		R	—	—
Dynam vlt margin [%]	889	Float	10	10	1		R/W	—	—
Enable zero pos Enabled Disabled	890	U16	0	1	Disabled (0)		R/Z 1 0	—	—
Lock zero pos ON OFF	891	U16	0	1	OFF (0)		R/W 1 0	ID L H	R/W
Zero pos gain [%]	892	U16	0	100	10		R/W	—	—
Spd srch time [s]	893	Float	0.01	10	10		R/W	—	—
Flux srch time [s]	894	Float	0.01	20	1		R/W	—	—
Spd autocapture [FF]	895	I16	-32768	32767	1500		R/W	—	—
Delay auto cap [ms]	896	U16	0	10000	1000		R/W	—	—
Delay retrying [ms]	897	U16	0	10000	1000		R/W	—	—
Enable save eng Enabled Disabled	898	U16	0	1	Disabled (0)		R/Z 1 0	—	—
Lock save eng OFF ON	899	U16	0	1	OFF (0)		R/W 0 1	ID L H	R/W
V/f flux level [%]	900	U16	0	100	100		R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10		R/W	—	—
Voltage I [%]	902	Float	0	100	4		R/W	—	—
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S		R/W	—	—
DC braking mode Enabled Disabled	904	U16	0	1	0		R/Z 1 0	—	—
Brk time @ stop [ms]	905	U16	0	30000	1000		R/W	—	—
Flux P Nw [%]	907	Float	0	100	S		R	—	—
Flux I Nw [%]	908	Float	0	100	S		R	—	—
Voltage I Nw [%]	909	Float	0	100	S		R	—	—
Enable ind store Enabled Disabled	911	U16	0	1	Disabled (0)		R/W 1 0	—	R/W
Ind store ctrl	912	U16	0	65535	0	—	R/W	—	R/W
Index storing	913	U32	0	2 ³² -1	—	—	R	—	R
Intake air temp [°C]	914	U16	—	—	—		R	QA	—
Out vlt level [%]	921	Float*	0	100	100		R/W	IA,QA	R/W
Act spd filter [s]	923	Float	1	0.1	0.1		R/W	—	—
F act spd (rpm)	924	I16	-32768	32767	—		R	QA	R
F act spd (d) [FF]	925	I16	-32768	32767	—		R	—	R
T curr filter [s]	926	Float	0.001	0.25	0.1		R/W	—	—
T curr (%)	927	I16	-500	500	—		R	QA	R
F T curr (%)	928	I16	-500	500	—		R	QA	R
Mot setup sel 0 Value 2° not sel Value 2° sel	940	U16	0	1	Not sel (0)	—	R/Z 0 1	ID L H	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Copy mot setup Setup 0 Setup 1	941	U16	0	1	Setup 0 (0)	√	R/Z 0 1	—	—
Actual mot setup Setup 0 Setup 1	942	U16	0	1	Setup 0 (0)	√	R 0 1	—	R
Mot setup sel Setup 0 Setup 1	943	U16	0	1	Setup 0 (0)	√	R/Z 0 1	—	R/W
Mot setup state Not running Running	944	U16	0	1	0	—	R 0 1	QD L H	R
Inertia c filter [ms]	1012	U16	0	1000	0	√	R/W	—	—
Torque const [N*m/A]	1013	Float	0.01	99.99	S	√	R	—	—
Inertia [kg*m*m*]	1014	Float	0.001	999.999	S	√	R/W	—	—
Friction [N*m]	1015	Float	0	99.999	S	√	R/W	—	—
Aux spd fun sel Speed up Inertia-loss cp	1016	U16	0	1	Speed up (0)	√	R/Z 0 1	—	—
Speed ratio	1017	I16	0	32767	10000	√	R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	—	√	R	QA	R
Spd draw out (%)	1019	Float	-200	200	—	√	R	—	—
Select enc 1 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1020	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	—	—
Select enc 2 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1021	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	—	—
Voltage P [%]	1022	Float	0	100	15	√	RW	RW	—
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S	√	R/W	—	—
Voltage P Nw [%]	1024	Float	100	0	S	√	R	R	—
Start part 3	1027	U16	0	65535	—	√	C	—	—
Take val part 3	1028	U16	0	65535	—	√	Z/C	—	—
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd direction (1)	√	R/Z 1 2	—	—
Inertia Nw [kg*m*m*]	1030	Float	0.001	999.999	—	√	R	—	—
Friction Nw [N*m]	1031	Float	0	99.99	—	√	R	—	—
Speed P Nw [%]	1032	Float	0	100	—	√	R	—	—
Speed I Nw [%]	1033	Float	0	100	—	√	R	—	—
Input 1 compare	1042	I16	-10000	10000	0	√	R/W	—	—
Input 1 cp error	1043	U16	0	10000	0	√	R/W	—	—
Input 1 cp delay	1044	U16	0	65000	0	√	R/W	—	—
Input 1 cp match Input 1 not thr.val. Input 1=thr.val	1045	U16	0	1	—	—	R 0 1	QD L H	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PID acc time [s]	1046	Float	0	900	0		R/W	—	—
PID dec time [s]	1047	Float	0	900	0		R/W	—	—
Test T curr lim [%]	1048	U16	0	S	20		R/Z	—	—
Encoder repeat Encoder 2 Encoder 1	1054	U16	0	1	Encoder 1 (1)		R/Z 0 1	—	—
PL stop acc [rpm/s]	1080	U32	0	99999999	100		R/W	—	—
PL stop dec [rpm/s]	1081	U32	0	99999999	10000		R/W	—	—
PL stop t limit [%]	1082	U16	0	F	100		R/W	—	—
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	U16	0	2	0		R/W 0 1 2	—	—
PL stop vdc ref [V]	1084	U16	646	800	800		R/W	—	—
PL stop I Gain [%]	1085	Float	0	100	0.3		R/W	—	—
PL stop P Gain [%]	1086	Float	0	100	5		R/W	—	—
PL time-out [s]	1087	U16	0	65535	10		R/W	—	—
PL stop active Not active Active	1088	U16	0	1	Not active (0)		R 0 1	—	R
PL active limit [%]	1089	U16	—	—	—		R	—	—
PL next active Not active Active	1090	U16	0	1	Not active (0)		R 0 1	—	R
PL next factor	1091	I16	0	32767	10000		R	—	R
PL mains status Not ok Ok	1092	U16	0	1	Not ok (0)		R/W 0 1	—	R/W
PL time-out sig Not active Active	1093	U16	0	1	Not active (0)		R 0 1	—	R
PL time-out ack Not acknowledged Acknowledged	1094	U16	0	1	Not acknowledged 0		R/W 0 1	—	R/W

* When the parameter is accessed by Opt2-A/PDC the format is U16

** When the parameter is accessed by Opt2-A/PDC the format is I16

*** When the parameter is accessed by Opt2-A/PDC the lower word of the parameter is considered

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Pdc in 0	1095	U16	0	65535	0	√	R/W	—	—
Pdc in 1	1096	U16	0	65535	0	√	R/W	—	—
Pdc in 2	1097	U16	0	65535	0	√	R/W	—	—
Pdc in 3	1098	U16	0	65535	0	√	R/W	—	—
Pdc in 4	1099	U16	0	65535	0	√	R/W	—	—
Pdc in 5	1100	U16	0	65535	0	√	R/W	—	—
Pdc out 0	1101	U16	0	65535	0	√	R/W	—	—
Pdc out 1	1102	U16	0	65535	0	√	R/W	—	—
Pdc out 2	1103	U16	0	65535	0	√	R/W	—	—
Pdc out 3	1104	U16	0	65535	0	√	R/W	—	—
Pdc out 4	1105	U16	0	65535	0	√	R/W	—	—
Pdc out 5	1106	U16	0	65535	0	√	R/W	—	—
Virt dig in 0	1107	U16	0	65535	0	√	R/W	—	—
Virt dig in 1	1108	U16	0	65535	0	√	R/W	—	—
Virt dig in 2	1109	U16	0	65535	0	√	R/W	—	—
Virt dig in 3	1110	U16	0	65535	0	√	R/W	—	—
Virt dig in 4	1111	U16	0	65535	0	√	R/W	—	—
Virt dig in 5	1112	U16	0	65535	0	√	R/W	—	—
Virt dig in 6	1113	U16	0	65535	0	√	R/W	—	—
Virt dig in 7	1114	U16	0	65535	0	√	R/W	—	—
Virt dig in 8	1115	U16	0	65535	0	√	R/W	—	—
Virt dig in 9	1116	U16	0	65535	0	√	R/W	—	—
Virt dig in 10	1117	U16	0	65535	0	√	R/W	—	—
Virt dig in 11	1118	U16	0	65535	0	√	R/W	—	—
Virt dig in 12	1119	U16	0	65535	0	√	R/W	—	—
Virt dig in 13	1120	U16	0	65535	0	√	R/W	—	—
Virt dig in 14	1121	U16	0	65535	0	√	R/W	—	—
Virt dig in 15	1122	U16	0	65535	0	√	R/W	—	—
Virt dig out 0	1123	U16	0	65535	0	√	R/W	—	—
Virt dig out 1	1124	U16	0	65535	0	√	R/W	—	—
Virt dig out 2	1125	U16	0	65535	0	√	R/W	—	—
Virt dig out 3	1126	U16	0	65535	0	√	R/W	—	—
Virt dig out 4	1127	U16	0	65535	0	√	R/W	—	—
Virt dig out 5	1128	U16	0	65535	0	√	R/W	—	—
Virt dig out 6	1129	U16	0	65535	0	√	R/W	—	—
Virt dig out 7	1130	U16	0	65535	0	√	R/W	—	—
Virt dig out 8	1131	U16	0	65535	0	√	R/W	—	—
Virt dig out 9	1132	U16	0	65535	0	√	R/W	—	—
Virt dig out 10	1133	U16	0	65535	0	√	R/W	—	—
Virt dig out 11	1134	U16	0	65535	0	√	R/W	—	—
Virt dig out 12	1135	U16	0	65535	0	√	R/W	—	—
Virt dig out 13	1136	U16	0	65535	0	√	R/W	—	—
Virt dig out 14	1137	U16	0	65535	0	√	R/W	—	—
Virt dig out 15	1138	U16	0	65535	0	√	R/W	—	—
Overload 200%	1139	U16	0	1	—		R 0 1	QD L H	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	1140	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	—	—

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Latch ON OFF	1141	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	1142	I16	0	1	ON (1)	√	R/Z 1 0	—	—
Enc1 supply vlt 5.41 V 5.68 V 5.91 V 6.18 V	1146	U16	0	3	5.41 V (0)	√	R/Z 0 1 2 3		
Regulation temp [°C]	1147	I16	—	—	—	√	R	—	—
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	1148	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	—	—
Latch ON OFF	1149	U16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	1150	I16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	1151	I16	0	1	ON (1)	√	R/Z 1 0	—	—
Ok relay open ON OFF	1152	I16	0	1	ON (1)	√	R/Z 1 0	—	—

