Danfoss

Quick Reference Guide

VLT® AQUA Drive FC 200

VLT®

THE REAL DRIVE

eps

electronic power
solutions pty ltd

Electrical Overview

Illustration 2.4 shows a basic electrical connection.
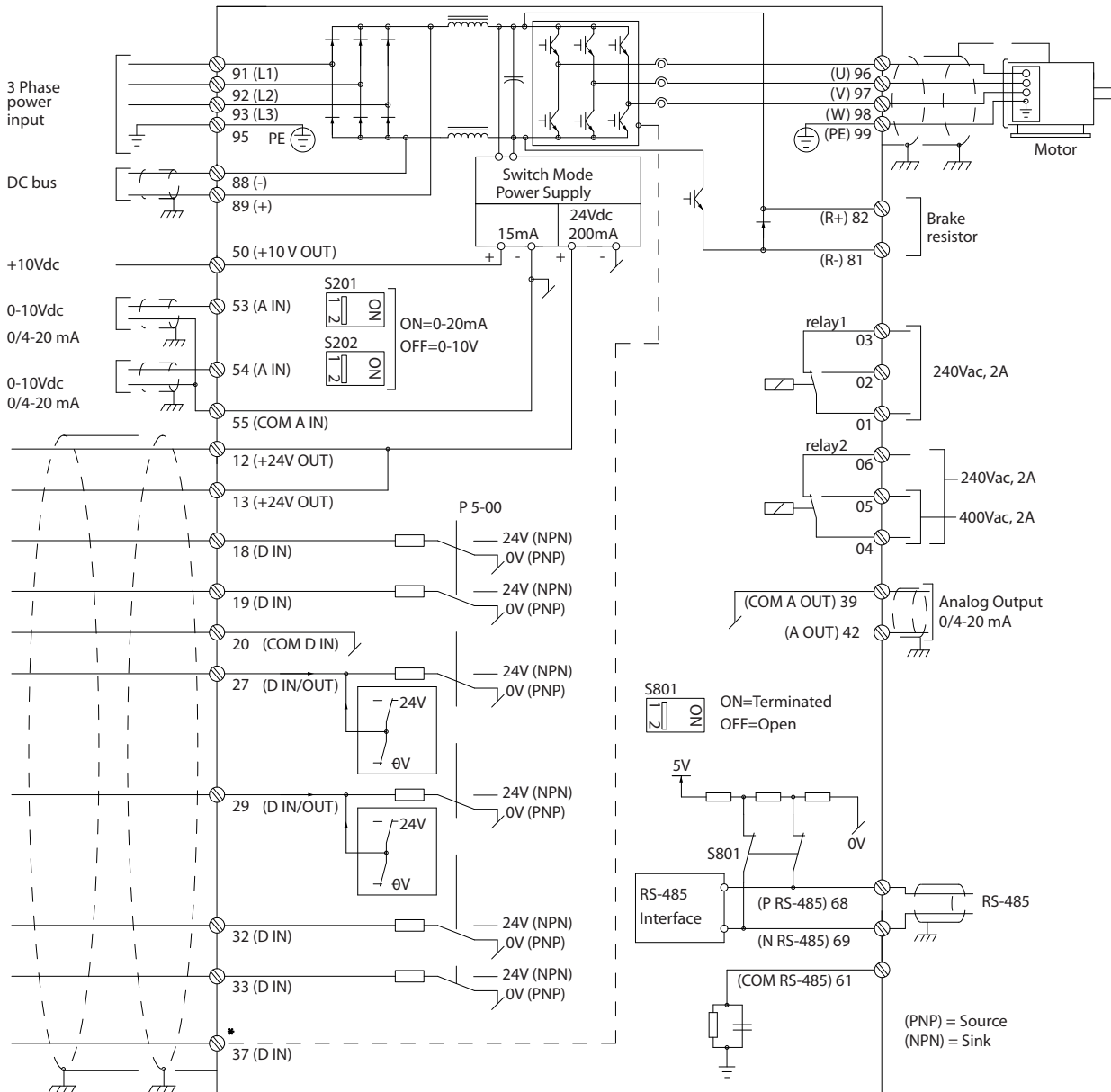
130BA544.12

Illustration 2.4 Basic Wiring Schematic Drawing.

* Terminal 37 is an option

How to Programme

Local Control Panel

The local control panel (LCP) is the combined display and keypad on the front of the unit. The LCP is the user interface to the frequency converter.

The LCP has several user functions.

- Start, stop, and control speed when in local control
- Display operational data, status, warnings and cautions
- Programming frequency converter functions
- Manually reset the frequency converter after a fault when auto-reset is inactive

An optional numeric LCP (NLCP) is also available. The NLCP operates in a manner similar to the LCP. See the *Programming Guide,* for details on use of the NLCP.

LCP Layout

The LCP is divided into four functional groups (see *Illustration 4.1*).
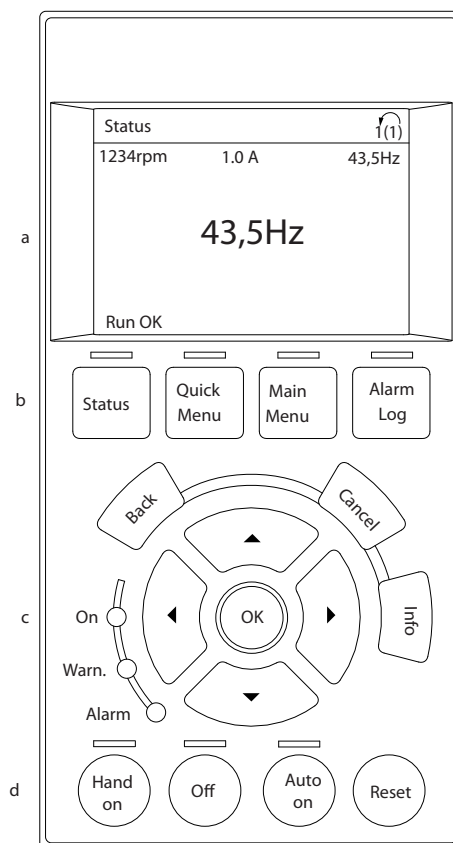
Illustration 4.1 LCP

    a.   Display area.

    b.   Display menu keys for changing the display to show status options, programming, or error message history.

    c.   Navigation keys for programming functions, moving the display cursor, and speed control in local operation. Also included are the status indicator lights.

    d.   Operational mode keys and reset.

