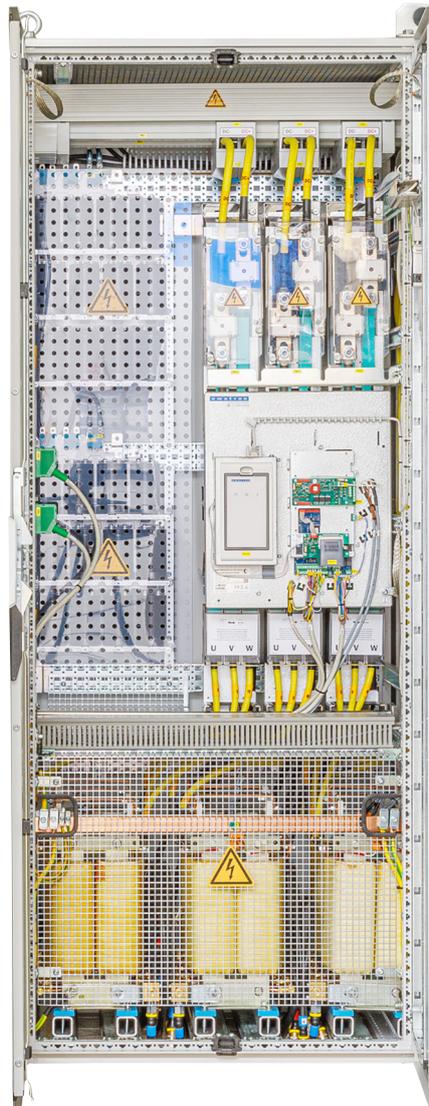




Emotron DCU DC/DC converter



Instruction manual

English

Valid from software version 95.04

emotron

DEDICATED DRIVE

 | A CG Product

Emotron DCDC Converter Unit

INSTRUCTION MANUAL - ENGLISH

Valid from Software version 95.04

Document number: 01-7848-01

Edition: r0

Date of release: 2024-04-09

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Safety instructions

Before you begin with the installation, commissioning or powering up the unit for the first time it is very important that you carefully study this instruction manual. The following symbols can appear in this manual or on the product itself. Always read these first before continuing.

NOTE: Additional information as an aid to avoid problems.



CAUTION!
Failure to follow these instructions can result in malfunction or damage to the DCU.



WARNING!
Failure to follow these instructions can result in serious injury to the user in addition to serious damage to the DCU.

Installation

- The device must be installed by trained personnel.
- Disconnect all power sources before servicing.
- Always use appropriate DC-fuses to protect the wiring and prevent short-circuiting. To protect the IGBTs against short circuit currents, superfast semiconductor fuses are preferred.

Operating and maintenance personnel

Technically qualified personnel

Installation, commissioning, demounting, making measurements, etc. may only be carried out by personnel technically qualified and trained for the task.

1. Read the whole instruction manual before installing and putting the equipment into operation.
2. During all work (operation, maintenance, repairs, etc.) observe the switch-off procedures given in this instruction as well as any other operating instruction for the driven machine or system.
3. The operator must avoid any working methods which reduce the safety of the device.
4. The operator must do what he can to ensure that no unauthorised person is working on the device.
5. The operator must immediately report any changes to the device which reduce its safety to the user.
6. The user must undertake all necessary measures to operate the device in recommended condition only.

Installation of spare parts

We expressly point out that any spare parts and accessories not supplied by us have also not been tested or approved by us.

Installing and/or using such products can have a negative effect on the characteristics designed for your unit. The manufacturer is not liable for damage arising as a result of using non-original parts and accessories.

General warnings



WARNING!
Make sure that all safety measures have been taken before switching on the power supply.



WARNING!
Make sure that all safety measures have been taken before starting the motor in order to avoid personal injury.



WARNING!
Never operate the DCU with the front cover removed.

Alarms

Never disregard an alarm. Always check and remedy the cause of an alarm.