10.3. parameters in alphabetical order

GFI-100360A

Parameter	N.	Position
Acc delta speed [FF]	21	BASIC MENU
Acc delta speed [FF]	21	RAMP \ Acceleration
Acc delta speed [FF]	21	DRIVECOM \ Acceleration
Acc delta speed0 [FF]	659	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta speed1 [FF]	23	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta speed2 [FF]	25	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta speed3 [FF]	27	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Acc delta time [s]	22	BASIC MENU
Acc delta time [s]	22	RAMP \ Acceleration
Acc delta time [s]	22	DRIVECOM \ Acceleration
Acc delta time 0 [s]	660	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta time 1 [s]	24	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta time 2 [s]	26	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta time 3 [s]	28	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Act percentage [%]	120	DRIVECOM
Act spd filter [rpm]	923	MONITOR \ Measurements \ Speed \ Speed in rpm
Act spd filter [s]	923	MONITOR \ Measurements \ Speed \ Speed in DRC []
Act speed value [FF]	119	DRIVECOM
Active power [%]	229	MONITOR \ Measurements
Activity	368	CONFIGURATION \ Prog alarms \ Heatsink sensor
Activity	1140	CONFIGURATION \ Prog alarms \ Intake air ot
Activity	1148	CONFIGURATION \ Prog alarms \ Regulation ot
Activity	365	CONFIGURATION \ Prog alarms \ Overtemp motor
Activity	354	CONFIGURATION \ Prog alarms \ External fault
Activity	639	CONFIGURATION \ Prog alarms \ Opt2 failure
Activity	634	CONFIGURATION \ Prog alarms \ Bus loss
Activity	386	CONFIGURATION \ Prog alarms \ Hw opt1 failure
Activity	728	CONFIGURATION \ Prog alarms \ Enable seq err
Activity	737	CONFIGURATION \ Prog alarms \ BU overload
Actual boost [%]	711	DRIVE PARAMETER \ V/f control \ Voltage boost
Actual mot setup	942	FUNCTIONS \ Motor setup
Actual slip comp [rpm]	724	DRIVE PARAMETER \ V/f control \ Slip compens
Actual spd (%)	121	
Actual spd (d) [FF]	119	MONITOR \ Measurements \ Speed \ Speed in DRC []
Actual spd (rpm)	122	BASIC MENU
Actual spd (rpm)	122	MONITOR \ Measurements \ Speed \ Speed in rpm
Adap I gain 1 [%]	189	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 2 [%]	191	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 3 [%]	193	ADD SPEED FUNCT \ Adap spd reg
Adap joint 1 [%]	186	ADD SPEED FUNCT \ Adap spd reg
Adap joint 2 [%]	187	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 1 [%]	188	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 2 [%]	190	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 3 [%]	192	ADD SPEED FUNCT \ Adap spd reg
Adap reference [FF]	183	ADD SPEED FUNCT \ Adap spd reg
Adap speed 1 [%]	184	ADD SPEED FUNCT \ Adap spd reg
Adap speed 2 [%]	185	ADD SPEED FUNCT \ Adap spd reg
Ambient temp [°C]	332	BASIC MENU \ Drive type
Ambient temp [°C]	332	CONFIGURATION \ Drive type
An in 1 target	295	I/O CONFIG \ Analog inputs \ Analog input 1
An in 2 target	296	I/O CONFIG \ Analog inputs \ Analog input 2
An in 3 target	297	I/O CONFIG \ Analog inputs \ Analog input 3
Auto capture	388	ADD SPEED FUNCT
Auto tune inp 1	259	I/O CONFIG \ Analog inputs \ Analog input 1
Auto tune inp 2	260	I/O CONFIG \ Analog inputs \ Analog input 2
Auto tune inp 3	261	I/O CONFIG \ Analog inputs \ Analog input 3
Aux spd fun sel	1016	SPEED REGULAT.
Base frequency [Hz]	168	DRIVE PARAMETER \ Mot plate data
Base voltage [V]	167	DRIVE PARAMETER \ Mot plate data
Bitword Pad A	519	SPEC FUNCTIONS \ Pad Parameters

Parameter	N.	Position
Bitword Pad B	536	SPEC FUNCTIONS \ Pad Parameters
Brk time @ stop [ms]	905	SPEC FUNCTIONS \ DC braking
BU DC vlt [V]	801	FUNCTIONS \ Brake unit
BU duty cycle [%]	741	FUNCTIONS \ Brake unit
BU ovlid time [s]	740	FUNCTIONS \ Brake unit
Comp slope [V/A]	645	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Comp slope [V/A]	645	REG PARAMETERS \ Percent values \ Current reg\Dead time comp
Comp slope Nw [V/A]	686	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Continuous curr [A]	802	BASIC MENU \ Drive type
Continuous curr [A]	802	CONFIGURATION \ Drive type
Control mode	253	CONFIGURATION
Control Word	55	DRIVECOM
Copy mot setup	941	FUNCTIONS \ Motor setup
Cos phi	371	DRIVE PARAMETER \ Mot plate data
Curr limit state	349	LIMITS \ Current limits
Current I [%]	90	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current I [%]	90	REG PARAMETERS \ Percent values \ Current reg
Current I base [V/A_ms]	96	REG PARAMETERS \ Base values \ Current reg
Current I Nw [%]	688	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current lim red [%]	13	LIMITS \ Current limits
Current norm	267	CURRENT REGULAT
Current P [%]	89	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current P [%]	89	REG PARAMETERS \ Percent values \ Current reg
Current P base [V/A]	95	REG PARAMETERS \ Base values \ Current reg
Current P Nw [%]	687	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Dancer constant [mm]	798	OPTIONS \ PID \ Diameter calc
DC braking curr [%]	717	SPEC FUNCTIONS \ DC braking
DC braking delay [ms]	716	
DC braking mode	904	SPEC FUNCTIONS \ DC braking
DC link voltage [V]	227	MONITOR \ Measurements
Dec delta speed [FF]	29	BASIC MENU
Dec delta speed [FF]	29	RAMP \ Deceleration
Dec delta speed [FF]	29	DRIVECOM \ Deceleration
Dec delta speed0 [FF]	661	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta speed1 [FF]	31	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta speed2 [FF]	33	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta speed3 [FF]	35	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Dec delta time [s]	30	BASIC MENU
Dec delta time [s]	30	RAMP \ Deceleration
Dec delta time [s]	30	DRIVECOM \ Deceleration
Dec delta time 0 [s]	662	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta time 1 [s]	32	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta time 2 [s]	34	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta time 3 [s]	36	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Delay auto cap [ms]	896	DRIVE PARAMETER \ V/f control \ V/f spd search
Delay retrying [ms]	897	DRIVE PARAMETER \ V/f control \ V/f spd search
Destination	485	SPEC FUNCTIONS \ Links \ Link 1
Destination	554	SPEC FUNCTIONS \ Links \ Link 2
Device address	319	CONFIGURATION
Diameter calc	794	OPTIONS \ PID \ Diameter calc
Diameter calc st	800	OPTIONS \ PID
Dig input term	564	MONITOR \ I/O
Dig input term 1	565	MONITOR \ I/O
Dig input term 10	574	MONITOR \ I/O
Dig input term 11	575	MONITOR \ I/O
Dig input term 12	576	MONITOR \ I/O
Dig input term 13	577	MONITOR \ I/O
Dig input term 14	578	MONITOR \ I/O
Dig input term 15	579	MONITOR \ I/O
Dig input term 16	580	MONITOR \ I/O

Parameter	N.	Position
Dig input term 2	566	MONITOR \ I/O
Dig input term 3	567	MONITOR \ I/O
Dig input term 4	568	MONITOR \ I/O
Dig input term 5	569	MONITOR \ I/O
Dig input term 6	570	MONITOR \ I/O
Dig input term 7	571	MONITOR \ I/O
Dig input term 8	572	MONITOR \ I/O
Dig input term 9	573	MONITOR \ I/O
Dig output term	581	MONITOR \ I/O
Digital I/O	-	MONITOR \ I/O
Digital input 1	137	I/O CONFIG \ Digital inputs
Digital input 2	138	I/O CONFIG \ Digital inputs
Digital input 3	139	I/O CONFIG \ Digital inputs
Digital input 4	140	I/O CONFIG \ Digital inputs
Digital input 5	141	I/O CONFIG \ Digital inputs
Digital input 6	142	I/O CONFIG \ Digital inputs
Digital input 7	143	I/O CONFIG \ Digital inputs
Digital input 8	144	I/O CONFIG \ Digital inputs
Digital output 1	145	I/O CONFIG \ Digital outputs
Digital output 2	146	I/O CONFIG \ Digital outputs
Digital output 3	147	I/O CONFIG \ Digital outputs
Digital output 4	148	I/O CONFIG \ Digital outputs
Digital output 5	149	I/O CONFIG \ Digital outputs
Digital output 6	150	I/O CONFIG \ Digital outputs
Digital output 7	151	I/O CONFIG \ Digital outputs
Digital output 8	152	I/O CONFIG \ Digital outputs
Dim factor den	51	CONFIGURATION \ Dimension fact
Dim factor den	51	DRIVECOM \ Dimension fact
Dim factor num	50	CONFIGURATION \ Dimension fact
Dim factor num	50	DRIVECOM \ Dimension fact
Dim factor text	52	CONFIGURATION \ Dimension fact
Dim factor text	52	DRIVECOM \ Dimension fact
Div.Gain	487	SPEC FUNCTIONS \ Links \ Link 1
Div.Gain	556	SPEC FUNCTIONS \ Links \ Link 2
Drive ready	380	
Drive type (AVi)	300	BASIC MENU \ Drive type
Drive type (AVi)	300	CONFIGURATION \ Drive type
Droop filter [ms]	697	SPEED REGULAT \ Droop function
Droop gain [%]	696	SPEED REGULAT \ Droop function
Droop limit [FF]	700	SPEED REGULAT \ Droop function
Dynam vlt margin [%]	889	LIMITS \ Voltage limits
Enab motor pot	246	FUNCTIONS \ Motor pot
Enab multi rmp	243	FUNCTIONS \ Multi ramp fct
Enab multi spd	153	FUNCTIONS \ Multi speed fct
Enable BU	736	FUNCTIONS \ Brake unit
Enable drive	314	BASIC MENU
Enable drive	314	MONITOR
Enable droop	699	SPEED REGULAT \ Droop function
Enable ind store	911	CONFIGURATION \ Motor spd fbk
Enable jog	244	FUNCTIONS \ Jog function
Enable lck sls	422	SPEED REGULAT \ Spd zero logic
Enable OPT2	425	OPTIONS \ Option 2
Enable PD PID	770	OPTIONS \ PID
Enable PI PID	769	OPTIONS \ PID
Enable ramp	245	RAMP
Enable rr adap	435	SPEC FUNCTIONS
Enable save eng	898	DRIVE PARAMETER \ V/f control \ Energy save
Enable spd adap	181	ADD SPEED FUNCT \ Adap spd reg
Enable spd reg	242	SPEED REGULAT.
Enable spd=0 l	123	SPEED REGULAT \ Spd zero logic

Parameter	N.	Position
Enable spd=0 P	125	SPEED REGULAT \ Spd zero logic
Enable spd=0 R	124	SPEED REGULAT \ Spd zero logic
Enable zero pos	890	SPEED REGULAT \ Spd zero logic
Enc1 speed [rpm]	427	MONITOR \ Measurements \ Speed \ Speed in rpm
Enc1 supply vlt	1146	CONFIGURATION \ Motor spd fbk
Enc2 speed [rpm]	420	MONITOR \ Measurements \ Speed \ Speed in rpm
Encoder 1 pulses	416	BASIC MENU
Encoder 1 pulses	416	CONFIGURATION \ Motor spd fbk
Encoder 1 pulses	416	I/O CONFIG \ Encoder inputs
Encoder 1 state	648	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	BASIC MENU
Encoder 1 type	415	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	I/O CONFIG \ Encoder inputs
Encoder 2 pulses	169	CONFIGURATION \ Motor spd fbk
Encoder 2 pulses	169	I/O CONFIG \ Encoder inputs
Encoder 2 state	651	CONFIGURATION \ Motor spd fbk
Encoder repeat	1054	CONFIGURATION \ Motor spd fbk
F act spd (d) [FF]	925	MONITOR \ Measurements \ Speed \ Speed in DRC []
F act spd (rpm)	924	MONITOR \ Measurements \ Speed \ Speed in rpm
F current ref	352	CURRENT REGULAT
F T curr (%)	928	MONITOR \ Measurements
Face value den	53	CONFIGURATION \ Face value fact
Face value den	53	DRIVECOM \ Face value fact
Face value num	54	CONFIGURATION \ Face value fact
Face value num	54	DRIVECOM \ Face value fact
Failure code	417	SPEC FUNCTIONS
Failure hour	328	SPEC FUNCTIONS
Failure min	329	SPEC FUNCTIONS
Failure reg del	263	SPEC FUNCTIONS
Failure register	-	SPEC FUNCTIONS
Failure reset	262	SPEC FUNCTIONS
Failure text	327	SPEC FUNCTIONS
Fast stop	316	
Feed-fwd PID	758	OPTIONS \ PID
Flt_100_mf	303	CONFIGURATION
Flux	234	FLUX REGULATION
Flux [%]	234	MONITOR \ Measurements
Flux corr factor	647	DRIVE PARAMETER \ Sensorless
Flux current	351	CURRENT REGULAT
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux I [%]	92	REG PARAMETERS \ Percent values \ Flux regulator
Flux I base [A/Vs_ms]	98	REG PARAMETERS \ Base values \ Flux regulator
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux level [%]	467	LIMITS \ Flux limits
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux P [%]	91	REG PARAMETERS \ Percent values \ Flux regulator
Flux P base [A/Vs]	97	REG PARAMETERS \ Base values \ Flux regulator
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux reference	500	FLUX REGULATION
Flux reg mode	469	FLUX REGULATION
Flux srch time [s]	894	DRIVE PARAMETER \ V/f control \ V/f spd search
Flux var time [s]	901	DRIVE PARAMETER \ V/f control \ Energy save
Forward sign	293	RAMP
Freeze ramp	373	RAMP
Friction [N*m]	1015	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Friction [N*m]	1015	SPEED REGULAT \ Inertia/loss cp