Quick Menu Structure

Q2 Quick Setup	0-37 Display Text 1	20-12 Reference/Feedback Unit	Trending Comparison	29-13 Derag Speed [RPM]
0-01 Language	0-38 Display Text 2	3-02 Minimum Reference	**Q7 Water and Pumps**	29-14 Derag Speed [Hz]
0-02 Motor Speed Unit	0-39 Display Text 3	3-03 Maximum Reference	*Q7-1 Pipe Fill*	29-15 Derag Off Delay
1-20 Motor Power [kW]	**Q3-12 Analog Output**	6-20 Terminal 54 Low Voltage	**Q7-10 Horizontal Pipes**	29-22 Derag Power Factor
1-22 Motor Voltage	6-50 Terminal 42 Output	6-21 Terminal 54 High Voltage	29-00 Pipe Fill Enable	29-23 Derag Power Delay
1-23 Motor Frequency	6-51 Terminal 42 Output Min Scale	6-24 Terminal 54 Low Ref./Feedb. Value	29-01 Pipe Fill Speed [RPM]	29-24 Low Speed [RPM]
1-24 Motor Current	6-52 Terminal 42 Output Max Scale	6-25 Terminal 54 High Ref./Feedb. Value	29-02 Pipe Fill Speed [Hz]	29-25 Low Speed [Hz]
1-25 Motor Nominal Speed	**Q3-13 Relays** Option relays if applicable	6-00 Live Zero Timeout Time	29-03 Pipe Fill Time	29-26 Low Speed Power [kW]
3-41 Ramp 1 Ramp Up Time	Relay 1 ⇒ 5-40 Function Relay	6-01 Live Zero Timeout Function	29-04 Pipe Fill Rate	29-27 Low Speed Power [HP]
3-42 Ramp 1 Ramp Down Time	Relay 2⇒ 5-40 Function Relay	**Q3-31 PID Settings**	29-05 Filled Setpoint	29-28 High Speed [RPM]
4-11 Motor Speed Low Limit [RPM]	*Q3-2 Open Loop Settings*	20-81 PID Normal/ Inverse Control	29-05 Filled Setpoint	29-29 High Speed [Hz]
4-13 Motor Speed High Limit [RPM]	**Q3-20 Digital Reference**	20-82 PID Start Speed [RPM]	29-06 No-Flow Disable Timer	29-30 High Speed Power [kW]
1-29 Automatic Motor Adaptation (AMA)	3-02 Minimum Reference	20-21 Setpoint 1	**Q7-11 Vertical Pipes**	29-31 High Speed Power [HP]
Q3 Function Setup	3-03 Maximum Reference	20-93 PID Proportional Gain	29-00 Pipe Fill Enable	29-32 Derag On Ref Bandwidth
Q3-1 General Settings	3-10 Preset Reference	20-94 PID Integral Time	29-04 Pipe Fill Rate	**Q7-3 Dry Run**
Q3-10 Clock Settings	5-13 Terminal 29 Digital Input	**Q5 Changes Made**	29-05 Filled Setpoint	22-21 Low Power Detection
0-70 Date and Time	5-14 Terminal 32 Digital Input	*Q5-1 Last 10 Changes*	29-06 No-Flow Disable Timer	22-20 Low Power Auto Set-up
0-71 Date Format	5-15 Terminal 33 Digital Input	*Q5-2 Since Factory Setting*	**Q7-12 Mixed Systems**	22-27 Dry Pump Delay
0-72 Time Format	**Q3-21 Analog Reference**	*Q5-3 Input Assignments*	29-00 Pipe Fill Enable	22-26 Dry Pump Function
0-74 DST/Summertime	3-02 Minimum Reference	**Q6 Loggings**	29-01 Pipe Fill Speed [RPM]	**Q7-4 End of Curve Detection**
0-76 DST/Summertime Start	3-03 Maximum Reference	Reference [Unit]	29-02 Pipe Fill Speed [Hz]	22-50 End of Curve Function
0-77 DST_Summertime End	6-10 Terminal 53 Low Voltage	Analog Input 53	29-03 Pipe Fill Time	22-51 End of Curve Delay
Q3-11 Display Settings	6-11 Terminal 53 High Voltage	Motor current	29-05 Filled Setpoint	**Q7-5 Sleep Mode**
0-20 Display Line 1.1 Small	6-14 Terminal 53 Low Ref./Feedb. Value	Frequency	29-06 No-Flow Disable Timer	*Q7-50 Low Speed*
0-21 Display Line 1.2 Small	6-15 Terminal 53 High Ref./Feedb. Value	Feedback [Unit]	**Q7-2 Deragging**	22-22 Low Speed Detection
0-22 Display Line 1.3 Small	*Q3-3 Closed Loop Settings*	Energy Log	29-10 Derag Cycles	22-23 No-Flow Function
0-23 Display Line 2 Large	**Q3-30 Feedback Settings**	Trending Cont Bin	29-11 Derag at Start/Stop	22-24 No-Flow Delay
0-24 Display Line 3 Large	1-00 Configuration Mode	Trending Timed Bin	29-12 Deragging Run Time	22-28 No-Flow Low Speed [RPM]

Table 5.2 Quick Menu Structure

			Q7-6 Flow Compensation	22-90 Flow at Rated Speed
22-29 No-Flow Low Speed [Hz]	22-24 No-Flow Delay	22-20 Low Power Auto Set-up	22-80 Flow Compensation	Q7-7 Special Ramps
22-40 Minimum Run Time	22-20 Low Power Auto Set-up	22-22 Low Speed Detection	22-81 Square-linear Curve Approximation	3-84 Initial Ramp Time
22-41 Minimum Sleep Time	22-40 Minimum Run Time	22-28 No-Flow Low Speed [RPM]	22-82 Work Point Calculation	3-88 Final Ramp Time
22-42 Wake-up Speed [RPM]	22-41 Minimum Sleep Time	22-29 No-Flow Low Speed [Hz]	22-83 Speed at No-Flow [RPM]	3-85 Check Valve Ramp Time
22-43 Wake-up Speed [Hz]	22-42 Wake-up Speed [RPM]	22-40 Minimum Run Time	22-84 Speed at No-Flow [Hz]	3-86 Check Valve Ramp End Speed [RPM]
22-44 Wake-up Ref./FB Difference	22-43 Wake-up Speed [Hz]	22-41 Minimum Sleep Time	22-85 Speed at Design Point [RPM]	3-87 Check Valve Ramp End Speed [HZ]
22-45 Setpoint Boost	22-44 Wake-up Ref./FB Difference	22-42 Wake-up Speed [RPM]	22-86 Speed at Design Point [Hz]	
22-46 Maximum Boost Time	22-45 Setpoint Boost	22-43 Wake-up Speed [Hz]	22-87 Pressure at No-Flow Speed	
Q7-51 Low Power	22-46 Maximum Boost Time	22-44 Wake-up Ref./FB Difference	22-88 Pressure at Rated Speed	
22-21 Low Power Detection	Q7-52 Low Speed/Power	22-45 Setpoint Boost	22-89 Flow at Design Point	
22-23 No-Flow Function	22-21 Low Power Detection	22-46 Maximum Boost Time		

Table 5.3

Main Menu Structure

0- Operation / Display**

0-0* Basic Settings
0-01	Language
0-02	Motor Speed Unit
0-03	Regional Settings
0-04	Operating State at Power-up
0-05	Local Mode Unit

0-1* Set-up Operations
0-10	Active Set-up
0-11	Programming Set-up
0-12	This Set-up Linked to
0-13	Readout: Linked Set-ups
0-14	Readout: Prog. Set-ups / Channel

0-2* LCP Display
0-20	Display Line 1.1 Small
0-21	Display Line 1.2 Small
0-22	Display Line 1.3 Small
0-23	Display Line 2 Large
0-24	Display Line 3 Large
0-25	My Personal Menu

0-3* LCP Custom Readout
0-30	Custom Readout Unit
0-31	Custom Readout Min Value
0-32	Custom Readout Max Value
0-37	Display Text 1
0-38	Display Text 2
0-39	Display Text 3

0-4* LCP Keypad
0-40	[Hand on] Key on LCP
0-41	[Off] Key on LCP
0-42	[Auto on] Key on LCP
0-43	[Reset] Key on LCP
0-44	[Off/Reset] Key on LCP
0-45	[Drive Bypass] Key on LCP

0-5* Copy/Save
0-50	LCP Copy
0-51	Set-up Copy

0-6* Password
0-60	Main Menu Password
0-61	Access to Main Menu w/o Password
0-65	Personal Menu Password
0-66	Access to Personal Menu w/o Password
0-67	Bus Password Access

0-7* Clock Settings
0-70	Date and Time
0-71	Date Format
0-72	Time Format
0-74	DST/Summertime
0-76	DST/Summertime Start
0-77	DST/Summertime End
0-79	Clock Fault
0-81	Working Days
0-82	Additional Working Days
0-83	Additional Non-Working Days
0-89	Date and Time Readout

1- Load and Motor**

1-0* General Settings
1-00	Configuration Mode
1-01	Motor Control Principle
1-03	Torque Characteristics
1-06	Clockwise Direction

1-1* Motor Selection
1-10	Motor Construction

1-1* VVC+ PM
1-14	Damping Gain
1-15	Low Speed Filter Time Const.
1-16	High Speed Filter Time Const.
1-17	Voltage filter time const.