Contents

Safety instructions	1	7. Operation via the Control Panel.....	37
Contents.....	3	7.1 General	37
1. Introduction.....	5	7.2 Control panel with 4-line display	37
1.1 Delivery and unpacking	5	7.2.1 The display.....	37
1.2 Using of the instruction manual	5	7.2.2 Menu [100] Start Window	39
1.2.1 Instruction manuals for optional equipment.....	5	7.2.3 Editing mode	39
1.3 Warranty	5	7.2.4 Fault logger.....	40
1.4 Type code number.....	6	7.2.5 Real Time clock	40
1.5 Dismantling and scrapping.....	7	7.2.6 LED indicators	40
1.5.1 Disposal of old electrical and electronic equipment...	7	7.2.7 Control keys.....	40
1.6 Glossary	7	7.2.8 The Toggle and Loc/Rem Key	41
1.6.1 Abbreviations and symbols.....	7	7.2.9 Function keys	42
1.6.2 Definitions.....	7	7.3 The menu structure	42
2. General description	9	7.3.1 The main menu	43
2.1 Introduction	9	7.4 Programming during operation	43
2.2 DCU applications.....	10	7.5 Editing values in a menu	43
2.2.1 Low DC-voltage DCU.....	10	7.6 Copy current parameter to all sets	44
2.2.2 High DC-link voltage DCU.....	10	7.7 Programming example.....	44
2.2.3 Alternative High DC-link voltage DCU system.....	11	8. Functional description.....	45
2.2.4 DCU for marine application, DE	11	8.1 Menus.....	45
2.2.5 Motor test bench with battery, DE	12	8.1.1 Description of menu table layout	45
3. Installation and connections.....	13	8.1.2 Resolution of settings	46
3.1 Power connections.....	13	8.1.3 1st Line [110].....	46
3.2 Control connection	14	8.2 Main Setup [200].....	47
3.2.1 Control board.....	14	8.2.1 Operation [210].....	47
3.2.2 Terminal connections	15	8.2.2 Thermal Protection [230]	50
3.2.3 Configuration with jumpers and switches	16	8.2.3 Parameter Set Handling [240]	51
3.2.4 Connection example	18	8.2.4 Trip Autoreset/Trip Conditions [250].....	53
3.2.5 Connecting the control signals.....	20	8.2.5 Serial Communication [260].....	56
3.2.6 Connecting options	23	8.2.6 Wireless [270].....	60
4. Commissioning and getting started	25	8.3 Process and Application Parameters [300]	63
4.1 Using the function keys	25	8.3.1 Set/View Reference Value [310]	63
4.2 To start the DCU	25	8.3.2 Process Settings [320]	63
5. Main features.....	27	8.3.3 Preset References [360]	63
5.1 DC/DC controller description	27	8.4 Process Protection [400].....	65
5.1.1 DC low side DC-voltage controller U (LV) - Basic U mode	27	8.4.1 Trip text [430].....	65
5.1.2 DCU low side DC-voltage controller U (LV) - Cascaded U+I mode.....	28	8.5 I/Os and Virtual Connections [500]	65
5.1.3 DCU low side DC-current controller I (LV)	29	8.5.1 Analogue Inputs [510]	65
5.1.4 DCU DC-link voltage controller U (HV).....	29	8.5.2 Digital Inputs [520].....	70
5.1.5 DCU main/pre-charge contactors controller	30	8.5.3 Analogue Outputs [530]	72
6. Communication	33	8.5.4 Digital Outputs [540]	75
6.1 Modbus RTU	33	8.5.5 Relays [550]	76
6.2 Parameter sets.....	33	8.5.6 Virtual Connections [560]	77
6.3 Start and stop commands	34	8.6 Logical Functions and Timers [600]	78
6.4 Reference signal	34	8.6.1 Comparators [610]	78
6.4.1 Process value	34	8.6.2 Analogue Multiplexer [620].....	84
6.5 Description of the Elint formats.....	35	8.6.3 Not Gate [630]	85
		8.6.4 Logic output [640]	86
		8.6.5 Timers [650].....	88
		8.6.6 Flip flops [660].....	90
		8.6.7 Counters [670]	92
		8.6.8 Clock Logic [680]	94
		8.7 View Operation/Status [700]	95
		8.7.1 Operation [710].....	95
		8.7.2 Status [720]	96

8.7.3	Stored values [730]	100
8.8	View Trip Log [800]	101
8.9	System Data [900]	102
8.9.1	VSD Data [920]	102
8.9.2	Real Time clock	104
8.9.3	Inspection [940]	105
8.9.4	Service cont [950]	105
8.10	DCDC option [000]	106
8.10.1	LV Setup [010]	106
8.10.2	U (LV) Ctrl [020]	107
8.10.3	I (LV) Ctrl [030]	108
8.10.4	U (HV) Ctrl [040]	109
8.10.5	LV Protectio [060]	110
8.10.6	View Energy [090]	112
9.	Troubleshooting, Diagnoses and Maintenance	113
9.1	Trips, warnings and limits	113
9.2	Trip conditions, causes and remedial action	115
9.2.1	Technically qualified personnel	115
9.2.2	Opening the DCU	115
9.2.3	Precautions to take with a connected motor	115
9.2.4	Autoreset Trip	115
9.3	Maintenance	119
10.	Options	121
10.1	Supply voltage measurement board (SVMB)	121
10.2	Liquid cooling	121
10.3	I/O Board	121
10.4	PTC/PT100	121
10.5	EmoSoftCom	121
10.6	Control panel	121
10.7	External control panel kits (4-line)	122
10.7.1	Control panel kit, including blank panel	122
10.7.2	Control panel kit, including control panel	122
10.8	Communication options	122
11.	Technical data	123
11.1	Emotron DCU48 ratings 450-760 VDC	123
11.2	Emotron DCU69 ratings 550-1120 VDC	123
11.3	General electrical specifications	124
11.4	Operation at higher temperatures	125
11.5	Environmental conditions	125
11.6	Control signals	126
12.	Menu List	129

1. Introduction

The Emotron DC/DC converter unit (Emotron DCU) is used for adapting between different DC-voltage levels.