Parameter	N.	Position
Friction Nw [N*m]	1031	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Full load curr [A]	179	CONFIGURATION
Fwd-Rev	673	RAMP
Fwd-Rev spd tune	1029	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Gear box ratio	797	OPTIONS \ PID \ Diameter calc
Gen access	58	SPEC FUNCTIONS \ Test generator
Gen amplitude [%]	60	SPEC FUNCTIONS \ Test generator
Gen frequency [Hz]	59	SPEC FUNCTIONS \ Test generator
Gen offset [%]	61	SPEC FUNCTIONS \ Test generator
Heatsink temp [°C]	881	MONITOR \ Measurements
Hold off time [ms]	636	CONFIGURATION \ Prog alarms \ Bus loss
I init gain PID %	734	OPTIONS \ PID \ PI controls
I_sqrt_t_accum [%]	655	FUNCTIONS \ Overload contr \ Ovld drv contr
In use Tcur lim- [%]	11	LIMITS \ Current limits
In use Tcur lim+ [%]	10	LIMITS \ Current limits
Ind store ctrl	912	CONFIGURATION \ Motor spd fbk
Index storing	913	CONFIGURATION \ Motor spd fbk
Inertia [kg*m*m*]	1014	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Inertia [kg*m*m]	1014	SPEED REGULAT \ Inertia/loss cp
Inertia c filter [ms]	1012	SPEED REGULAT \ Inertia/loss cp
Inertia Nw [kg*m*m*]	1030	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Input 1 compare	1042	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp delay	1044	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp error	1043	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp match	1045	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 filter [ms]	792	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 sign	389	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 type	71	I/O CONFIG \ Analog inputs \ Analog input 1
Input 2 sign	390	I/O CONFIG \ Analog inputs \ Analog input 2
Input 2 type	76	I/O CONFIG \ Analog inputs \ Analog input 2
Input 3 sign	391	I/O CONFIG \ Analog inputs \ Analog input 3
Input 3 type	81	I/O CONFIG \ Analog inputs \ Analog input 3
Input absolute	492	SPEC FUNCTIONS \ Links \ Link 1
Input absolute	561	SPEC FUNCTIONS \ Links \ Link 2
Input max	488	SPEC FUNCTIONS \ Links \ Link 1
Input max	557	SPEC FUNCTIONS \ Links \ Link 2
Input min	489	SPEC FUNCTIONS \ Links \ Link 1
Input min	558	SPEC FUNCTIONS \ Links \ Link 2
Input offset	490	SPEC FUNCTIONS \ Links \ Link 1
Input offset	559	SPEC FUNCTIONS \ Links \ Link 2
Intake air temp	914	MONITOR \ Measurements
Jog -	399	FUNCTIONS \ Jog function
Jog +	398	FUNCTIONS \ Jog function
Jog operation	-	FUNCTIONS \ Jog function
Jog reference [FF]	266	FUNCTIONS \ Jog function
Jog selection	375	FUNCTIONS \ Jog function
Jog stop control	630	FUNCTIONS \ Stop control
Latch	357	CONFIGURATION \ Prog alarms \ Undervoltage
Latch	361	CONFIGURATION \ Prog alarms \ Overvoltage
Latch	369	CONFIGURATION \ Prog alarms \ Heatsink sensor
Latch	1141	CONFIGURATION \ Prog alarms \ Intake air ot
Latch	1149	CONFIGURATION \ Prog alarms \ Regulation ot
Latch	366	CONFIGURATION \ Prog alarms \ Overtemp motor
Latch	355	CONFIGURATION \ Prog alarms \ External fault
Latch	363	CONFIGURATION \ Prog alarms \ Overcurrent
Latch	210	CONFIGURATION \ Prog alarms \ Output stages
Latch	633	CONFIGURATION \ Prog alarms \ Bus loss
Latch	729	CONFIGURATION \ Prog alarms \ Enable seq err
Life time [h.min]	235	SPEC FUNCTIONS
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter

Parameter	N.	Position
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Lkg inductance Nw [H]	684	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Load comp [%]	698	SPEED REGULAT \ Droop function
Load default	258	SPEC FUNCTIONS
Load motor par	251	DRIVE PARAMETER \ Motor Parameter
Lock save eng	899	DRIVE PARAMETER \ V/f control \ Energy save
Lock speed l	348	SPEED REGULAT.
Lock speed reg	322	SPEED REGULAT.
Lock zero pos	891	SPEED REGULAT \ Spd zero logic
Low speed factor	646	DRIVE PARAMETER \ Sensorless
Magn boost curr [%]	413	CONFIGURATION
Magn ramp time [s]	675	CONFIGURATION
Magn working cur [A]	726	DRIVE PARAMETER \ Motor Parameter
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2b
Magnetizing cur [A]	165	DRIVE PARAMETER \ Motor Parameter
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2b
Main commands	252	CONFIGURATION
Mains voltage	333	BASIC MENU \ Drive type
Mains voltage	333	CONFIGURATION \ Drive type
Malfunction code	57	DRIVECOM
Manual boost [%]	710	DRIVE PARAMETER \ V/f control \ Voltage boost
Manual slip comp [rpm]	723	DRIVE PARAMETER \ V/f control \ Slip compens
Max deviation	796	OPTIONS \ PID \ Diameter calc
Menu		OPTIONS \ Option 1
Menu		OPTIONS \ Option 2
Minimum diameter [cm]	799	OPTIONS \ PID \ Diameter calc
Mot setup sel	943	FUNCTIONS \ Motor setup
Mot setup sel 0	940	FUNCTIONS \ Motor setup
Mot setup state	944	FUNCTIONS \ Motor setup
Motor cont curr [%]	656	FUNCTIONS \ Overload contr \ Ovld mot contr
Motor current [A]	231	BASIC MENU
Motor current [A]	231	MONITOR \ Measurements
Motor losses %	727	DRIVE PARAMETER \ V/f control \ Slip compens
Motor pot down	397	FUNCTIONS \ Motor pot
Motor pot oper	-	FUNCTIONS \ Motor pot
Motor pot reset	249	FUNCTIONS \ Motor pot
Motor pot sign	248	FUNCTIONS \ Motor pot
Motor pot up	396	FUNCTIONS \ Motor pot
Mul.Gain	486	SPEC FUNCTIONS \ Links \ Link 1
Mul.Gain	555	SPEC FUNCTIONS \ Links \ Link 2
Multi ramp sel	202	FUNCTIONS \ Multi ramp fct
Multi speed 1 [FF]	154	FUNCTIONS \ Multi speed fct
Multi speed 2 [FF]	155	FUNCTIONS \ Multi speed fct
Multi speed 3 [FF]	156	FUNCTIONS \ Multi speed fct
Multi speed 4 [FF]	157	FUNCTIONS \ Multi speed fct
Multi speed 5 [FF]	158	FUNCTIONS \ Multi speed fct
Multi speed 6 [FF]	159	FUNCTIONS \ Multi speed fct
Multi speed 7 [FF]	160	FUNCTIONS \ Multi speed fct
Multi speed sel	208	FUNCTIONS \ Multi speed fct
N of attempts	360	CONFIGURATION \ Prog alarms \ Undervoltage
Nom frequency [Hz]	163	DRIVE PARAMETER \ Mot plate data
Nominal current [A]	164	DRIVE PARAMETER \ Mot plate data
Nominal speed [rpm]	162	DRIVE PARAMETER \ Mot plate data
Nominal voltage [V]	161	DRIVE PARAMETER \ Mot plate data
Offset input 1	74	I/O CONFIG \ Analog inputs \ Analog input 1
Offset input 2	79	I/O CONFIG \ Analog inputs \ Analog input 2
Offset input 3	84	I/O CONFIG \ Analog inputs \ Analog input 3
Ok relay funct	412	CONFIGURATION

Parameter	N.	Position
OK relay open	358	CONFIGURATION \ Prog alarms \ Undervoltage
Ok relay open	362	CONFIGURATION \ Prog alarms \ Overvoltage
Ok relay open	370	CONFIGURATION \ Prog alarms \ Heatsink sensor
Ok relay open	1142	CONFIGURATION \ Prog alarms \ Heatsink air ot
Ok relay open	1152	CONFIGURATION \ Prog alarms \ Heatsink ot
Ok relay open	1150	CONFIGURATION \ Prog alarms \ Regulation ot
Ok relay open	1151	CONFIGURATION \ Prog alarms \ Module overtemp
Ok relay open	367	CONFIGURATION \ Prog alarms \ Overtemp motor
OK relay open	356	CONFIGURATION \ Prog alarms \ External fault
OK relay open	364	CONFIGURATION \ Prog alarms \ Overcurrent
OK relay open	211	CONFIGURATION \ Prog alarms \ Output stages
OK relay open	640	CONFIGURATION \ Prog alarms \ Opt2 failure
OK relay open	635	CONFIGURATION \ Prog alarms \ Bus loss
OK relay open	387	CONFIGURATION \ Prog alarms \ Hw opt1 failure
OK relay open	730	CONFIGURATION \ Prog alarms \ Enable seq err
OK relay open	738	CONFIGURATION \ Prog alarms \ BU overload
Out vlt level [%]	921	FLUX REGULATION
Output frequency [Hz]	324	MONITOR \ Measurements
Output offset	491	SPEC FUNCTIONS \ Links \ Link 1
Output offset	560	SPEC FUNCTIONS \ Links \ Link 2
Output voltage [V]	233	MONITOR \ Measurements
Overload 200%	1139	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld Available	406	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld mot state	658	FUNCTIONS \ Overload contr \ Ovld mot contr
P init gain PID %	793	OPTIONS \ PID \ PI controls
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Pad 0	503	SPEC FUNCTIONS \ Pad Parameters
Pad 1	504	SPEC FUNCTIONS \ Pad Parameters
Pad 10	513	SPEC FUNCTIONS \ Pad Parameters
Pad 11	514	SPEC FUNCTIONS \ Pad Parameters
Pad 12	515	SPEC FUNCTIONS \ Pad Parameters
Pad 13	516	SPEC FUNCTIONS \ Pad Parameters
Pad 14	517	SPEC FUNCTIONS \ Pad Parameters
Pad 15	518	SPEC FUNCTIONS \ Pad Parameters
Pad 2	505	SPEC FUNCTIONS \ Pad Parameters
Pad 3	506	SPEC FUNCTIONS \ Pad Parameters
Pad 4	507	SPEC FUNCTIONS \ Pad Parameters
Pad 5	508	SPEC FUNCTIONS \ Pad Parameters
Pad 6	509	SPEC FUNCTIONS \ Pad Parameters
Pad 7	510	SPEC FUNCTIONS \ Pad Parameters
Pad 8	511	SPEC FUNCTIONS \ Pad Parameters
Pad 9	512	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 0	520	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 1	521	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 10	530	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 11	531	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 12	532	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 13	533	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 14	534	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 15	535	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 2	522	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 3	523	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 4	524	SPEC FUNCTIONS \ Pad Parameters

Parameter	N.	Position
Pad A Bit 5	525	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 6	526	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 7	527	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 8	528	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 9	529	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 0	537	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 1	538	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 10	547	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 11	548	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 12	549	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 13	550	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 14	551	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 15	552	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 2	539	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 3	540	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 4	541	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 5	542	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 6	543	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 7	544	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 8	545	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 9	546	SPEC FUNCTIONS \ Pad Parameters
Password 2	86	SERVICE
PD D filter PID [ms]	767	OPTIONS \ PID \ PD controls
PD D gain 1 PID [%]	766	OPTIONS \ PID \ PD controls
PD D gain 2 PID [%]	789	OPTIONS \ PID \ PD controls
PD D gain 3 PID [%]	791	OPTIONS \ PID \ PD controls
PD output PID	421	OPTIONS \ PID
PD P gain 1 PID [%]	768	OPTIONS \ PID \ PD controls
PD P gain 2 PID [%]	788	OPTIONS \ PID \ PD controls
PD P gain 3 PID [%]	790	OPTIONS \ PID \ PD controls
Pdc in 0	1095	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc in 1	1096	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc in 2	1097	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc in 3	1098	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc in 4	1099	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc in 5	1100	OPTIONS \ Option 1 \ PDC config \ PDC inputs
Pdc out 0	1101	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Pdc out 1	1102	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Pdc out 2	1103	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Pdc out 3	1104	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Pdc out 4	1105	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Pdc out 5	1106	OPTIONS \ Option 1 \ PDC config \ PDC outputs
Percent ref var [%]	116	DRIVECOM
PI bottom lim	785	OPTIONS \ PID \ PI controls
PI central v sel	779	OPTIONS \ PID \ PI controls
PI central v1	776	OPTIONS \ PID \ PI controls
PI central v2	777	OPTIONS \ PID \ PI controls
PI central v3	778	OPTIONS \ PID \ PI controls
PI central vs0	780	OPTIONS \ PID
PI central vs1	781	OPTIONS \ PID
PI I gain PID %	764	OPTIONS \ PID \ PI controls
PI integr freeze	783	OPTIONS \ PID \ PI controls
PI output PID	771	OPTIONS \ PID
PI P gain PID %	765	OPTIONS \ PID \ PI controls
PI steady delay [ms]	731	OPTIONS \ PID \ PI controls
PI steady thr	695	OPTIONS \ PID \ PI controls
PI top lim	784	OPTIONS \ PID \ PI controls
PID acc time [s]	1046	OPTIONS \ PID \ PID references
PID clamp	757	OPTIONS \ PID \ PID references
PID dec time [s]	1047	OPTIONS \ PID \ PID references