1-2* Motor Data
1-20	Motor Power [kW]
1-21	Motor Power [HP]
1-22	Motor Voltage
1-23	Motor Frequency
1-24	Motor Current
1-25	Motor Nominal Speed
1-26	Motor Cont. Rated Torque
1-28	Motor Rotation Check
1-29	Automatic Motor Adaptation (AMA)

1-3* Adv. Motor Data
1-30	Stator Resistance (Rs)
1-31	Rotor Resistance (Rr)
1-33	Stator Leakage Reactance (X1)
1-34	Rotor Leakage Reactance (X2)
1-35	Main Reactance (Xh)
1-36	Iron Loss Resistance (Rfe)
1-37	d-axis Inductance (Ld)
1-39	Motor Poles
1-40	Back EMF at 1000 RPM
1-46	Position Detection Gain

1-5* Load Indep. Setting
1-50	Motor Magnetisation at Zero Speed
1-51	Min Speed Normal Magnetising [RPM]
1-52	Min Speed Normal Magnetising [Hz]
1-55	V/f Characteristic - V
1-56	V/f Characteristic - f
1-58	Flystart Test Pulses Current
1-59	Flystart Test Pulses Frequency

1-6* Load Depen. Setting
1-60	Low Speed Load Compensation
1-61	High Speed Load Compensation
1-62	Slip Compensation
1-63	Slip Compensation Time Constant
1-64	Resonance Dampening
1-65	Resonance Dampening Time Constant
1-66	Min. Current at Low Speed

1-7* Start Adjustments
1-70	PM Start Mode
1-71	Start Delay
1-72	Start Function
1-73	Flying Start
1-74	Start Speed [RPM]
1-75	Start Speed [Hz]
1-76	Start Current

1-8* Stop Adjustments
1-80	Function at Stop
1-81	Min Speed for Function at Stop [RPM]
1-82	Min Speed for Function at Stop [Hz]
1-86	Trip Speed Low [RPM]
1-87	Trip Speed Low [Hz]

1-9* Motor Temperature
1-90	Motor Thermal Protection
1-91	Motor External Fan
1-93	Thermistor Source

2- Brakes**

2-0* DC-Brake
2-00	DC Hold/Preheat Current
2-01	DC Brake Current
2-02	DC Braking Time
2-03	DC Brake Cut In Speed [RPM]
2-04	DC Brake Cut In Speed [Hz]
2-06	Parking Current
2-07	Parking Time

2-1* Brake Energy Funct.
2-10	Brake Function
2-11	Brake Resistor (ohm)
2-12	Brake Power Limit (kW)
2-13	Brake Power Monitoring
2-15	Brake Check
2-16	AC brake Max. Current
2-17	Over-voltage Control

3- Reference / Ramps**

3-0* Reference Limits
3-02	Minimum Reference
3-03	Maximum Reference
3-04	Reference Function

3-1* References
3-10	Preset Reference
3-11	Jog Speed [Hz]
3-13	Reference Site
3-14	Preset Relative Reference
3-15	Reference 1 Source
3-16	Reference 2 Source
3-17	Reference 3 Source
3-19	Jog Speed [RPM]

3-4* Ramp 1
3-41	Ramp 1 Ramp Up Time
3-42	Ramp 1 Ramp Down Time

3-5* Ramp 2
3-51	Ramp 2 Ramp Up Time
3-52	Ramp 2 Ramp Down Time

3-8* Other Ramps
3-80	Jog Ramp Time
3-81	Quick Stop Ramp Time
3-84	Initial Ramp Time
3-85	Check Valve Ramp Time
3-86	Check Valve Ramp End Speed [RPM]
3-87	Check Valve Ramp End Speed [Hz]
3-88	Final Ramp Time

3-9* Digital Pot.Meter
3-90	Step Size
3-91	Ramp Time
3-92	Power Restore
3-93	Maximum Limit
3-94	Minimum Limit
3-95	Ramp Delay

4- Limits / Warnings**

4-1* Motor Limits
4-10	Motor Speed Direction
4-11	Motor Speed Low Limit [RPM]
4-12	Motor Speed Low Limit [Hz]
4-13	Motor Speed High Limit [RPM]
4-14	Motor Speed High Limit [Hz]
4-16	Torque Limit Motor Mode
4-17	Torque Limit Generator Mode
4-18	Current Limit
4-19	Max Output Frequency

4-5* Adj. Warnings
4-50	Warning Current Low
4-51	Warning Current High
4-52	Warning Speed Low
4-53	Warning Speed High
4-54	Warning Reference Low
4-55	Warning Reference High
4-56	Warning Feedback Low
4-57	Warning Feedback High
4-58	Missing Motor Phase Function

4-6* Speed Bypass
4-60	Bypass Speed From [RPM]
4-61	Bypass Speed From [Hz]
4-62	Bypass Speed To [RPM]
4-63	Bypass Speed To [Hz]
4-64	Semi-Auto Bypass Set-up

5- Digital In/Out**

5-0* Digital I/O mode
5-00	Digital I/O Mode
5-01	Terminal 27 Mode
5-02	Terminal 29 Mode

5-1* Digital Inputs
5-10	Terminal 18 Digital Input
5-11	Terminal 19 Digital Input
5-12	Terminal 27 Digital Input
5-13	Terminal 29 Digital Input
5-14	Terminal 32 Digital Input
5-15	Terminal 33 Digital Input
5-16	Terminal X30/2 Digital Input
5-17	Terminal X30/3 Digital Input
5-18	Terminal X30/4 Digital Input
5-19	Terminal 37 Digital Input

5-3* Digital Outputs
5-30	Terminal 27 Digital Output
5-31	Terminal 29 Digital Output
5-32	Term X30/6 Digi Out (MCB 101)
5-33	Term X30/7 Digi Out (MCB 101)

5-4* Relays
5-40	Function Relay
5-41	On Delay, Relay
5-42	Off Delay, Relay

5-5* Pulse Input
5-50	Term. 29 Low Frequency
5-51	Term. 29 High Frequency
5-52	Term. 29 Low Ref./Feedb. Value
5-53	Term. 29 High Ref./Feedb. Value
5-54	Pulse Filter Time Constant #29
5-55	Term. 33 Low Frequency
5-56	Term. 33 High Frequency
5-57	Term. 33 Low Ref./Feedb. Value
5-58	Term. 33 High Ref./Feedb. Value
5-59	Pulse Filter Time Constant #33

5-6* Pulse Output
5-60	Terminal 27 Pulse Output Variable
5-62	Pulse Output Max Freq #27
5-63	Terminal 29 Pulse Output Variable
5-65	Pulse Output Max Freq #29
5-66	Terminal X30/6 Pulse Output Variable
5-68	Pulse Output Max Freq #X30/6

5-8* I/O Options
5-80	AHF Cap Reconnect Delay

5-9* Bus Controlled
5-90	Digital & Relay Bus Control
5-93	Pulse Out #27 Bus Control
5-94	Pulse Out #27 Timeout Preset
5-95	Pulse Out #29 Bus Control
5-96	Pulse Out #29 Timeout Preset
5-97	Pulse Out #X30/6 Bus Control
5-98	Pulse Out #X30/6 Timeout Preset

6- Analog In/Out**

6-0* Analog I/O Mode
6-00	Live Zero Timeout Time
6-01	Live Zero Timeout Function

6-1* Analog Input 53
6-10	Terminal 53 Low Voltage
6-11	Terminal 53 High Voltage
6-12	Terminal 53 Low Current
6-13	Terminal 53 High Current
6-14	Terminal 53 Low Ref./Feedb. Value
6-15	Terminal 53 High Ref./Feedb. Value
6-16	Terminal 53 Filter Time Constant
6-17	Terminal 53 Live Zero

6-2* Analog Input 54
6-20	Terminal 54 Low Voltage
6-21	Terminal 54 High Voltage
6-22	Terminal 54 Low Current
6-23	Terminal 54 High Current
6-24	Terminal 54 Low Ref./Feedb. Value
6-25	Terminal 54 High Ref./Feedb. Value
6-26	Terminal 54 Filter Time Constant
6-27	Terminal 54 Live Zero

6-3* Analog Input X30/11
6-30	Terminal X30/11 Low Voltage
6-31	Terminal X30/11 High Voltage
6-34	Term. X30/11 Low Ref./Feedb. Value
6-35	Term. X30/11 High Ref./Feedb. Value
6-36	Term. X30/11 Filter Time Constant
6-37	Term. X30/11 Live Zero

6-4* Analog Input X30/12
6-40	Terminal X30/12 Low Voltage
6-41	Terminal X30/12 High Voltage
6-44	Term. X30/12 Low Ref./Feedb. Value
6-45	Term. X30/12 High Ref./Feedb. Value
6-46	Term. X30/12 Filter Time Constant