The main feature and operating principle of the Emotron DCU is to convert the high DC-link voltage (internal in the DCU) down to a suitable low side DC-voltage for general use, i.e. DC-supply for inverter or battery systems.

NOTE: Read this instruction manual carefully before installing, connecting or working with the Emotron DC/DC converter unit.

Users

This instruction manual is intended for:

- installation engineers
- maintenance engineers
- operators
- service engineers

DCU loads

The DCU is suitable for connecting DC loads/sources and it allows bi-directional power flow between DC loads/sources.

1.1 Delivery and unpacking

Check for any visible signs of damage. Inform your supplier immediately of any damage found. Do not install the unit if damaged.

Check that all items are present and that the type number is correct.

1.2 Using of the instruction manual

Within this instruction manual the abbreviation “DCU” is used to indicate the complete DC/DC converter unit as a single unit.

Check that the software version number on the first page of this manual matches the software version in the Emotron DCU. See section chapter 8.9.1 page 102 for more information.

With help of the Contents in this manual, it is easy to track individual functions and find out how to use and set them.

1.2.1 Instruction manuals for optional equipment

In the following table we have listed available options and the name of the Instruction manual or data sheet/ Instruction plus document number. Further in this main manual we are referring to these instructions.

Table 1 Available options and documents

Option	Valid instruction manual/ document number
I/O board	I/O board 2.0, instruction manual / 01-5916-01
PTC/PT100 board	PTC/PT100 board 2.0, instruction manual / 01-5920-01
Fieldbus - Profibus	Fieldbus Option, Instruction manual / 01-3698-01
Fieldbus - DeviceNet	
Fieldbus - CANopen	
Ethernet - Modbus TCP	
Ethernet - EtherCAT	
Ethernet - Profinet IO 1-port	
Ethernet - Profinet IO 2-port	
Ethernet - EtherNet/IP 2-port	
Safe Torque Off board	Option Safe Torque Off OSTO – 100 option board 01-7513-11

1.3 Warranty

The warranty applies when the equipment is installed, operated and maintained according to instructions in this instruction manual. Duration of warranty is as per contract. Faults that arise due to faulty installation or operation are not covered by the warranty.

1.4 Type code number

Fig. 1 gives an example of the type code numbering used for the Emotron DCU. This identification will be required for type specific information when mounting and installing. The code number is located on the product label.

Type code	DCU	48	-031	-20	D	I	-	-	-	A	-	N	N	N	N	A	N	-	-	A
Position No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Fig. 1 Type code number

Table 2

Position No	Configuration	
1	DC/DC converter type	DCU
2	Supply voltage	48=480 V mains 69=690 V mains
3	Rated current (A) continuous	-025=37,5 A - -1460=2190 A
4	Protection class	20=IP20 - Intended for mounting inside a cabinet 21=IP21 - Intended for wall-mounting 54=IP54 - Intended for wall-mounting
5	Control panel	--=Blank panel D=4-line Control panel, standard IP2X/54 E=4-line Control panel with Bluetooth (option IP2X/54) F=4-line Control panel with WiFi (option IP2X/54)
6	EMC option	I=IT-Net
7	Brake chopper option	D=DC+/- interface
8	Stand-by power supply option	--=No SBS (24V input included in Control board 2.1)
9	Safe Torque Off option	--=No Safe Torque Off O=Safe Torque Off included
10	Brand label	A=Standard
11	Coated boards option	V=Standard coated boards
12	Option position 1	N=No option
13	Option position 2	P=PTC/PT100 (max. 2)
14	Option position 3	I=Extended I/O (max. 3)
15	Option position, communication	N= No option D= DeviceNet P= Profibus S= RS232/485 M= Modbus/TCP 1-port H= Modbus/TCP 2-port E= EtherCAT A= Profinet IO 1-port B= Profinet IO 2-port G= EtherNet/IP 2-port C= CANopen
16	Software type	A= Standard DCU software
17	Motor PTC (Only valid for 002-105/B-D2(69))	N= No option P= PTC
18	Gland kit (Only valid for 002-074/IP54)	--= Glands not included G= Gland kit included

Table 2

Position No	Configuration	
19	Approval/certification	–= CE approved D= Marine DNV Product certificate (above 100 kW) + CE approved M= Marine version + CE approved U=UL/cUL approved
20	Painted DCU	A=Standard paint

*) Serial No coding: PPPPRRYWWSSSS
 PPPP = Manufacturing plant
 RR = Product revision no
 YY = Manufacturing year
 WW = Manufacturing week
 SSSS = Serial no
 E.g. 18410121010001

1.5 Dismantling and scrapping

The enclosure of the Emotron DCU is made from recyclable material such as aluminium, iron and plastic.