Parameter	N.	Position
PID error	759	OPTIONS \ PID \ PID references
PID feed-back	763	OPTIONS \ PID \ PID references
PID offs. Sel	762	OPTIONS \ PID \ PID references
PID offset 0	760	OPTIONS \ PID \ PID references
PID offset 1	761	OPTIONS \ PID \ PID references
PID out scale	773	OPTIONS \ PID \ PID target
PID out sign PID	772	OPTIONS \ PID
PID output	774	OPTIONS \ PID
PID source	786	OPTIONS \ PID \ PID source
PID source gain	787	OPTIONS \ PID \ PID source
PID target	782	OPTIONS \ PID \ PID target
PL active limit [%]	1089	FUNCTIONS \ Pwr loss stop f
PL mains status	1092	FUNCTIONS \ Pwr loss stop f
PL next active	1090	FUNCTIONS \ Pwr loss stop f
PL next factor	1091	FUNCTIONS \ Pwr loss stop f
PL stop acc [rpm/s]	1080	FUNCTIONS \ Pwr loss stop f
PL stop active	1088	FUNCTIONS \ Pwr loss stop f
PL stop dec [rpm/s]	1081	FUNCTIONS \ Pwr loss stop f
PL stop enable	1083	FUNCTIONS \ Pwr loss stop f
PL stop I Gain [%]	1085	FUNCTIONS \ Pwr loss stop f
PL stop P Gain [%]	1086	FUNCTIONS \ Pwr loss stop f
PL stop t limit [%]	1082	FUNCTIONS \ Pwr loss stop f
PL stop vdc ref [V]	1084	FUNCTIONS \ Pwr loss stop f
PL time-out [s]	1087	FUNCTIONS \ Pwr loss stop f
PL time-out ack	1094	FUNCTIONS \ Pwr loss stop f
PL time-out sig	1093	FUNCTIONS \ Pwr loss stop f
Pointer	330	SPEC FUNCTIONS
Positioning spd [rpm]	795	OPTIONS \ PID \ Diameter calc
Prop. filter [ms]	444	SPEED REGULAT.
Pword 1 :	85	CONFIGURATION
QStp delta speed [FF]	37	RAMP \ Quick stop
QStp delta speed [FF]	37	DRIVECOM \ Quick stop
QStp delta time [s]	38	RAMP \ Quick stop
QStp delta time [s]	38	DRIVECOM \ Quick stop
Qstp opt code	713	CONFIGURATION
QStp opt code	713	DRIVECOM \ Quick stop
Quick stop	343	
Ramp -	347	RAMP
Ramp +	346	RAMP
Ramp +/- delay [ms]	20	RAMP
Ramp in = 0	345	RAMP
Ramp out = 0	344	RAMP
Ramp outp (rpm)	113	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp output (%)	114	MONITOR \ Measurements \ Speed \ Speed in %
Ramp output (d) [FF]	112	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (%)	111	MONITOR \ Measurements \ Speed \ Speed in %
Ramp ref (d) [FF]	109	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (rpm)	110	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp ref 1 (%)	47	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 1 [FF]	44	BASIC MENU
Ramp ref 1 [FF]	44	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 2 (%)	49	INPUT VARIABLES \ Ramp ref \ Ramp ref 2
Ramp ref 2 [FF]	48	INPUT VARIABLES \ Ramp ref \ Ramp ref 2
Ramp sel 0	403	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp sel 1	404	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp shape	18	RAMP
Rated drive curr	334	BASIC MENU \ Drive type
Rated drive curr	334	CONFIGURATION \ Drive type
Real FF PID	418	OPTIONS \ PID
Ref 0 level [FF]	106	SPEED REGULAT \ Spd zero logic

Parameter	N.	Position
Refresh enc 1	649	CONFIGURATION \ Motor spd fbk
Refresh enc 1	649	I/O CONFIG \ Encoder inputs
Refresh enc 2	652	CONFIGURATION \ Motor spd fbk
Refresh enc 2	652	I/O CONFIG \ Encoder inputs
Regulation mode	321	BASIC MENU
Regulation mode	321	CONFIGURATION
Regulation temp [°C]	1147	MONITOR \ Measurements
Relay 2	629	I/O CONFIG \ Digital outputs
Restart time [ms]	359	CONFIGURATION \ Prog alarms \ Undervoltage
Restart time [ms]	637	CONFIGURATION \ Prog alarms \ Bus loss
Reverse sign	294	RAMP
Rotor resist Nw [Ohm]	682	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
S acc t const [ms]	663	RAMP
S acc t const 0 [ms]	665	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
S acc t const 1 [ms]	667	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
S acc t const 2 [ms]	669	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
S acc t const 3 [ms]	671	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
S dec t const [ms]	664	RAMP
S dec t const 0 [ms]	666	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
S dec t const 1 [ms]	668	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
S dec t const 2 [ms]	670	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
S dec t const 3 [ms]	672	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
S shape t const [ms]	19	RAMP
Save parameters	256	BASIC MENU
Save parameters	256	SPEC FUNCTIONS
Scale input 1	72	I/O CONFIG \ Analog inputs \ Analog input 1
Scale input 2	77	I/O CONFIG \ Analog inputs \ Analog input 2
Scale input 3	82	I/O CONFIG \ Analog inputs \ Analog input 3
Scale output 1	62	I/O CONFIG \ Analog outputs \ Analog output 1
Scale output 2	63	I/O CONFIG \ Analog outputs \ Analog output 2
Scale output 3	64	I/O CONFIG \ Analog outputs \ Analog output 3
Scale output 4	65	I/O CONFIG \ Analog outputs \ Analog output 4
Sel adap type	182	ADD SPEED FUNCT \ Adap spd reg
Select enc 1	1020	I/O CONFIG \ Encoder inputs
Select enc 2	1021	I/O CONFIG \ Encoder inputs
Select input 1	70	I/O CONFIG \ Analog inputs \ Analog input 1
Select input 2	75	I/O CONFIG \ Analog inputs \ Analog input 2
Select input 3	80	I/O CONFIG \ Analog inputs \ Analog input 3
Select output 1	66	I/O CONFIG \ Analog outputs \ Analog output 1
Select output 2	67	I/O CONFIG \ Analog outputs \ Analog output 2
Select output 3	68	I/O CONFIG \ Analog outputs \ Analog output 3
Select output 4	69	I/O CONFIG \ Analog outputs \ Analog output 4
Self tune state	705	DRIVE PARAMETER \ Motor Parameter \ Self-tuning
Ser answer delay [ms]	408	CONFIGURATION
Set delay [ms]	105	ADD SPEED FUNCT \ Speed control
Set error [FF]	104	ADD SPEED FUNCT \ Speed control
Set speed	394	ADD SPEED FUNCT \ Speed control
Slip comp filt [s]	725	DRIVE PARAMETER \ V/f control \ Slip compens
Slip comp type	722	DRIVE PARAMETER \ V/f control \ Slip compens
Sl speed filter [s]	643	DRIVE PARAMETER \ Sensorless
Software version	331	BASIC MENU \ Drive type
Software version	331	CONFIGURATION \ Drive type
Source	484	SPEC FUNCTIONS \ Links \ Link 1
Source	553	SPEC FUNCTIONS \ Links \ Link 2
Spd 0 trip delay [ms]	627	FUNCTIONS \ Stop control
Spd autocapture [FF]	895	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd draw out (%)	1019	FUNCTIONS \ Speed draw
Spd draw out (d)	1018	FUNCTIONS \ Speed draw

Parameter	N.	Position
Spd srch time [s]	893	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd threshold	393	ADD SPEED FUNCT \ Speed control
Spd threshold - [FF]	102	ADD SPEED FUNCT \ Speed control
Spd threshold + [FF]	101	ADD SPEED FUNCT \ Speed control
Spd=0 P gain [%]	126	SPEED REGULAT \ Spd zero logic
Spd zero thr	395	ADD SPEED FUNCT \ Speed zero
Speed base value [FF]	45	BASIC MENU
Speed base value [FF]	45	CONFIGURATION
Speed base value [FF]	45	DRIVECOM
Speed fbk sel	414	CONFIGURATION \ Motor spd fbk
Speed I [%]	88	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed I [%]	88	REG PARAMETERS \ Percent values \ Speed regulator
Speed I base[A/rpm_ms]	94	REG PARAMETERS \ Base values \ Speed regulator
Speed I in use [%]	100	REG PARAMETERS \ In use values
Speed I Nw [%]	1033	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed input perc [%]	46	DRIVECOM
Speed input var [FF]	44	DRIVECOM
Speed limited	372	LIMITS \ Speed limits \ Speed min/max
Speed max amount [FF]	2	LIMITS \ Speed limits \ Speed amount
Speed max amount [FF]	2	DRIVECOM \ Speed amount
Speed max neg [FF]	4	LIMITS \ Speed limits \ Speed min/max
Speed max neg [FF]	4	DRIVECOM \ Speed min/max
Speed max pos [FF]	3	LIMITS \ Speed limits \ Speed min/max
Speed max pos [FF]	3	DRIVECOM \ Speed min/max
Speed min amount [FF]	1	LIMITS \ Speed limits \ Speed amount
Speed min amount [FF]	1	DRIVECOM \ Speed amount
Speed min neg [FF]	6	LIMITS \ Speed limits \ Speed min/max
Speed min neg [FF]	6	DRIVECOM \ Speed min/max
Speed min pos [FF]	5	LIMITS \ Speed limits \ Speed min/max
Speed min pos [FF]	5	DRIVECOM \ Speed min/max
Speed P [%]	87	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed P [%]	87	REG PARAMETERS \ Percent values \ Speed regulator
Speed P base [A/rpm]	93	REG PARAMETERS \ Base values \ Speed regulator
Speed P in use [%]	99	REG PARAMETERS \ In use values
Speed P Nw [%]	1032	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed ratio	1017	FUNCTIONS \ Speed draw
Speed ref (%)	117	MONITOR \ Measurements \ Speed \ Speed in %
Speed ref (d) [FF]	115	MONITOR \ Measurements \ Speed \ Speed in DRC []
Speed ref (rpm)	118	MONITOR \ Measurements \ Speed \ Speed in rpm
Speed ref [rpm]	118	SPEED REGULAT.
Speed ref 1 (%)	378	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed ref 1 [FF]	42	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed Ref 2 (%)	379	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref 2 [FF]	43	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref var [FF]	115	DRIVECOM
Speed reg output [%]	236	SPEED REGULAT.
Speed sel 0	400	FUNCTIONS \ Multi speed fct
Speed sel 1	401	FUNCTIONS \ Multi speed fct
Speed sel 2	402	FUNCTIONS \ Multi speed fct
Speed up base [ms]	446	SPEED REGULAT \ Speed up
Speed up filter [ms]	447	SPEED REGULAT \ Speed up
Speed up gain [%]	445	SPEED REGULAT \ Speed up
Speed zero delay [ms]	108	ADD SPEED FUNCT \ Speed zero
Speed zero level [FF]	107	ADD SPEED FUNCT \ Speed zero
Start part 1	676	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Start part 2a	678	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Start part 2b	680	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2b
Start part 3	1027	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 3
Start/Stop	315	BASIC MENU
Start/Stop	315	MONITOR