Parameter	Description
6-47	Term. X30/12 Live Zero
6-5*	**Analog Output 42**
6-50	Terminal 42 Output
6-51	Terminal 42 Output Min Scale
6-52	Terminal 42 Output Max Scale
6-53	Terminal 42 Output Bus Control
6-54	Terminal 42 Output Timeout Preset
6-55	Terminal 42 Output Filter
6-6*	**Analog Output X30/8**
6-60	Terminal X30/8 Output
6-61	Terminal X30/8 Min. Scale
6-62	Terminal X30/8 Max. Scale
6-63	Terminal X30/8 Output Bus Control
6-64	Terminal X30/8 Output Timeout Preset
8-*	**Comm. and Options**
8-0*	**General Settings**
8-01	Control Site
8-02	Control Source
8-03	Control Timeout Time
8-04	Control Timeout Function
8-05	End-of-Timeout Function
8-06	Reset Control Timeout
8-07	Diagnosis Trigger
8-08	Readout Filtering
8-1*	**Control Settings**
8-10	Control Profile
8-13	Configurable Status Word STW
8-14	Configurable Control Word CTW
8-3*	**FC Port Settings**
8-30	Protocol
8-31	Address
8-32	Baud Rate
8-33	Parity / Stop Bits
8-35	Minimum Response Delay
8-36	Max Response Delay
8-37	Maximum Inter-Char Delay
8-4*	**FC MC protocol set**
8-40	Telegram Selection
8-42	PCD Write Configuration
8-43	PCD Read Configuration
8-5*	**Digital/Bus**
8-50	Coasting Select
8-52	DC Brake Select
8-53	Start Select
8-54	Reversing Select
8-55	Set-up Select
8-56	Preset Reference Select
8-7*	**BACnet**
8-70	BACnet Device Instance
8-72	MS/TP Max Masters
8-73	MS/TP Max Info Frames
8-74	"I-Am" Service
8-75	Initialisation Password
8-8*	**FC Port Diagnostics**
8-80	Bus Message Count
8-81	Bus Error Count
8-82	Slave Message Rcvd
8-83	Slave Error Count
8-9*	**Bus Jog / Feedback**
8-90	Bus Jog 1 Speed
8-91	Bus Jog 2 Speed
8-94	Bus Feedback 1
8-95	Bus Feedback 2
8-96	Bus Feedback 3
9-*	**PROFIdrive**
9-00	Setpoint
9-07	Actual Value
9-15	PCD Write Configuration
9-16	PCD Read Configuration
9-18	Node Address
9-22	Telegram Selection
9-23	Parameters for Signals
9-27	Parameter Edit
9-28	Process Control
9-31	Safe Address
9-44	Fault Message Counter
9-45	Fault Code
9-47	Fault Number
9-52	Fault Situation Counter
9-53	Profibus Warning Word
9-63	Actual Baud Rate
9-64	Device Identification
9-65	Profile Number
9-67	Control Word 1
9-68	Status Word 1
9-71	Profibus Save Data Values
9-72	ProfibusDriveReset
9-75	DO Identification
9-80	Defined Parameters (1)
9-81	Defined Parameters (2)
9-82	Defined Parameters (3)
9-83	Defined Parameters (4)
9-84	Defined Parameters (5)
9-90	Changed Parameters (1)
9-91	Changed Parameters (2)
9-92	Changed Parameters (3)
9-93	Changed Parameters (4)
9-94	Changed Parameters (5)
9-99	Profibus Revision Counter
10-*	**CAN Fieldbus**
10-0*	**Common Settings**
10-00	CAN Protocol
10-01	Baud Rate Select
10-02	MAC ID
10-05	Readout Transmit Error Counter
10-06	Readout Receive Error Counter
10-07	Readout Bus Off Counter
10-1*	**DeviceNet**
10-10	Process Data Type Selection
10-11	Process Data Config Write
10-12	Process Data Config Read
10-13	Warning Parameter
10-14	Net Reference
10-15	Net Control
10-2*	**COS Filters**
10-20	COS Filter 1
10-21	COS Filter 2
10-22	COS Filter 3
10-23	COS Filter 4
10-3*	**Parameter Access**
10-30	Array Index
10-31	Store Data Values
10-32	Devicenet Revision
10-33	Store Always
10-34	DeviceNet Product Code
10-39	Devicenet F Parameters
12-*	**Ethernet**
12-0*	**IP Settings**
12-00	IP Address Assignment
12-01	IP Address
12-02	Subnet Mask
12-03	Default Gateway
12-04	DHCP Server
12-05	Lease Expires
12-06	Name Servers
12-07	Domain Name
12-08	Host Name
12-09	Physical Address
12-1*	**Ethernet Link Parameters**
12-10	Link Status
12-11	Link Duration
12-12	Auto Negotiation
12-13	Link Speed
12-14	Link Duplex
12-2*	**Process Data**
12-20	Control Instance
12-21	Process Data Config Write
12-22	Process Data Config Read
12-27	Primary Master
12-28	Store Data Values
12-29	Store Always
12-3*	**EtherNet/IP**
12-30	Warning Parameter
12-31	Net Reference
12-32	Net Control
12-33	CIP Revision
12-34	CIP Product Code
12-35	EDS Parameter
12-37	COS Inhibit Timer
12-38	COS Filter
12-4*	**Modbus TCP**
12-40	Status Parameter
12-41	Slave Message Count
12-42	Slave Exception Message Count
12-8*	**Other Ethernet Services**
12-80	FTP Server
12-81	HTTP Server
12-82	SMTP Service
12-89	Transparent Socket Channel Port
12-9*	**Advanced Ethernet Services**
12-90	Cable Diagnostic
12-91	MDI-X
12-92	IGMP Snooping
12-93	Cable Error Length
12-94	Broadcast Storm Protection
12-95	Broadcast Storm Filter
12-96	Port Mirroring
12-98	Interface Counters
12-99	Media Counters
13-*	**Smart Logic**
13-0*	**SLC Settings**
13-00	SL Controller Mode
13-01	Start Event
13-02	Stop Event
13-03	Reset SLC
13-1*	**Comparators**
13-10	Comparator Operand
13-11	Comparator Operator
13-12	Comparator Value
13-2*	**Timers**
13-20	SL Controller Timer
13-4*	**Logic Rules**
13-40	Logic Rule Boolean 1
13-41	Logic Rule Operator 1
13-42	Logic Rule Boolean 2
13-43	Logic Rule Operator 2
13-44	Logic Rule Boolean 3
13-5*	**States**
13-51	SL Controller Event
13-52	SL Controller Action
14-*	**Special Functions**
14-0*	**Inverter Switching**
14-00	Switching Pattern
14-01	Switching Frequency
14-03	Overmodulation
14-04	PWM Random
14-1*	**Mains On/Off**
14-10	Mains Failure
14-11	Mains Voltage at Mains Fault
14-12	Function at Mains Imbalance
14-2*	**Reset Functions**
14-20	Reset Mode
14-21	Automatic Restart Time
14-22	Operation Mode
14-23	Typecode Setting
14-25	Trip Delay at Torque Limit
14-26	Trip Delay at Inverter Fault
14-28	Production Settings
14-29	Service Code
14-3*	**Current Limit Ctrl.**
14-30	Current Lim Ctrl, Proportional Gain
14-31	Current Lim Ctrl, Integration Time
14-32	Current Lim Ctrl, Filter Time
14-4*	**Energy Optimising**
14-40	VT Level
14-41	AEO Minimum Magnetisation
14-42	Minimum AEO Frequency
14-43	Motor Cosphi
14-5*	**Environment**
14-50	RFI Filter
14-51	DC Link Compensation
14-52	Fan Control
14-53	Fan Monitor
14-55	Output Filter
14-59	Actual Number of Inverter Units
14-6*	**Auto Derate**
14-60	Function at Over Temperature
14-61	Function at Inverter Overload
14-62	Inv. Overload Derate Current
14-8*	**Options**
14-80	Option Supplied by External 24VDC
14-9*	**Fault Settings**
14-90	Fault Level
15-*	**Drive Information**
15-0*	**Operating Data**
15-00	Operating hours
15-01	Running Hours
15-02	kWh Counter
15-03	Power Up's
15-04	Over Temp's
15-05	Over Volt's
15-06	Reset kWh Counter
15-07	Reset Running Hours Counter
15-08	Number of Starts
15-1*	**Data Log Settings**
15-10	Logging Source
15-11	Logging Interval
15-12	Trigger Event
15-13	Logging Mode
15-14	Samples Before Trigger
15-2*	**Historic Log**
15-20	Historic Log: Event
15-21	Historic Log: Value
15-22	Historic Log: Time
15-23	Historic log: Date and Time
15-3*	**Alarm Log**
15-30	Alarm Log: Error Code
15-31	Alarm Log: Value
15-32	Alarm Log: Time
15-33	Alarm Log: Date and Time
15-34	Alarm Log: Setpoint
15-35	Alarm Log: Feedback
15-36	Alarm Log: Current Demand
15-37	Alarm Log: Process Ctrl Unit
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15-40	FC Type
15-41	Power Section
15-42	Voltage
15-43	Software Version
15-44	Ordered Typecode String
15-45	Actual Typecode String
15-46	Frequency Converter Ordering No
15-47	Power Card Ordering No
15-48	LCP Id No
15-49	SW ID Control Card
15-50	SW ID Power Card
15-51	Frequency Converter Serial Number
15-53	Power Card Serial Number
15-59	CSIV Filename
15-6*	**Option Ident**
15-60	Option Mounted
15-61	Option SW Version
15-62	Option Ordering No
15-63	Option Serial No
15-70	Option in Slot A