Parameter	N.	Position
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Stator resist Nw [Ohm]	683	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Status word	56	DRIVECOM
Stop mode	626	FUNCTIONS \ Stop control
Switching freq	240	CONFIGURATION
T curr (%)	927	MONITOR \ Measurements
T curr filter [s]	926	MONITOR \ Measurements
T curr lim type	715	LIMITS \ Current limits
T current lim - [%]	9	BASIC MENU
T current lim - [%]	9	LIMITS \ Current limits
T current lim [%]	7	LIMITS \ Current limits
T current lim + [%]	8	BASIC MENU
T current lim + [%]	8	LIMITS \ Current limits
T current ref [%]	41	MONITOR \ Measurements
T current ref 1 [%]	39	INPUT VARIABLES \ T current ref
T current ref 2 [%]	40	INPUT VARIABLES \ T current ref
Take motor par	694	DRIVE PARAMETER \ Mot plate data
Take val part 1	677	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Take val part 2a	679	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Take val part 2b	681	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2b
Take val part 3	1028	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 3
Test T curr lim [%]	1048	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 3
Threshold delay [ms]	103	ADD SPEED FUNCT \ Speed control
Torque [%]	230	MONITOR \ Measurements
Torque const [N*m/A]	1013	SPEED REGULAT \ Inertia/loss cp
Torque current	350	CURRENT REGULAT
Torque reduct	342	LIMITS \ Current limits
Trip time 50% [s]	657	FUNCTIONS \ Overload contr \ Ovld mot contr
Tune value inp 1	73	I/O CONFIG \ Analog inputs \ Analog input 1
Tune value inp 2	78	I/O CONFIG \ Analog inputs \ Analog input 2
Tune value inp 3	83	I/O CONFIG \ Analog inputs \ Analog input 3
V/f flux level [%]	900	DRIVE PARAMETER \ V/f control \ Energy save
V/f shape	712	DRIVE PARAMETER \ V/f control
Virt dig in 0	1107	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 1	1108	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 10	1117	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 11	1118	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 12	1119	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 13	1120	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 14	1121	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 15	1122	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 2	1109	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 3	1110	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 4	1111	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 5	1112	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 6	1113	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 7	1114	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 8	1115	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig in 9	1116	OPTIONS \ Option 1 \ PDC config \ Virt dig in
Virt dig out 0	1123	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 1	1124	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 10	1133	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 11	1134	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 12	1135	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 13	1136	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 14	1137	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 15	1138	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 2	1125	OPTIONS \ Option 1 \ PDC config \ Virt dig out
Virt dig out 3	1126	OPTIONS \ Option 1 \ PDC config \ Virt dig out

Parameter	N.	Position
Virt dig out 4	1127	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 5	1128	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 6	1129	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 7	1130	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 8	1131	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 9	1132	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virtual dig inp	582	MONITOR \ I/O
Virtual dig out	583	MONITOR \ I/O
Vlt boost type	709	DRIVE PARAMETER \ V/f control \ Voltage boost
Volt comp lim Nw [V]	685	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	REG PARAMETERS \ Percent values \ Current reg\Dead time comp
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage I [%]	902	REG PARAMETERS \ Percent values \ Voltage reg
Voltage I base [Vs/V x s]	903	REG PARAMETERS \ Base values \ Voltage reg
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	REG PARAMETERS \ Percent values \ Voltage reg
Voltage P base [Vs/V]	1023	REG PARAMETERS \ Base values \ Voltage reg
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Zero pos gain [%]	892	SPEED REGULAT \ Spd zero logic
Zero torque	353	CURRENT REGULAT

10.4. List of high priority parameters

When a 6KCV300DGF is used a subset of the AV-300i, parameters can be exchanged with the optional card through the automatic synchronous communication. For more details see the 6KCV300DGF Technical documentation.

Parameter	N.	Format	Value			Read/W rite
			min	max	Default	
T current lim + [CURR]	8	U16	0	F	S	R/W
T current lim - [CURR]	9	U16	0	F	S	R/W
In use T cur lim + [CURR]	10	U16	0	F	-	R
In use T cur lim - [CURR]	11	U16	0	F	-	R
current lim red [CURR]	13	U16	0	F	F	R/W
T current ref 1 [CURR]	39	I16	F	F	0	R/W
T current ref 2 [CURR]	40	I16	F	F	0	R/W
T current ref [CUR+A11R]	41	I16	F	F	-	R
Speed ref1 [spd]	42	I16	-32768	32767	0	R/W
Speed ref2 [spd]	43	I16	-32768	32767	0	R/W
Ramp ref1 [spd]	44	I16	-32768	32767	0	R/W
Ramp ref2 [spd]	48	I16	-32768	32767	0	R/W
Control word	55	U16	0	65535	0	R/W
Status word	56	U16	0	65535	-	R
Ramp ref [spd]	110	I16	-32768	32767	-	R
Ramp outp [spd]	113	I16	-32768	32767	-	R
Speed ref [spd]	118	I16	-32768	32767	-	R
Actual spd [spd]	122	I16	-8192	8192	-	R
Adap reference [spd]	183	I16	-32768	32767	4000	R/W
Enc 1 position [enc_pls]	197	I16	-32768	32767	-	R
Enc 2 position [enc_pls]	198	I16	-32768	32767	-	R
Enc 1 last time [enc_tim]	204	U32	0	232-1	-	R
Enc 1 last time high [enc_tim]	205	U16	0	65535	-	R
Enc 2 last time [enc_tim]	206	U32	0	232-1	-	R
Enc 2 last time high [enc_tim]	207	U16	0	65535	-	R
Speed reg output	236	I16	—	—	-	R
Lock speed reg	322	U16	0	1	0	R/W
Enc 2 speed [spd]	420	I16	-32768	32767	-	R
Enc 1 speed [spd]	427	I16	-32768	32767	-	R
Flux level	467	U16	1638	16384	16384	R/W
Flux reference	500	Float	0	16384	16384	R
Pad 0	503	I16	-32768	32767	0	R/W
Pad 1	504	I16	-32768	32767	0	R/W
Pad 2	505	I16	-32768	32767	0	R/W
Pad 3	506	I16	-32768	32767	0	R/W
Pad 4	507	I16	-32768	32767	0	R/W
Pad 5	508	I16	-32768	32767	0	R/W
Pad 6	509	I16	-32768	32767	0	R/W
Pad 7	510	I16	-32768	32767	0	R/W
Pad 8	511	I16	-32768	32767	0	R/W
Pad 9	512	I16	-32768	32767	0	R/W
Pad 10	513	I16	-32768	32767	0	R/W

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Parameter	N.	Format	Value			Read/W rite
			min	max	Default	
Pad 11	514	I16	-32768	32767	0	R/W
Pad 12	515	I16	-32768	32767	0	R/W
Pad 13	516	I16	-32768	32767	0	R/W
Pad 14	517	I16	-32768	32767	0	R/W
Pad 15	518	I16	-32768	32767	0	R/W
Bit word pad A	519	U16	0	65535	0	R/W
Bit word pad B	536	U16	0	65535	0	R/W
Dig input term	564	U16	0	65535	-	R
Dig output term	581	U16	0	65535	-	R
Load comp [CURR]	698	I16	F	F	-	R
V/f flux level	900	U16	0	16384	16384	R/W
Ind store ctrl	912	U16	0	65535	0	R/W
Index storing	913	U16	0	+2 ³² -1	-	R
Out vlt level	921	Float	0	16384	16384	R/W
Fact speed (rpm) [spd]	924	I16	-32768	32767	-	R
Fact speed (d) [spd]	925	I16	-32768	32767	-	R
T curr % [CURR]	927	I16	F	F	-	R
FT curr % [CURR]	928	I16	F	F	-	R
Speed ratio	1017	I16	0	+32767	10000	R/W
Spd draw out (d)	1018	I16	-32767	+32767	-	R
PL next factor	1091	I16	0	+32768	10000	R

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Notes!

- Speed settings are expressed in **[SPD]**: 1 SPD = 0.25 rpm
- Current settings are expressed in **[CURR]** : 1 CURR = **[Current norm / (2¹⁵·√2)]** ARMS
 - **Current norm**: (parameter no 267, format: floating, access code R (read only), not available via key pad), depends on drive sizes
 - **Flt 100 mf** (parameter no. 303, format: integer 16 bits, access code R (read only), not available via keypad): expressed in [CURR].
 Setting **T current lim...** [CURR] equal to **Flt 100mf** implies the setting **Motor current** [ARMS] = FLC
- Encoder positions are expressed in **[ENC_PLS]**: 1 ENC_PLS = 0.25 pulses
- Encoders last time[s] are expressed in 50 ns units (1 = 50 ns) **[ENC_TIM]**.
- Speed reg Output [%] contains valid information even if the speed regulator is disabled (**Enable Speed reg** = Disabled). If Speed Output is enabled, it contains the sum of actual speed regulator output and **T current ref 2**.

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
6KAVI43F75	2.4	10.8
6KAVI43001	4	17.5
6KAVI43002	5.6	25.1
6KAVI43003	7.5	33.4
6KAVI43005	9.6	42.4
6KAVI43007	12.6	56.5
6KAVI43010	17.7	79
6KAVI43015	24.8	110.4
6KAVI43020	33	147.2
6KAVI43025	47	211
6KAVI43030	63	256.4
6KAVI43040	79	33.3
6KAVI43050	93	421.9
6KAVI43060	114	512.8
6KAVI43075	142	606.1
6KAVI43100	185	847.1
6KAVI43125	210	847.1
6KAVI43150	250	1129.9
6KAVI43200	324	1432.2

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10.5. Default Motor Parameter

Standard for 460V											
Description	No.	F75	001	002	003	005	007	010	015	020	025
Nominal Voltage	161	460	460	460	460	460	460	460	460	460	460
Nominal speed	162	870	1775	1770	1765	1760	1765	1765	1770	1770	1775
Nom. frequency	163	60	60	60	60	60	60	60	60	60	60
Nominal current	164	2.20	2.20	2.70	4.80	6.60	11.00	14.00	21.00	27.00	29.00
Magn. current	165	1.70	1.20	1.40	2.30	3.40	5.00	4.40	6.40	4.60	7.60
Rotor resistance	166	4.0241	1.6767	1.6394	1.0759	0.8952	0.4695	0.4490	0.2510	0.5890	0.1272
Cos phi	371	0.57	0.76	0.79	0.81	0.79	0.83	0.82	0.82	0.83	0.87
Stator resist	436	4.0241	1.6767	1.6394	1.0759	0.8952	0.4695	0.4690	0.2540	0.5570	0.1272
Lkg inductance	437	0.11170	0.07880	0.05960	0.03170	0.02440	0.01300	0.01700	0.01100	0.01500	0.00640
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	89	6.99	7.97	8.63	6.12	5.97	4.25	7.76	7.02	12.76	7.81
Current I	90	0.76	0.51	0.71	0.62	0.66	0.46	0.62	0.48	1.48	0.47
Flux P	91	4.98	7.40	5.28	6.04	5.73	8.18	6.12	7.83	2.50	8.09
Flux I	92	3.62	1.45	1.16	1.43	1.65	1.81	1.33	1.39	0.69	0.85
Base voltage	167	460	460	460	460	460	460	460	460	460	460
Base frequency	168	60	60	60	60	60	60	60	60	60	60
Description	No.	030	040	050	060	075	100	125	150	200	
Nominal Voltage	161	460	460	460	460	460	460	460	460	460	
Nominal speed	162	1770	1780	1775	1785	1785	1790	1785	1790	1790	
Nom. frequency	163	60	60	60	60	60	60	60	60	60	
Nominal current	164	40.00	52.00	65.00	77.00	96.00	124.00	156.00	180.00	240.00	
Magn. current	165	11.80	13.10	17.10	20.30	26.30	32.70	33.90	46.50	68.30	
Rotor resistance	166	0.1260	0.2100	0.0910	0.0900	0.0750	0.0470	0.0470	0.0310	0.0066	
Cos phi	371	0.84	0.88	0.87	0.87	0.86	0.87	0.91	0.87	0.85	
Stator resist	436	0.1190	0.3100	0.2860	0.1490	0.1250	0.0760	0.0620	0.0440	0.0080	
Lkg inductance	437	0.00600	0.01200	0.00900	0.00800	0.00700	0.00400	0.00400	0.00300	0.00060	
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Current P	89	7.00	6.00	5.80	5.80	7.00	6.20	5.00	5.70	6.90	
Current I	90	0.40	0.30	0.30	0.20	0.20	0.15	0.20	0.15	0.15	
Flux P	91	8.40	12.60	10.70	18.00	15.00	25.50	18.00	27.70	24.70	
Flux I	92	1.20	1.00	1.10	1.10	1.00	1.00	1.00	1.10	1.00	
Base voltage	167	460	460	460	460	460	460	460	460	460	
Base frequency	168	60	60	60	60	60	60	60	60	60	

ai105A

Standard for 400V											
Description	No.	F75	001	002	003	005	007	010	015	020	025
Nominal Voltage	161	400	400	400	400	400	400	400	400	400	400
Nominal speed	162	1400	1405	1415	1415	1435	1450	1450	1460	1460	1455
Nom. frequency	163	50	50	50	50	50	50	50	50	50	50
Nominal current	164	1.95	3.70	5.20	6.80	9.20	11.80	15.60	22.50	30.00	43.00
Magn. current	165	0.97	1.74	2.45	3.30	4.60	5.04	6.66	6.63	8.54	12.24
Rotor resistance	166	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935	0.2737	0.2053	0.1611
Cos phi	371	0.80	0.82	0.82	0.81	0.80	0.85	0.85	0.84	0.85	0.85
Stator resist	436	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935	0.2737	0.2053	0.1611
Lkg inductance	437	0.08380	0.04170	0.02960	0.02340	0.01780	0.01180	0.00890	0.00960	0.00700	0.00490
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	89	6.03	4.84	4.94	5.19	5.00	4.44	4.70	7.07	6.83	6.83
Current I	90	1.70	1.38	1.26	1.28	0.92	0.74	0.78	0.60	0.60	0.68
Flux P	91	2.54	3.14	3.44	3.38	4.71	5.89	5.57	7.18	7.18	6.38
Flux I	92	1.97	2.17	2.12	2.15	2.37	1.92	2.13	1.52	1.36	1.46
Base voltage	167	400	400	400	400	400	400	400	400	400	400
Base frequency	168	50	50	50	50	50	50	50	50	50	50
Description	No.	030	040	050	060	075	100	125	150	200	
Nominal Voltage	161	400	400	400	400	400	400	400	400	400	
Nominal speed	162	1465	1470	1470	1475	1480	1480	1485	1485	1485	
Nom. frequency	163	50	50	50	50	50	50	50	50	50	
Nominal current	164	58.00	71.00	85.00	93.50	140.00	170.00	205.00	240.00	295.00	
Magn. current	165	15.91	19.48	22.41	24.65	38.41	46.64	56.24	63.28	77.78	
Rotor resistance	166	0.0929	0.0651	0.0543	0.0412	0.0220	0.0181	0.0113	0.0096	0.0078	
Cos phi	371	0.86	0.86	0.87	0.87	0.86	0.86	0.86	0.87	0.87	
Stator resist	436	0.0929	0.0651	0.0543	0.0412	0.0220	0.0181	0.0113	0.0096	0.0078	
Lkg inductance	437	0.00350	0.00280	0.00230	0.00210	0.00140	0.00120	0.00100	0.00080	0.00070	
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Current P	89	5.93	6.30	6.40	7.07	5.81	6.68	5.54	6.07	6.26	
Current I	90	0.48	0.43	0.46	0.42	0.27	0.31	0.19	0.22	0.22	
Flux P	91	9.11	10.01	9.46	10.28	16.28	14.14	22.74	19.96	19.36	
Flux I	92	1.56	1.47	1.23	1.12	1.48	1.28	1.55	1.30	1.26	
Base voltage	167	400	400	400	400	400	400	400	400	400	
Base frequency	168	50	50	50	50	50	50	50	50	50	

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Section 11: Renewal Parts List

CATALOG #	Description		Drive Model Number																	Recommended Spare	
			6KAV3375	6KAV3001	6KAV3002	6KAV3003	6KAV3005	6KAV3007	6KAV3010	6KAV3015	6KAV3020	6KAV3025	6KAV3030	6KAV3040	6KAV3050	6KAV3060	6KAV3070	6KAV3100	6KAV3125		6KAV3150
RV331	RV33-1 regulation board		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X
PV33100	PV33-1-00 power board		1																		X
PV33101	PV33-1-01 power board			1																	X
PV331L02	PV33-1L-02 power board				1																X
PV331L03	PV33-1L-03 power board					1															X
PV33204	PV33-2-04 power board						1														X
PV33205	PV33-2-05 power board							1													X
PV33207	PV33-2-07 power board								1												X
PV33311	PV33-3-11 power board									1											X
PV33315	PV33-3-15 power board										1										X
PV33422	PV33-4-22 power board											1									X
PV33430	PV33-4-30 power board												1								X
PV33437	PV33-4-37 power board													1							X
PV33445	PV33-4-45 power board														1						X
PV33455	PV33-4-55 power board															1					X
PV33575	PV33-5-75 power board																1				X
PV33590	PV33-5-90 power board																	1			X
PV335110	PV33-5-110 power board																		1		X
PV335132	PV33-5-132 power board																			1	X
6KS512D	DL2-SKM Drivers																3				X
6KS511D	DL3-SKM Drivers																	3	3		X
6KS513D	DL4-SKM Drivers																			3	X
6KS5R33	TA-AVi Current Tfr.											1	1	1							
6KS5D63	F-AVi Filter board											1	1	1							
6KS5R32	F1-AVi Filter board														1	1					
6KS5D84	FL-AM Filter Board																1	1	1	1	
6KS783E	TA DC 200A 2K														3	3					
6KS7E87	TA-DC 200A 2K																3				
6KS780E	TA-DC 300A 2K																		3	3	
6KS7YC7	THERMAL SWITCH		1	1	1	1	1	1	1	1	1							1	1	1	
6KS7YC9	THERMAL SWITCH											2	2	2							
6KS7YG1	THERMAL SWITCH NTC															2	2				
6KS7YI2X	THERMAL SWITCH																2				
6KS7YI3X	THERMAL SWITCH																	1	1		
6KS7YI1	THERMAL SWITCH																			1	
6KS7ZA5	FAN 40x40x10 24V		1	1	1	1	1	1	1												X
6KS7ZA4	FAN 60x60x25 24V			1	1	1	2	2	2	1	1										X
6KS7YC8	FAN 80x80 24V									2	2										X
6KS7G70	FAN A 24V DC 00-0-80-B											2									X
6KS7G79	FAN A 024DC 00-0-250 B												1			2					X
6KS7G78	FAN A 024DC 345B													1							X
6KS7G71	FAN A 024DC 170B 20/+75														2						X
6KS70GG	FAN 115VAC																2				X
6KS7G17	FAN 230VAC 50HZ.																	3	3	3	X
6KS7G36	THERMAL SWITCH 90										1	1		1	1	1					
6KS7G37	THERMAL SWITCH 85													1					2	2	
6KS8H87	IGBT6 MODULE	8A,1K2V	1																		X
6KS8H88	IGBT6 MODULE	12A,1K2V		1																	X
6KS8H89	IGBT6 MODULE	22A,1K2V			1	1															X
6KS8H10	IGBT6 MODULE	25A,1K2V					1														X
6KS8H11	IGBT6 MODULE	45A,1K2V						1	1												X
6KS8H12	IGBT6 MODULE	65A,1K2V								1											X
6KS8H13	IGBT6 MODULE	85A,1K2V									1										X
6KS8H85	D10D0 6 MODULE	75A,1K5V								1											X
6KS8H86	D10D0 6 MODULE	125A,1K5V									1										X
6KS796F	D10D0 6 MODULE	160A,1K6V										1	1								X
6KS797F	D10D0 6 MODULE	186A,1K6V												1							X

GEI-100360A

CATALOG #	Description		Drive Model Number																	Recommended Spare	
			6KAV3B75	6KAV3001	6KAV3002	6KAV3003	6KAV3005	6KAV3007	6KAV3010	6KAV3015	6KAV3020	6KAV3025	6KAV3030	6KAV3040	6KAV3050	6KAV3060	6KAV3070	6KAV3100	6KAV3125		6KAV3150
6KS779F	DIODE 2 MODULE	99A,1K6V													3	3					X
6KS782F	DIODE 2 MODULE	100A,1K6V															3	3			X
6KS780F	DIODE 2 MODULE	195A,1K6V																	3	3	X
6KS787F	DIODE/SCR MODULE	250A,1K6V															1				X
6KS8H56	IGBT2 MODULE	100A,1K2V										3									X
6KS8H57	IGBT2 MODULE	150A,1K2V											3								X
6KS8H58	IGBT2 MODULE	200A,1K2V												3							X
6KS8H59	IGBT2 MODULE	300A,1K2V													3	3					X
6KS8H60	IGBT2 MODULE	200A,1K2V															6	9	9	12	X
6KS757F	SCR MODULE	85A,1K6V										1									X
6KS776F	SCR MODULE	116A,1K6V											1								X
6KS781F	SCR MODULE	130A,1K6V												1							X
6KS778F	SCR MODULE	181A,1K6V													1	1					X
6KS786F	SCR MODULE	400A,1K6V																1	1	1	X
6KS8H75	MODULE IGBT 1 (int BU)	50A,1K2V										1									X
6KS8H76	MODULE IGBT 1 (int BU)	75A,1K2V											1	1							X
6KS8H77	MODULE IGBT 1 (int BU)	100A,1K2V													1	1					X
6KS7NR3	PRECHARGE RESISTOR	7.2ohm, 68W												1							
6KS7NR2	PRECHARGE RESISTOR	9.2ohm, 68W											1								
6KS7NR1	PRECHARGE RESISTOR	15.4ohm, 68W										1									
6KS7ZA0	PRECHARGE RESISTOR	4.5ohm, 91W													1	1					
6KS721S	PRECHARGE RESISTOR	4.7ohm, 91W															1	2	2	2	
6KS844B	INTERNAL FUSE TV32	2,5A-250V																1	1	1	X
6KS7829	AUTOTRF 200VA																	1	1	1	

AV-300i™ Index**A**

AC Input Fuses 4-17
 AC Input Chokes 4-20
 AC Input Contactors 4-18
 AC Input current 2-7
 AC Input frequency 2-7
 AC Input Voltage 2-7
 AC Output 2-9
 Acc delta speed 6-43
 Acc delta speed 0 6-116
 Acc delta speed 1 6-117
 Acc delta speed 2 6-117
 Acc delta speed 3 6-117
 Acc delta time 6-43
 Acc delta time 0 6-116
 Acc delta time 1 6-117
 Acc delta time 2 6-117
 Acc delta time 3 6-117
 Acceleration 6-43
 Acceleration, Deceleration,
 Quick Stop 6-43
 Accuracy 2-11
 Act spd filter 6-12
 Act speed value 6-86, 87
 Active Power 6-12, 86
 Activity 6-77
 Activity (Heatsink) 6-79
 Actual boost 6-28
 Actual mot setup 6-125
 Actual slip comp 6-28
 Actual spd (%) 6-12
 Actual spd (d) 6-12
 Actual spd (rpm) 6-12
 Actual speed 6-8, 12, 86, 87
 Adap I gain 1 6-102
 Adap I gain 2 6-103
 Adap I gain 3 6-103
 Adap joint 1 6-102
 Adap joint 2 6-102
 Adap P gain 1 6-102
 Adap P gain 2 6-103
 Adap P gain 3 6-103
 Adap reference 6-102
 Adap speed 1 6-102
 Adap speed 2 6-102
 Adaptive spd reg 5-51, 6-101
 Additional Speed Functions 6-101
 Address for bus operation 6-82
 Alarms 8-1

Ambient temp1 2-5, 6-8, 72
 An in 1 target 6-90, 97
 An in 2 target 6-90, 97
 An in 3 target 6-90, 97
 An in XX target 6-90
 Analog input 1 6-90
 Analog input 2 6-90
 Analog input 3 6-90
 Analog input scaling 6-91
 Analog Inputs 6-90
 Analog output scaling 6-87
 Analog Outputs 6-85
 Anti Drift Function 5-50, 6-51,
 Application note 6-174
 Auto capture 6-101
 Auto tune inp XX 6-91
 Autorestart after a momentary
 alarm: Retrying 6-30
 Aux spd fun sel 6-48
 AV-300i Connections 4-16
 AV-300i Power Dip Ride 4-30