15-71 Slot A Option SW Version
15-72 Option in Slot B
15-73 Slot B Option SW Version
15-74 Option in Slot C0/E0
15-75 Slot C0/E0 Option SW Version
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16-11 Power [hp]
16-12 Motor Voltage
16-13 Frequency
16-14 Motor current
16-15 Frequency [%]
16-16 Torque [Nm]
16-17 Speed [RPM]
16-18 Motor Thermal
16-20 Motor Angle
16-22 Torque [%]
16-3* Drive Status
16-30 DC Link Voltage
16-32 Brake Energy /s
16-33 Brake Energy /2 min
16-34 Heatsink Temp.
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16-36 Inv. Nom. Current
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16-38 SL Controller State
16-39 Control Card Temp.
16-40 Logging Buffer Full
16-49 Current Fault Source
16-5* Ref. & Feedb.
16-50 External Reference
16-52 Feedback[Unit]
16-53 Digi Pot Reference
16-54 Feedback 1 [Unit]
16-55 Feedback 2 [Unit]
16-56 Feedback 3 [Unit]
16-58 PID Output [%]
16-59 Adjusted Setpoint
16-6* Inputs & Outputs
16-60 Digital Input
16-61 Terminal 53 Switch Setting
16-62 Analog Input 53
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16-64 Analog Input 54

16-65 Analog Output 42 [mA]
16-66 Digital Output [bin]
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16-68 Pulse Input #33 [Hz]
16-69 Pulse Output #27 [Hz]
16-70 Pulse Output #29 [Hz]
16-71 Relay Output [bin]
16-72 Counter A
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16-75 Analog In X30/11
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16-8* Fieldbus & FC Port
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16-84 Comm. Option STW
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16-86 FC Port REF 1
16-9* Diagnosis Readouts
16-90 Alarm Word
16-91 Alarm Word 2
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16-93 Warning Word 2
16-94 Ext. Status Word
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16-96 Maintenance Word
18-** Info & Readouts
18-0* Maintenance Log
18-00 Maintenance Log: Item
18-01 Maintenance Log: Action
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18-3* Analog Readouts
18-30 Analog Input X42/1
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18-33 Analog Out X42/7 [V]
18-34 Analog Out X42/9 [V]
18-35 Analog Out X42/11 [V]
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20-0* Feedback
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20-2* Feedback/Setpoint
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20-21 Setpoint 1
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20-23 Setpoint 3
20-7* PID Autotuning
20-70 Closed Loop Type
20-71 PID Performance
20-72 PID Output Change
20-73 Minimum Feedback Level
20-74 Maximum Feedback Level
20-79 PID Autotuning
20-8* PID Basic Settings
20-81 PID Normal/ Inverse Control
20-82 PID Start Speed [RPM]
20-83 PID Start Speed [Hz]
20-84 On Reference Bandwidth
20-9* PID Controller
20-91 PID Anti Windup
20-93 PID Proportional Gain
20-94 PID Integral Time
20-95 PID Differentiation Time
20-96 PID Diff. Gain Limit
21-** Ext. Closed Loop
21-0* Ext. CL Autotuning
21-00 Closed Loop Type
21-01 PID Performance
21-02 PID Output Change
21-03 Minimum Feedback Level
21-04 Maximum Feedback Level
21-09 PID Auto Tuning
21-1* Ext. CL 1 Ref./Fb.
21-10 Ext. 1 Ref./Feedback Unit
21-11 Ext. 1 Minimum Reference
21-12 Ext. 1 Maximum Reference
21-13 Ext. 1 Reference Source
21-14 Ext. 1 Feedback Source
21-15 Ext. 1 Setpoint
21-17 Ext. 1 Reference [Unit]
21-18 Ext. 1 Feedback [Unit]
21-19 Ext. 1 Output [%]
21-2* Ext. CL 1 PID
21-20 Ext. 1 Normal/Inverse Control
21-21 Ext. 1 Proportional Gain
21-22 Ext. 1 Integral Time
21-23 Ext. 1 Differentation Time
21-24 Ext. 1 Dif. Gain Limit
21-3* Ext. CL 2 Ref./Fb.
21-30 Ext. 2 Ref./Feedback Unit
21-31 Ext. 2 Minimum Reference
21-32 Ext. 2 Maximum Reference
21-33 Ext. 2 Reference Source
21-34 Ext. 2 Feedback Source
21-35 Ext. 2 Setpoint
21-37 Ext. 2 Reference [Unit]
21-38 Ext. 2 Feedback [Unit]
21-39 Ext. 2 Output [%]
21-4* Ext. CL 2 PID
21-40 Ext. 2 Normal/Inverse Control
21-41 Ext. 2 Proportional Gain
21-42 Ext. 2 Integral Time

21-43 Ext. 2 Differentation Time
21-44 Ext. 2 Dif. Gain Limit
21-5* Ext. CL 3 Ref./Fb.
21-50 Ext. 3 Ref./Feedback Unit
21-51 Ext. 3 Minimum Reference
21-52 Ext. 3 Maximum Reference
21-53 Ext. 3 Reference Source
21-54 Ext. 3 Feedback Source
21-55 Ext. 3 Setpoint
21-57 Ext. 3 Reference [Unit]
21-58 Ext. 3 Feedback [Unit]
21-59 Ext. 3 Output [%]
21-6* Ext. CL 3 PID
21-60 Ext. 3 Normal/Inverse Control
21-61 Ext. 3 Proportional Gain
21-62 Ext. 3 Integral Time
21-63 Ext. 3 Differentation Time
21-64 Ext. 3 Dif. Gain Limit
22-** Appl. Functions
22-0* Miscellaneous
22-00 External Interlock Delay
22-2* No-Flow Detection
22-20 Low Power Auto Set-up
22-21 Low Power Detection
22-22 Low Speed Detection
22-23 No-Flow Function
22-24 No-Flow Delay
22-26 Dry Pump Function
22-27 Dry Pump Delay
22-28 No-Flow Low Speed [RPM]
22-29 No-Flow Low Speed [Hz]
22-3* No-Flow Power Tuning
22-30 No-Flow Power
22-31 Power Correction Factor
22-32 Low Speed [RPM]
22-33 Low Speed [Hz]
22-34 Low Speed Power [kW]
22-35 Low Speed Power [HP]
22-36 High Speed [RPM]
22-37 High Speed [Hz]
22-38 High Speed Power [kW]
22-39 High Speed Power [HP]
22-4* Sleep Mode
22-40 Minimum Run Time
22-41 Minimum Sleep Time
22-42 Wake-up Speed [RPM]
22-43 Wake-up Speed [Hz]
22-44 Wake-up Ref./FB Difference
22-45 Setpoint Boost
22-46 Maximum Boost Time
22-5* End of Curve
22-50 End of Curve Function
22-51 End of Curve Delay
22-6* Broken Belt Detection
22-60 Broken Belt Function
22-61 Broken Belt Torque
22-62 Broken Belt Delay
22-7* Short Cycle Protection
22-75 Short Cycle Protection

22-76 Interval between Starts
22-77 Minimum Run Time
22-78 Minimum Run Time Override
22-79 Minimum Run Time Override Value
22-8* Flow Compensation
22-80 Flow Compensation
22-81 Square-linear Curve Approximation
22-82 Work Point Calculation
22-83 Speed at No-Flow [RPM]
22-84 Speed at No-Flow [Hz]
22-85 Speed at Design Point [RPM]
22-86 Speed at Design Point [Hz]
22-87 Pressure at No-Flow Speed
22-88 Pressure at Rated Speed
22-89 Flow at Design Point
22-90 Flow at Rated Speed
23-** Time-based Functions
23-0* Timed Actions
23-00 ON Time
23-01 ON Action
23-02 OFF Time
23-03 OFF Action
23-04 Occurrence
23-1* Maintenance
23-10 Maintenance Item
23-11 Maintenance Action
23-12 Maintenance Time Base
23-13 Maintenance Time Interval
23-14 Maintenance Date and Time
23-11 Maintenance Reset
23-15 Reset Maintenance Word
23-16 Maintenance Text
23-5* Energy Log
23-50 Energy Log Resolution
23-51 Period Start
23-53 Energy Log
23-54 Reset Energy Log
23-6* Trending
23-60 Trend Variable
23-61 Continuous Bin Data
23-62 Timed Bin Data
23-63 Timed Period Start
23-64 Timed Period Stop
23-65 Minimum Bin Value
23-66 Reset Continuous Bin Data
23-67 Reset Timed Bin Data
23-8* Payback Counter
23-80 Power Reference Factor
23-81 Energy Cost
23-82 Investment
23-83 Energy Savings
23-84 Cost Savings
24-** Appl. Functions 2
24-1* Drive Bypass
24-10 Drive Bypass Function
24-11 Drive Bypass Delay Time
25-** Cascade Controller
25-0* System Settings
25-00 Cascade Controller