B

Base frequency 6-15
 Base voltage 6-15
 Basic menu 6-6
 Basic Settings of the Drive 5-33
 Bitword pad A 6-147
 Bitword pad B 6-147
 Block Diagram 9-1
 Braking Resistance 4-23
 Braking Type 6-131
 Braking Unit 6-131
 Braking unit function 6-131
 Braking Units 4-22
 Brk time @ stop 6-150
 BU DC vlt 6-132
 BU duty cycle 6-132
 BU overload 6-96, 8-1
 BU ovld time 6-132
 Buffering the Regulator Supply 4-28
 Bus 6-64
 Bus loss - Hold off time 6-78
 Bus loss - Restart time 6-78
 Bus loss 6-77, 96, 8-1

C

Cable cross section 4-6
 Cable cross-section on the plug-in
 terminals 4-6
 Calculation of the external braking
 resistance 4-27
 Care 7-1
 Catch spining motor 6-30
 Changing / Saving Parameters /
 Password 5-5
 Checking and fine tuning of
 parameters in Sensorless 5-42
 Checking and manual tuning of
 magnetizing current 5-42
 Checking and manual tuning of
 Rotor resistance 5-48
 Checking the Wiring and
 Auxiliary Voltages 5-31
 Chokes / Filters 4-20, 21
 Circuit Protection 4-17
 Commissioning 5-31
 Comp slope 6-24, 63
 Comp slope Nw 6-24
 Configuration 6-64
 Configuration of the OK relay
 (Terminals 80,82) 6-67
 Connection Diagram 4-16
 Connection to a dancer with
 potentiometer 6-163
 Connection to a load cell
 with full range + 10V. 6-163
 Connection with a Braking Unit 4-22
 Connector for the RS 485 4-13
 Constant current 6-59
 Cont motor curr 6-129
 Continuous current 6-8, 72
 Control mode 6-64
 Control Section 2-10
 Control word 6-178
 Control word, status word,
 malfunction code 6-195, 196
 Copy mot setup 6-124, 126
 Cos phi 6-15
 Curr fbk loss 6-78, 82, 8-1
 Curr lim stop 6-78
 Curr limit state 6-40, 96
 Current 5-43, 44, 6-24, 62
 Current I base 6-62
 Current I Nw 6-24
 Current lim red 6-40
 Current limits 6-38

Current norm	10-68	Dip-switch S3	4-8	Enable zero pos	6-51
Current P	5-43, 44, 6-24, 62	Disable drive	6-77	Enc1 speed	6-12
Current P base	6-62	Discharge Time of the DC-Link	4-32	Enc2 speed	6-12
Current P Nw	6-24	Displaying Parameters	5-5	Encoder 1 pulses	6-9, 69, 99
Current Regulation	6-57	Disposal of the Device	2-6	Encoder 1 state	6-70
Current U	6-86	Div gain (link)	6-144	Encoder 1 type	6-69, 99
Current V	6-86	Drive Dimensions	3-1, 2, 3	Encoder 2 pulses	6-9, 69, 99
Current W	6-86	Drive faults	6-79, 80, 8-1	Encoder 2 state	6-70
Customer Service	7-1	Drive Healthy	6-67	Encoder Connections	3-10
D		Drive not reacting to adaptive speed regulation	8-6	Encoders	3-8
Dancer constant	6-172	Drive Operation	5-1	Energy save function	6-31
DC braking	6-148	Drive Parameter	6-14	Engage a spinning motor: Autorestart	6-29, 30
DC braking curr	6-150	Drive ready	6-96	Example of "parameters set" procedure	6-125
DC braking delay	6-150	Drive Trip Times	4-31	Examples of application	6-174
DC braking function menu	6-148	Drivecom	6-195	External braking resistance	4-23, 27
DC braking mode = 0	6-149	Droop Enable	6-97	External Fault	6-2, 5, 96, 8-1
DC braking mode = 1	6-149	Droop filter	6-53	External fuses of the power section	4-17
DC link voltage	6-12, 86	Droop function	6-52	External fuses of the power section DC input side	4-19
Dead time comp	6-63	Droop gain	6-53	External standard braking resistor	4-23
Dec delta speed	6-9, 43, 198	Droop limit	6-53	F	
Dec delta speed0	6-116	DSP error	8-1	F act spd (d)	6-12
Dec delta speed1	6-117	Dynamic modification of the integral gain of the P	6-193	F act spd (rpm)	6-12, 86
Dec delta speed2	6-117	Dynamic vlt margin	6-41	F current ref	6-57, 86
Dec delta time	6-9, 43, 198	E		F T curr (%)	6-13, 86
Dec delta time 0	6-116	EEPROM Error	6-83	Face value den	6-73, 199
Dec delta time 1	6-117	EMI filter	4-21	Face value factor	6-73, 74, 199
Dec delta time 2	6-117	Enab multi rmp	6-116	Face value num	6-73, 199
Dec delta time 3	6-117	Enab multi spd	6-112	Factor function	6-73, 199
Deceleration	6-43	Enabl seq err	6-80, 8-1	Failure alarms	8-1
Delay auto cap	6-30	Enable BU	6-131	Failure reg del	5-10, 6-142
Delay retrying	6-30	Enable drive	6-2, 3, 4, 7, 12	Failure register	5-9, 6-142
Destination (link)	6-144	Enable droop	6-53, 97	Failure register/acknowledge alarms	5-9
Device address	6-82	Enable ind store	6-70	Failure reset	5-10, 6-142
Diameter sensor	6-185	Enable jog	6-109, 110	Failure supply	6-77, 82, 86, 8-1
Diameter calc	6-97, 158, 172	Enable lck sls	6-50	Fast stop	6-4
Diameter calc st	6-97, 158	Enable motor pot	6-107	Faults	8-1
Dig input term	6-13	Enable OPT2	6-155	Feed - Forward	6-159, 160
Dig output term	6-14	Enable PD PID	6-158, 97	Feed fwd power	6-86
Digital	6-64	Enable PI PID	6-158, 97	Feed-fwd PID	6-159, 160, 163
Digital Encoder Input Interface	3-8	Enable Ramp	6-44	Field oriented	5-47, 6-8, 66
Digital I/O	6-13	Enable rr adap	6-140	Flt 100mF	6-57, 10-68
Digital input XX	6-97	Enable save eng	6-31	Flux	6-13, 59, 86
Digital Inputs	6-13, 97	Enable seq err	6-77, 78, 80, 8-1	Flux corr factor	6-26
Digital Output XX	6-96	Enable Signals	6-2	Flux current	6-57, 86
Digital Outputs	6-14, 96	Enable spd adap	6-102	Flux I	6-24, 62
Dim factor den	6-73, 199	Enable spd reg	6-49		
Dim factor num	6-73, 199	Enable spd=0 I	5-50, 6-50		
Dim factor text	6-73, 199	Enable spd=0 P	5-50, 6-50		
Dimension factor	6-73	Enable spd=0 R	5-50, 6-50		
Dimension factor, face value factor	6-73				

Flux I base	6-62
Flux I Nw	6-24
Flux Level	6-41, 86, 90, 31
Flux limit	6-41
Flux P	6-24, 62
Flux P base	6-62
Flux P Nw	6-24
Flux ref	6-59, 140
Flux reference	6-59, 86
Flux reg mode	6-59
Flux Regulation	6-59
Flux srch time	6-29
Flux var time	6-31
Forward sign	6-45, 97
Freeze ramp	6-46, 97
Friction	6-54
Full load curr	6-57, 66
Function Description	6-1
Function calculation for Initial diameter	6-171
Functions	6-107
Fuses	4-17, 19
Fwd sign	6-97, 45
Fwd-Rev	6-45
Fwd-Rev spd tune	6-25

G

Gear box ratio	6-172
Gen access	6-139
Gen amplitude	6-140
Gen frequency	6-140
General description of the PID blocks	6-158
Generator offset	6-140
Generic PID	6-189

H

Heat Dissipation	3-4
Heatsink Sensor	6-79, 96, 8-2
Heatsink Airtmp	6-13
Hold off time	6-78
Hw Opt 1 failure	6-78, 80, 96

I

I init gain PID	6-165
I/O CONFIG	6-85
I_sqrt_t_accum	6-128
Ignore	6-78
In use Tcur lim -	6-40
In use Tcur lim +	6-41
Ind store ctrl	6-70

Index storing	6-70
Index storing parameter	6-71
Inertia	6-54
Inertia c filter	6-55
Inertia/Loss comp	6-54
Inp absolute (link)	6-144
Input 1 compare	6-93
Input 1 cp delay	6-93
Input 1 cp error	6-93
Input 1 cp match	6-93
Input 1 filter [mS]	6-89
Input 1 sign -	6-91
Input 1 sign +	6-90
Input 2 sign -	6-91
Input 2 sign +	6-90
Input 3 sign -	6-91
Input 3 sign +	6-90
Input Command	6-2, 158
Input max (link)	6-144
Input min (link)	6-144
Input offset (link)	6-144
Input Variables	6-32
Input XX sign-	6-91
Input XX sign	6-90
Input XX sign +	6-90
Input XX type	6-90
Inputs / Outputs PID	6-158
Installation Guidelines	3-1
Installation Mounting Clearance	3-6
Int Overcurrent	6-80, 8-2
Interference Suppression Filters	4-21
Internal braking unit	4-22
Internal Fans	3-5
Internal fuses	4-19
Internal speed reference values not actuated	8-6
Interrupt error	6-77, 78, 8-2

J

Jog -	6-97, 110
Jog +	6-97, 110
Jog function	6-109
Jog operation	6-110
Jog operation not possible	8-6
Jog reference	6-90, 110
Jog selection	6-110
Jumpers on Regulator Card	4-8

K

Keypad	5-2
Keypad Description	5-3
Keypad Operation	5-8

L

Latch	6-78
LEDs on keypad	5-2
LEDs on Regulation card	4-7
Life time	6-141
Limits	6-37
Linear ramp	6-45
Link1 Destination	6-144
Link1 Source	6-143
Link2 Destination	6-144
Link2 Source	6-143
List of all Parameters	10-1
List of all parameters in numeric order	10-28
List of High Priority Parameters	10-67
List of non-programmable alarms	6-82
List of Parameters in alphabetical order	10-54
List of programmable alarms	6-79
List of self tune error messages	5-40
Lkg inductance	6-20, 21
Lkg inductance Nw	6-24
Load comp	6-53, 90
Load default	6-141
Load motor par	6-21
Load Motor Parameter	10-69
Loading default factory settings	6-141
Local	6-64
Lock save eng	6-31, 97
Lock speed I	6-49, 97
Lock speed reg	6-48, 97
Lock zero pos	6-51, 97
Loss Comp	6-54
Low speed factor	6-26

M

Magn boost curr	6-67
Magn ramp time	6-67
Magn working curr	6-21
Magnetiz curr Nw	6-24
Magnetizing curr	6-21, 24
Main commands	6-64
Main menu	5-14
Mains voltage	6-8, 72

Mains voltage, Ambient temp, Continuous current, S	6-72	Motor potentiometer	6-107	Output frequency	6-12
Maintenance	7-1	Motor Potentiometer function	5-10	Output KVA	2-7
Malfunction code	6-196	Motor potentiometer function not executed	8-6	Output offset (link)	6-144
Manual boost	6-28	Motor protection	3-7, 6-129	Output reference	6-169
Manual slip comp	6-29	Motor setup function	6-124	Output voltage	6-12, 86
Manual tuning of current regulator	5-43	Motor thermal protection	6-129	Output voltage oscillates strongly under load	8-5
Manual tuning of flux regulator	5-44	Motor turning in the wrong direction	8-4	Overcurrent	6-80, 96, 8-2
Manual tuning of regulator loops	5-42	Motor turns slowly, although reference value = Zero	8-5	Overflow list	6-15
Manual tuning of rotor resistance	5-48	Moving Inside a Menu	5-4	Overld available	6-96, 128
Manual tuning of rotor resistance by dynamic response	5-48	Mul gain (link)	6-144	Overload control	6-127
Manual tuning the Speed regulator	5-46	Multi ramp fct	6-115	Overload time	6-129
Max deviation	6-172	Multi ramp sel	6-116	Overtemp mot	6-96, 80, 8-3
Maximum Cable Sizes	4-6	Multi speed 1	6-112	Overvoltage	6-79, 96, 8-2
Maximum permissible cable cross-section on the plug	4-6, 10	Multi speed 2	6-112	Ovld mot state	6-96
Measurement error messages	5-40	Multi speed 3	6-112		
Measurement of Dancer constant	6-172	Multi speed 4	6-112	P	
Menu	5-3, 6-155	Multi speed 5	6-112	P init gain PID	6-165
Menu Structure	5-12, 6-1	Multi speed 6	6-112	P1 flux model	6-24
Minimum cabinet opening suggested for the cooling	3-4	Multi speed 7	6-113	P1 flux model Nw	6-24
Minimum diameter	6-166, 180	Multi speed fct	6-111	P2 flux model	6-24
Monitor	6-10	Multi speed sel	6-113	P2 flux model Nw	6-24
Mot setup sel	6-124	Multi-Ramp function not reacting	8-6	Pad 0	6-86, 90, 145
Mot setup sel 0	6-97, 124			Pad 1	6-86, 90, 145
Mot setup state	6-96, 125	N		Pad 2	6-90, 145
Motor accelerates immediately to maximum speed	8-4	Nip-roll control with dancer	6-174	Pad 3	6-90, 145
Motor accelerates too slowly	8-5	Nip-rolls control with load cell	6-117	Pad 4	6-86, 145
Motor cont curr	6-129	No of attempts	6-78	Pad 5	6-86, 145
Motor current	6-8, 12, 86	Nom frequency	6-15	Pad 6	6-86, 145
Motor decelerates too slowly	8-5	Nominal current	6-15	Pad A bit	6-96
Motor losses %	6-29	Nominal Drive Current	2-9	PAD A bit 0	6-97, 146
Motor not reaching nominal speed	8-4	Nominal speed	6-15	PAD A bit 1	6-97, 146
Motor not supplying the maximum torque	8-5	Nominal voltage	6-15	PAD A bit 2	6-97, 146
Motor not turning	8-4	Normal stop	6-78	PAD A bit 3	6-97, 146
Motor parameter	6-20	O		PAD A bit 4	6-97, 146
Motor plate data	6-14	Offset inp XX	6-91	PAD A bit 5	6-97, 146
Motor pot down	6-97, 109	Ok relay func	6-67	PAD A bit 6	6-97, 146
Motor pot oper	6-108	OK relay open	6-78	PAD A bit 7	6-97, 146
Motor pot reset	6-97, 108	Operating mode selection	6-64	Pad B bit	6-96
Motor pot sign -	6-97, 108	Operating the Drive via the Keypad	5-8	Pads	6-145
Motor pot sign	6-97, 108	Opt2 failure	6-80, 96	Parameters cannot be used as a destination of a Links	6-144
Motor pot sign +	6-97, 108	Option 1	6-151	Parameters Lists	10-1
Motor pot up	6-97, 109	Option 1 menu	6-151	Parameter Menu	6-1
		Option 2	6-155	Parameters regarding the initial diameter	6-183
		Option 2 menu	6-155	Password	6-83
		Options	6-151	Pause time	6-129
		Out vlt level	6-59, 86	PD block	6-167
		Output Filters	4-20	PD controls menu	6-168
				PD D filter PID	6-169
				PD D gain 1	6-168

PD D gain 2	6-169	Programmable alarms	6-76	Relay 2	6-96
PD D gain 3	6-169	Programmable on digital inputs	6-97	Removing the front cover	4-1
PD output PID	6-169	Programming example of the analog input 2 on PID s	6-160	Repairs	7-1
PD P gain 1	6-168	Programming example of the ramp output block	6-159	Replacement Parts	11-1, 2
PD P gain 2	6-169	Prop filter	6-49	Resistor model: Standard DB resistor data	4-24
PD P gain 3	6-169	Proportional - Derivative control block	6-167	Restart time	6-78
Percent ref var	6-196	Proportional - integral block	6-163	Reverse sign	6-46, 97
Permissible Environmental Conditions	2-5	Pword 1	5-5, 6-83, 144	Ride Through	4-30
PI block	6-163	Pword 2	6-83	Rotor resist Nw	6-24
PI bottom lim	6-165	Q		Rotor resistance	5-36, 48, 6-24, 21
PI central v 1	6-165	Qstp delta speed	6-5, 43, 84, 199	Rr adap output	6-86
PI central v 2	6-165	Qstp delta time	6-5, 43, 199	Rr adap output1	6-86
PI central v 3	6-90, 165	Qstp Opt code	6-5, 149, 84	RS485 Serial Interface	4-12
PI central v S0	6-97, 158	Quick Stop	6-5, 43, 77, 97	Rubber Calendar	6-123
PI central v S1	6-97, 158	R		S	
PI central v sel	6-165	Ramp-	6-45, 96	S acc t const	6-45
PI central v3 PID	6-158	Ramp	6-43	S acc t const 0	6-116
PI controls menu	6-164	Ramp +	6-45, 96	S acc t const 1	6-117
PI I gain PID	6-165	Ramp +/- delay	6-45	S acc t const 2	6-117
PI integral freeze	6-97, 158	Ramp in = 0	6-46, 97	S acc t const 3	6-117
PI output PID	6-166	Ramp out = 0	6-46, 97	S dec t const	6-45
PI P gain PID	6-165	Ramp outp	6-86	S dec t const 0	6-116
PI steady delay	6-165	Ramp outp (rpm)	6-12, 46	S dec t const 1	6-117
PI steady thr	6-165	Ramp output (%)	6-12, 46	S dec t const 2	6-117
PI top lim	6-165	Ramp output (d)	6-12, 46	S dec t const 3	6-117
PID acc time	6-162	Ramp ref (%)	6-12, 33	S shape t cons	6-45
PID clamp	6-162	Ramp ref	6-12, 33, 86	Safety Precautions	0-1
PID dec time	6-162	Ramp ref (d)	6-12, 33	Save parameters	5-5, 6-9, 141
PID error	6-162	Ramp ref (rpm)	6-12, 33	Saving parameters, loading default factory setting	6-141
PID feed-back	6-90, 158, 162	Ramp ref 1	6-9, 33, 42, 86, 90	Scale input 1	6-91
PID Function	6-158, 161	Ramp ref 2	6-33, 42, 86, 90	Scale input 2	6-91
PID offs. sel	6-97, 162	Ramp sel 0	6-97, 117	Scale input 3	6-91
PID offset 0	6-90, 158, 162	Ramp sel 1	6-97, 117	Scale input XX	6-91
PID offset 1	6-162	Ramp shape	45	Scale output XX	6-87
PID offset sel	6-158, 97	Ramp shape and control commands	6-44	Select adap type	6-102
PID out scale	6-170	Reactors	4-20	Select enc 1	6-99
PID out. sign PID	6-170	Ready to start	6-67	Select enc 2	6-99
PID output	6-86, 158, 170	Real FF PID	6-167	Select input XX	6-99
PID reference menu	6-162	Ref 0 level	6-50	Select output XX	6-86
PID source	6-158, 159, 160	Refresh enc 1	6-70, 99	Self tune 3	5-39
PID source gain	6-159, 160	Refresh enc 2	6-70, 99	Self tuning	5-37, 6-21, 8, 66
PID source menu	6-159	Reg Parameters	6-61	Self-tune 1	5-37
PID target	6-158, 170	Regulation Inputs/outputs	6-158	Self-tune 2a	5-37
Positioning spd	6-172	Regulation Mode	6-8, 66	Self-tune 2b	5-37
Power Dip Ride Through	4-30	Regulation Section	4-7	Sensorless	5-41, 6-8, 25, 66
Power Section	4-3	Regulator Card	4-7	Ser answer del	6-84
Power Up Checks	5-33			Serial Interface Description	4-12
Pressure control for pumps and extruders	6-186			Service	7-1
Procedure for calculation for initial diameter	6-171, 173			Set delay	6-104

Set error	6-104	Speed ref (d)	6-12, 35	Tach follower function	6-98
Set speed	6-96, 104	Speed ref (rpm)	6-12, 35	Take motor par	5-38, 6-15
Setting Jumpers and Switches	4-8	Speed ref 1 (%)	6-35	Take val part 1	5-38, 6-24
Setting Motor parameters	5-34	Speed ref 1	6-35, 86, 90	Take val part 2a	5-38, 6-24
Ssetting of the base setpoint	6-16	Speed ref 2 (%)	6-35, 86, 90	Take val part 2b	6-24
Setting the Speed zero logic	6-49	Speed ref var	6-196	Take val part 3	6-25
Signal adaptation (Links function)	6-142	Speed reference from encoder input	6-98	Temperature compensation of the rotor resistance	6-140
Sizing internal braking resistors	4-24	Speed reg output	6-48	Terminal Assignment of the Power section	4-6
Slip comp filter	6-29	Speed Regulation	2-11, 6-47	Terminal Assignment of the regulation section	4-9
Slip comp type	6-29	Speed regulator	6-48	Terminals	6-64
Slip compensation	6-28	Speed sel 0	6-97, 113	Test generator	6-139
Sls speed filter	6-26	Speed sel 1	6-97, 113	Test points on Regulator card	4-7
Software version	6-8, 72	Speed sel 2	6-97, 113	The speed during acceleration not linear	8-5
Source (link)	6-143	Speed up	5-52, 6-52	Thermistors	3-7
Spd auto capture	6-29, 101	Speed up base	6-53	Threshold delay	6-104
Spd draw out (%)	6-122	Speed up filter	6-53	Torque	6-12, 86
Spd draw out (d)	6-86, 122	Speed up gain	6-53	Torque const	6-55
Spd reg output	6-86	Speed zero	6-105	Torque Current	6-57, 86
Spd srch time	6-29	Speed zero delay	6-106	Torque current reference value (Tcurrent ref)	6-35
Spd threshold -	6-104	Speed zero level	6-106	Torque reduct	6-40, 97
Spd threshold	6-96	Speed zero logic	6-49	Trip time 50%	6-130
Spd threshold +	6-104	Speed zero thr	6-96, 106	Troubleshooting	8-1
Spd zero logic	6-49	Speed-up function	6-52	Tune value inp 1	6-91
Spd = O P gain	6-50	S-shaped ramp	6-45	Tune value inp 2	6-91
Special Functions	6-139	Standard connection diagram	4-16	Tune value inp 3	6-91
Speed base value	6-9, 66, 187	Standards	2-5	Tune value inp XX	6-91
Speed control	6-103	Start	6-2	Tuning of voltage compensation	6-27
Speed Draw function	6-121	Start / Stop	6-3, 7, 12		
Speed fbk loss	6-82, 96, 8-3	Start part 1	5-38, 6-24	U	
Speed fbk sel	6-69, 97	Start part 2b	5-38, 6-24	Undervoltage - N of attempts	6-78
Speed I	6-62	Start part 3	5-39, 6-24	Undervoltage - Restart time	6-78
Speed I base	6-62	Starting and Stopping the Drive with Keypad	5-8	Undervoltage	6-79, 96, 8-3
Speed I in use	6-62	Stator resistance	5-37, 6-21, 24		
Speed input percent	6-196	Stator resistance Nw	6-24	V	
Speed input var	6-196	Status word	6-196	V/f control	5-41, 6-7, 27, 66
Speed limitation	6-197	Switch S3 Settings	4-8	V/f flux level	6-31, 90
Speed limited	6-38, 96	Switching frequency	2-7, 6-82	V/f shape	6-26
Speed Limits	6-37			V/f spd search	6-29
Speed max amount	6-37, 197	T		Virtual dig inp	6-14
Speed max neg	6-37, 197	T curr (%)	6-13	Vlt boost type	6-28
Speed max pos	6-37, 197	T curr filter	6-12	Voltage available on the drive output	6-16
Speed min amount	6-37, 197	T curr lim type	6-39	Voltage boost	6-28
Speed min neg	6-37, 197	T current lim -	6-40, 9,90	Voltage comp lim	6-24, 63
Speed min pos	6-37, 197	T current lim	6-40, 90	Voltage control	6-59
Speed oscillating	8-6	T current lim+	6-9, 40, 90	Voltage I	6-24, 62
Speed P	6-62	T current ref	6-12, 36, 86, 140	Voltage I base	6-62
Speed P base	6-62	T current ref 1	6-36, 86, 90		
Speed P in use	6-62	T current ref 2	6-36, 86, 90		
Speed ratio	6-90, 121	T lim +/-	6-39		
Speed ref (%)	6-12, 35	T lim mot gen	6-39		
Speed ref	6-34, 48, 86				

Voltage I Nw	6-24
Voltage limits	6-41
Voltage P	6-24, 62
Voltage P base	6-62
Voltage P Nw	6-24
Voltage U	6-86
Voltage V	6-86
Voltage/frequency characteristic	5-35

W

Warning	6-77
Watts Loss	3-4
Weights	3-1, 3
Winder/Unwinder control with dancer	6-180
Wiring Procedure	4-1

X

XE connector for an encoder	3-9, 10
XS connector for the RS 485 serial interface	4-13

Z

Zero pos gain	6-51
Zero torque	6-57, 97



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