25-02 Motor Start
25-04 Pump Cycling
25-05 Fixed Lead Pump
25-06 Number of Pumps
25-2* **Bandwidth Settings**
25-20 Staging Bandwidth
25-21 Override Bandwidth
25-22 Fixed Speed Bandwidth
25-23 SBW Staging Delay
25-24 SBW Destaging Delay
25-25 OBW Time
25-26 Destage At No-Flow
25-27 Stage Function
25-28 Stage Function Time
25-29 Destage Function
25-30 Destage Function Time
25-4* **Staging Settings**
25-40 Ramp Down Delay
25-41 Ramp Up Delay
25-42 Staging Threshold
25-43 Destaging Threshold
25-44 Staging Speed [RPM]
25-45 Staging Speed [Hz]
25-46 Destaging Speed [RPM]
25-47 Destaging Speed [Hz]
25-5* **Alternation Settings**
25-50 Lead Pump Alternation
25-51 Alternation Event
25-52 Alternation Time Interval
25-53 Alternation Timer Value
25-54 Alternation Predefined Time
25-55 Alternate if Load < 50%
25-56 Staging Mode at Alternation
25-58 Run Next Pump Delay
25-59 Run on Mains Delay
25-8* **Status**
25-80 Cascade Status
25-81 Pump Status
25-82 Lead Pump
25-83 Relay Status
25-84 Pump ON Time
25-85 Relay ON Time
25-86 Reset Relay Counters
25-9* **Service**
25-90 Pump Interlock
25-91 Manual Alternation
26-** **Analog I/O Option**
26-0* **Analog I/O Mode**
26-00 Terminal X42/1 Mode
26-01 Terminal X42/3 Mode
26-02 Terminal X42/5 Mode
26-1* **Analog Input X42/1**
26-10 Terminal X42/1 Low Voltage
26-11 Terminal X42/1 High Voltage
26-14 Term. X42/1 Low Ref./Feedb. Value
26-15 Term. X42/1 High Ref./Feedb. Value
26-16 Term. X42/1 Filter Time Constant
26-17 Term. X42/1 Live Zero
26-2* **Analog Input X42/3**

26-20 Terminal X42/3 Low Voltage
26-21 Terminal X42/3 High Voltage
26-24 Term. X42/3 Low Ref./Feedb. Value
26-25 Term. X42/3 High Ref./Feedb. Value
26-26 Term. X42/3 Filter Time Constant
26-27 Term. X42/3 Live Zero
26-3* **Analog Input X42/5**
26-30 Terminal X42/5 Low Voltage
26-31 Terminal X42/5 High Voltage
26-34 Term. X42/5 Low Ref./Feedb. Value
26-35 Term. X42/5 High Ref./Feedb. Value
26-36 Term. X42/5 Filter Time Constant
26-37 Term. X42/5 Live Zero
26-4* **Analog Out X42/7**
26-40 Terminal X42/7 Output
26-41 Terminal X42/7 Min. Scale
26-42 Terminal X42/7 Max. Scale
26-43 Terminal X42/7 Bus Control
26-44 Terminal X42/7 Timeout Preset
26-5* **Analog Out X42/9**
26-50 Terminal X42/9 Output
26-51 Terminal X42/9 Min. Scale
26-52 Terminal X42/9 Max. Scale
26-53 Terminal X42/9 Bus Control
26-54 Terminal X42/9 Timeout Preset
26-6* **Analog Out X42/11**
26-60 Terminal X42/11 Output
26-61 Terminal X42/11 Min. Scale
26-62 Terminal X42/11 Max. Scale
26-63 Terminal X42/11 Bus Control
26-64 Terminal X42/11 Timeout Preset
27-** **Cascade CTL Option**
27-0* **Control & Status**
27-01 Pump Status
27-02 Manual Pump Control
27-03 Current Runtime Hours
27-04 Pump Total Lifetime Hours
27-1* **Configuration**
27-10 Cascade Controller
27-11 Number Of Drives
27-12 Number Of Pumps
27-14 Pump Capacity
27-16 Runtime Balancing
27-17 Motor Starters
27-18 Spin Time for Unused Pumps
27-19 Reset Current Runtime Hours
27-2* **Bandwidth Settings**
27-20 Normal Operating Range
27-21 Override Limit
27-22 Fixed Speed Only Operating Range
27-23 Staging Delay
27-24 Destaging Delay
27-25 Override Hold Time
27-27 Min Speed Destage Delay
27-3* **Staging Speed**
27-30 Auto Tune Staging Speeds
27-31 Stage On Speed [RPM]
27-32 Stage On Speed [Hz]
27-33 Stage Off Speed [RPM]

27-34 Stage Off Speed [Hz]
27-4* **Staging Settings**
27-40 Auto Tune Staging Settings
27-41 Ramp Down Delay
27-42 Ramp Up Delay
27-43 Staging Threshold
27-44 Destaging Threshold
27-45 Staging Speed [RPM]
27-46 Staging Speed [Hz]
27-47 Destaging Speed [RPM]
27-48 Destaging Speed [Hz]
27-5* **Alternate Settings**
27-50 Automatic Alternation
27-51 Alternation Event
27-52 Alternation Time Interval
27-53 Alternation Timer Value
27-54 Alternation At Time of Day
27-55 Alternation Predefined Time
27-56 Alternate Capacity is <
27-58 Run Next Pump Delay
27-6* **Digital Inputs**
27-60 Terminal X66/1 Digital Input
27-61 Terminal X66/3 Digital Input
27-62 Terminal X66/5 Digital Input
27-63 Terminal X66/7 Digital Input
27-64 Terminal X66/9 Digital Input
27-65 Terminal X66/11 Digital Input
27-66 Terminal X66/13 Digital Input
27-7* **Connections**
27-70 Relay
27-9* **Readouts**
27-91 Cascade Reference
27-92 % Of Total Capacity
27-93 Cascade Option Status
27-94 Cascade System Status
27-95 Advanced Cascade Relay Output [bin]
27-96 Extended Cascade Relay Output [bin]
29-** **Water Application Functions**
29-0* **Pipe Fill**
29-00 Pipe Fill Enable
29-01 Pipe Fill Speed [RPM]
29-02 Pipe Fill Speed [Hz]
29-03 Pipe Fill Time
29-04 Pipe Fill Rate
29-05 Filled Setpoint
29-06 No-Flow Disable Timer
29-1* **Deragging Function**
29-10 Derag Cycles
29-11 Derag at Start/Stop
29-12 Deragging Run Time
29-13 Derag Speed [RPM]
29-14 Derag Speed [Hz]
29-15 Derag Off Delay
29-2* **Derag Power Tuning**
29-20 Derag Power[kW]
29-21 Derag Power[HP]
29-22 Derag Power Factor
29-23 Derag Power Delay
29-24 Low Speed [RPM]

29-25 Low Speed [Hz]
29-26 Low Speed Power [kW]
29-27 Low Speed Power [HP]
29-28 High Speed [RPM]
29-29 High Speed [Hz]
29-30 High Speed Power [kW]
29-31 High Speed Power [HP]
29-32 Derag On Ref Bandwidth
29-33 Power Derag Limit
29-34 Consecutive Derag Interval
30-** **Special Features**
30-8* **Compatibility (I)**
30-81 Brake Resistor (ohm)
31-** **Bypass Option**
31-00 Bypass Mode
31-01 Bypass Start Time Delay
31-02 Bypass Trip Time Delay
31-03 Test Mode Activation
31-10 Bypass Status Word
31-11 Bypass Running Hours
31-19 Remote Bypass Activation
35-** **Sensor Input Option**
35-0* **Temp. Input Mode**
35-00 Term. X48/4 Temperature Unit
35-01 Term. X48/4 Input Type
35-02 Term. X48/7 Temperature Unit
35-03 Term. X48/7 Input Type
35-04 Term. X48/10 Temperature Unit
35-05 Term. X48/10 Input Type
35-06 Temperature Sensor Alarm Function
35-1* **Temp. Input X48/4**
35-14 Term. X48/4 Filter Time Constant
35-15 Term. X48/4 Temp. Monitor
35-16 Term. X48/4 Low Temp. Limit
35-17 Term. X48/4 High Temp. Limit
35-2* **Temp. Input X48/7**
35-24 Term. X48/7 Filter Time Constant
35-25 Term. X48/7 Temp. Monitor
35-26 Term. X48/7 Low Temp. Limit
35-27 Term. X48/7 High Temp. Limit
35-3* **Temp. Input X48/10**
35-34 Term. X48/10 Filter Time Constant
35-35 Term. X48/10 Temp. Monitor
35-36 Term. X48/10 Low Temp. Limit
35-37 Term. X48/10 High Temp. Limit
35-4* **Analog Input X48/2**
35-42 Term. X48/2 Low Current
35-43 Term. X48/2 High Current
35-44 Term. X48/2 Low Ref./Feedb. Value
35-45 Term. X48/2 High Ref./Feedb. Value
35-46 Term. X48/2 Filter Time Constant
35-47 Term. X48/2 Live Zero

Motor Thermal Protection

This is the way Danfoss is protecting the motor from being overheated. It is an electronic feature that simulates a bimetal relay based on internal measurements. The characteristic is shown in the following figure:
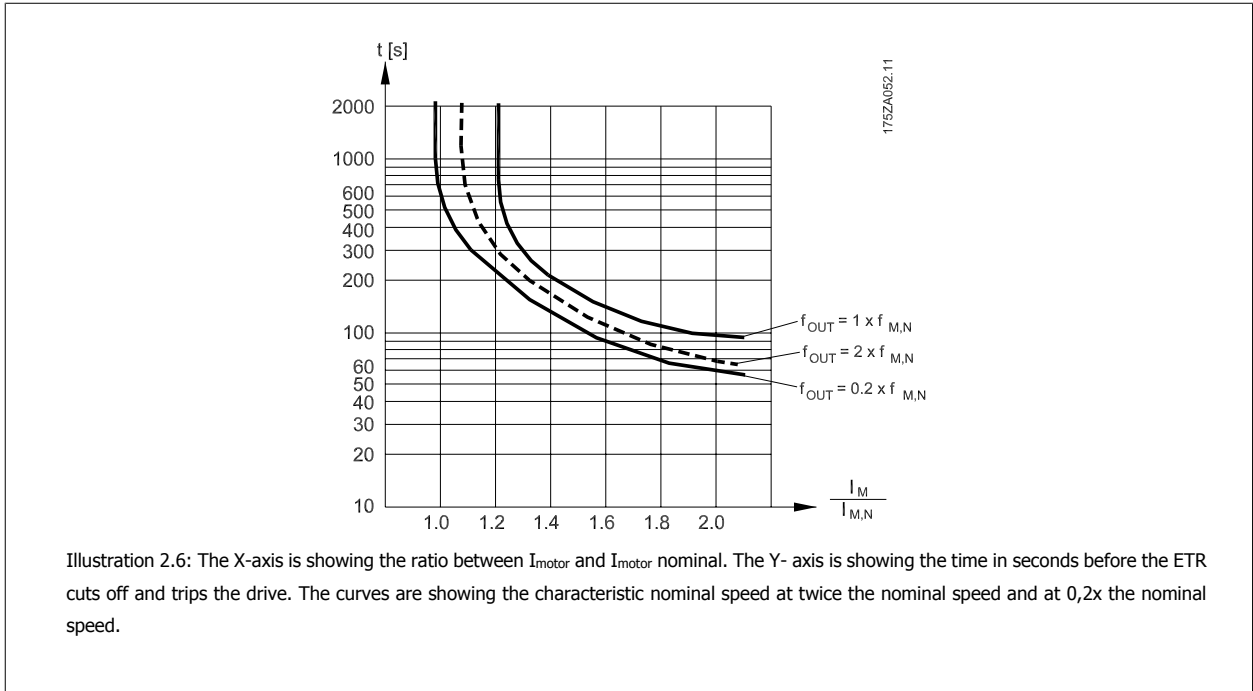

Illustration 2.6: The X-axis is showing the ratio between I_{motor} and I_{motor} nominal. The Y- axis is showing the time in seconds before the ETR cuts off and trips the drive. The curves are showing the characteristic nominal speed at twice the nominal speed and at 0,2x the nominal speed.

It is clear that at lower speed the ETR cuts of at lower heat due to less cooling of the motor. In that way the motor are protected from being over heated even at low speed. The ETR feature is calculating the motor temperature based on actual current and speed. The calculated temperature is visible as a read out parameter in par. 16-18 *Motor Thermal* in the frequency converter.

The thermistor cut-out value is > 3 kΩ.

Integrate a thermistor (PTC sensor) in the motor for winding protection.

Motor protection can be implemented using a range of techniques: PTC sensor in motor windings; mechanical thermal switch (Klixon type); or Electronic Thermal Relay (ETR).
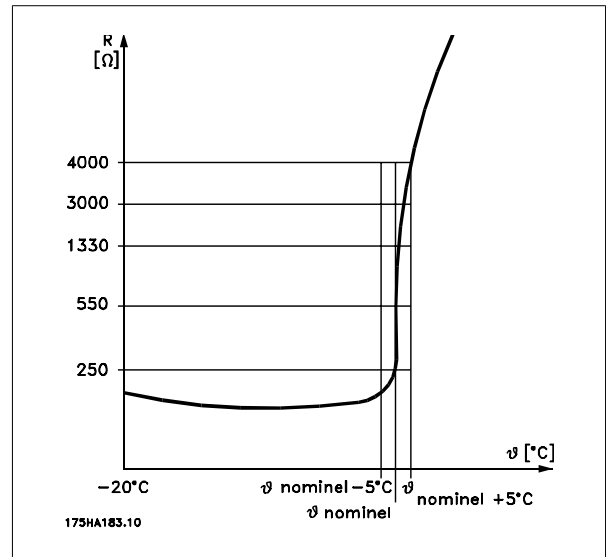
Using a digital input and 24 V as power supply:
Example: The frequency converter trips when the motor temperature is too high.
Parameter set-up:
Set par. 1-90 *Motor Thermal Protection* to *Thermistor Trip* [2]
Set par. 1-93 *Thermistor Source* to *Digital Input 33* [6]
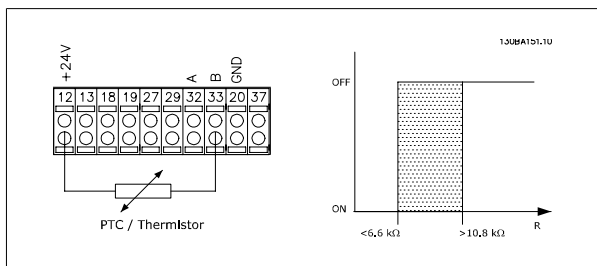
Using a digital input and 10 V as power supply:

Example: The frequency converter trips when the motor temperature is too high.

Parameter set-up:

Set par. 1-90 *Motor Thermal Protection* to *Thermistor Trip* [2]

Set par. 1-93 *Thermistor Source* to *Digital Input 33* [6]
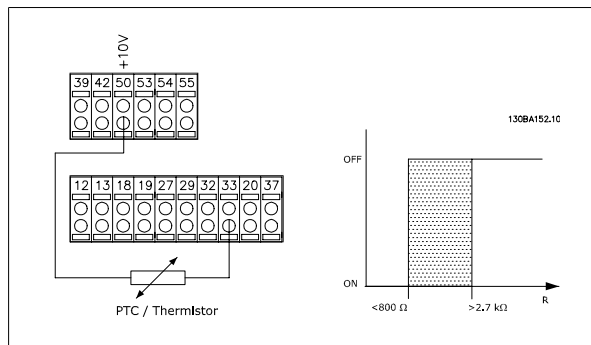
Using an analog input and 10 V as power supply:

Example: The frequency converter trips when the motor temperature is too high.

Parameter set-up:

Set par. 1-90 *Motor Thermal Protection* to *Thermistor Trip* [2]

Set par. 1-93 *Thermistor Source* to *Analog Input 54* [2]

Do not select a reference source.
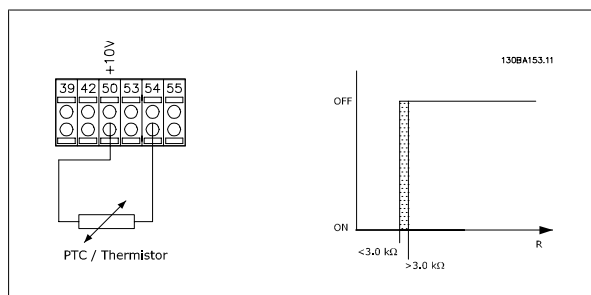
Input	Supply Voltage	Threshold
Digital/analog	Volt	Cut-out Values
Digital	24 V	< 6.6 kΩ - > 10.8 kΩ
Digital	10 V	< 800Ω - > 2.7 kΩ
Analog	10 V	< 3.0 kΩ - > 3.0 kΩ

NB!

Check that the chosen supply voltage follows the specification of the used thermistor element.

Summary

With the Torque limit feature the motor is protected for being overloaded independent of the speed. With the ETR the motor is protected for being over heated and there is no need for any further motor protection. That means when the motor is heated up the ETR timer controls for how long time the motor can be running at the high temperature before it is stopped in order to prevent over heating. If the motor is overloaded without reaching the temperature where the ETR shuts of the motor, the torque limit is protecting the motor and application for being overloaded.

NB!

ETR is activated in par.   and is controlled in par. 4-16 *Torque Limit Motor Mode*. The time before the torque limit warning trips the frequency converter is set in par. 14-25 *Trip Delay at Torque Limit*.

Troubleshooting

Warnings/Alarm Messages

A warning or an alarm is signalled by the relevant LED on the front of the frequency converter and indicated by a code on the display.

A warning remains active until its cause is no longer present. Under certain circumstances operation of the motor may still be continued. Warning messages may be critical, but are not necessarily so.

In the event of an alarm, the frequency converter will have tripped. Alarms must be reset to restart operation once their cause has been rectified.

This may be done in three ways
- By pressing [Reset].
- Via a digital input with the "Reset" function.
- Via serial communication/optional fieldbus.

NOTE
After a manual reset pressing [Reset], [Auto On] must be pressed to restart the motor.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip-locked (see also *Table 5.1*).

Alarms that are trip-locked offer additional protection, meaning that the mains supply must be switched off before the alarm can be reset. After being switched back on, the frequency converter is no longer blocked and may be reset as described above once the cause has been rectified.

Alarms that are not trip-locked can also be reset using the automatic reset function in *14-20 Reset Mode* (Warning: automatic wake-up is possible!)

If a warning and alarm is marked against a code in *Table 5.1*, this means that either a warning occurs before an alarm, or else that it is possible to specify whether it is a warning or an alarm that is to be displayed for a given fault.

This is possible, for instance, in *1-90 Motor Thermal Protection*. After an alarm or trip, the motor carries on coasting, and the alarm and warning flash. Once the problem has been rectified, only the alarm continues flashing until the frequency converter is reset.

NOTE
No missing motor phase detection (no 30-32) and no stall detection is active when *1-10 Motor Construction* is set to [1] *PM non salient SPM*.

No.	Description	Warning	Alarm/Trip	Alarm/Trip Lock	Parameter Reference
1	10 Volts low	X			
2	Live zero error	(X)	(X)		6-01 Live Zero Timeout Function
3	No motor	(X)			1-80 Function at Stop
4	Mains phase loss	(X)	(X)	(X)	14-12 Function at Mains Imbalance
5	DC link voltage high	X			
6	DC link voltage low	X			
7	DC over-voltage	X	X		
8	DC under voltage	X	X		
9	Inverter overloaded	X	X		
10	Motor ETR over temperature	(X)	(X)		1-90 Motor Thermal Protection
11	Motor thermistor over temperature	(X)	(X)		1-90 Motor Thermal Protection
12	Torque limit	X	X		
13	Over Current	X	X	X	

No.	Description	Warning	Alarm/Trip	Alarm/Trip Lock	Parameter Reference
14	Earth Fault	X	X	X	
15	Hardware mismatch		X	X	
16	Short Circuit		X	X	
17	Control word time-out	(X)	(X)		8-04 Control Timeout Function
20	Temp. Input Error				
21	Param Error				
22	Hoist Mech. Brake	(X)	(X)		Parameter group 2-2*
23	Internal Fans	X			
24	External Fans	X			
25	Brake resistor short-circuited	X			
26	Brake resistor power limit	(X)	(X)		2-13 Brake Power Monitoring
27	Brake chopper short-circuited	X	X		
28	Brake check	(X)	(X)		2-15 Brake Check
29	Heatsink temp	X	X	X	
30	Motor phase U missing	(X)	(X)	(X)	4-58 Missing Motor Phase Function
31	Motor phase V missing	(X)	(X)	(X)	4-58 Missing Motor Phase Function
32	Motor phase W missing	(X)	(X)	(X)	4-58 Missing Motor Phase Function
33	Inrush Fault		X	X	
34	Fieldbus communication fault	X	X		
35	Option Fault				
36	Mains failure	X	X		
37	Phase imbalance		X		
38	Internal Fault		X	X	
39	Heatsink sensor		X	X	
40	Overload of Digital Output Terminal 27	(X)			5-00 Digital I/O Mode, 5-01 Terminal 27 Mode
41	Overload of Digital Output Terminal 29	(X)			5-00 Digital I/O Mode, 5-02 Terminal 29 Mode
42	Ovrld X30/6-7	(X)			
43	Ext. Supply (option)				
45	Earth Fault 2	X	X	X	
46	Pwr. card supply		X	X	
47	24 V supply low	X	X	X	
48	1.8 V supply low		X	X	
49	Speed limit	X			
50	AMA calibration failed		X		
51	AMA check U_{nom} and I_{nom}		X		
52	AMA low I_{nom}		X		
53	AMA motor too big		X		
54	AMA motor too small		X		
55	AMA parameter out of range		X		
56	AMA interrupted by user		X		
57	AMA time-out		X		
58	AMA internal fault	X	X		
59	Current limit	X			
60	External Interlock	X	X		

No.	Description	Warning	Alarm/Trip	Alarm/Trip Lock	Parameter Reference
61	Feedback Error	(X)	(X)		4-30 Motor Feedback Loss Function
62	Output Frequency at Maximum Limit	X			
63	Mechanical Brake Low		(X)		2-20 Release Brake Current
64	Voltage Limit	X			
65	Control Board Over-temperature	X	X	X	
66	Heat sink Temperature Low	X			
67	Option Configuration has Changed		X		
68	Safe Stop	(X)	(X)[1]		5-19 Terminal 37 Digital Input
69	Pwr. Card Temp		X	X	
70	Illegal FC configuration			X	
71	PTC 1 Safe Stop				
72	Dangerous failure				
73	Safe Stop Auto Restart	(X)	(X)		5-19 Terminal 37 Digital Input
74	PTC Thermistor			X	
75	Illegal Profile Sel.		X		
76	Power Unit Setup	X			
77	Reduced power mode	X			14-59 Actual Number of Inverter Units
78	Tracking Error	(X)	(X)		4-34 Tracking Error Function
79	Illegal PS config		X	X	
80	Drive Initialized to Default Value		X		
81	CSIV corrupt		X		
82	CSIV parameter error		X		
83	Illegal Option Combination			X	
84	No Safety Option		X		
88	Option Detection			X	
89	Mechanical Brake Sliding	X			
90	Feedback Monitor	(X)	(X)		17-61 Feedback Signal Monitoring
91	Analog input 54 wrong settings			X	S202
163	ATEX ETR cur.lim.warning	X			
164	ATEX ETR cur.lim.alarm		X		
165	ATEX ETR freq.lim.warning	X			
166	ATEX ETR freq.lim.alarm		X		
250	New spare parts			X	
251	New Type Code		X	X	

Table 5.1 Alarm/Warning Code List

(X) Dependent on parameter

1) Can not be Auto reset via 14-20 Reset Mode

A trip is the action when an alarm has appeared. The trip will coast the motor and can be reset by pressing [Reset] or make a reset by a digital input (parameter group 5-1* [1]). The origin event that caused an alarm cannot damage the frequency converter or cause dangerous conditions. A trip lock is an action when an alarm occurs, which may damage the frequency converter or connected parts. A Trip Lock situation can only be reset by a power cycling.

LED indication	
Warning	yellow
Alarm	flashing red
Trip locked	yellow and red

Table 5.2