Our DCU complies to RoHS II directive, and contain electronic waste (e-waste). Any local or national regulations in force for the disposal and recycling of e-waste must be complied with.

1.5.1 Disposal of old electrical and electronic equipment

This symbol on the product or on its packaging indicates that this product shall be taken to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potentially negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, please contact the local distributor of the product.



1.6 Glossary

1.6.1 Abbreviations and symbols

In this manual the following abbreviations are used, see Table 3.

Table 3 Abbreviations

Abbreviation/symbol	Description
BESS	Battery Energy Storage Systems
CB	Control board
DCU	DC/DC Converter Unit
DOL	Direct On-Line
DG	Distributed Generation
FC	Fuel cells
FLC	Full Load Current
i^2t	The amount of energy losses, heating up the motor.
PB-PTC	Power board PTC input
PTC	Positive Temperature Coefficient (temperature sensor, also known as thermistor)
RMS	Root Mean Square value
SELV	Safety Extra Low Voltage
	The function cannot be changed in run mode

1.6.2 Definitions

In this manual the following definitions for current, torque and frequency are used:

Table 4 Definitions

Name	Description	Quantity
I_{CL}	Maximum output current	A_{RMS}
I_{IN}	Nominal input current of DCU	A_{RMS}
I_{NOM}	Nominal output current of DCU	A_{RMS}
n_{MOT}	Nominal speed of motor	rpm
P_{NOM}	Nominal power of DCU	kW

2. General description

2.1 Introduction

The main feature and operating principle of the Emotron DCU is to convert the high DC-link voltage (internal in the DCU) down to a suitable low side DC-voltage for general use, i.e. DC-supply for inverter or battery systems.

1. Converting 690 VAC supply voltage, i.e. 1000 VDC, to a lower DC-voltage (600-800 VDC) for supply to DC-fed inverter (rated for 400 VAC supply).
2. Adaptation of inverter high DC-link voltage to lower voltage DC systems including battery energy storage systems (BESS), fuel cells (FC), and solar power.

An alternative configuration is to control the high DC-link voltage from the low DC-voltage source, i.e. battery. This configuration is suitable (and needed) for the AC frequency control in micro-grid applications where the DCU and battery balances (in the short time frame) the power from the source (generator system) to the varying AC loads connected to the micro-grid created by a VSI/AFE.

Another application for this alternative configuration is for distributed generation (DG) systems with requirement for participation in the grid frequency control.

The following definitions are made to differentiate between the two DCU applications,

DCU (LV)	Low DC-voltage DCU	Controls (balances) the low side DC voltage (or current) for supply to DC-fed inverters/loads. The high DC-link voltage side is fed (and controlled) from another source, e.g. a rectifier or AFE converter.
DCU (HV)	High DC-link voltage DCU	Controls (balances) the high DC-link voltage from an external low DC-voltage source, e.g. a battery

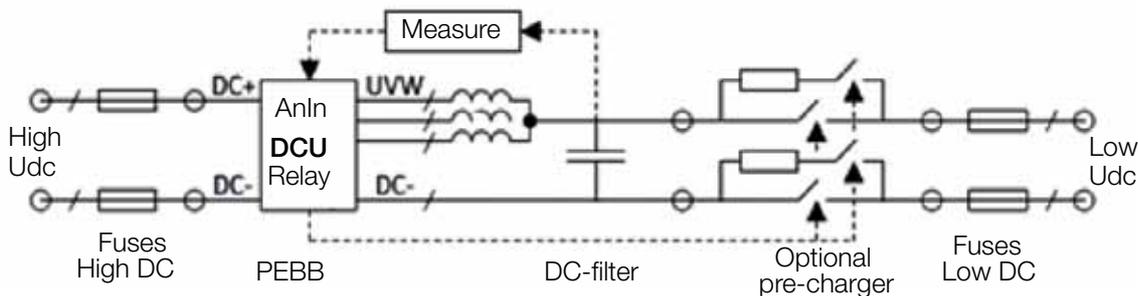


Fig. 2 Principal diagram of a DC/DC-converter system.

The DC-converter unit system consists of:

- PEBB (DCU) with DCU software. The DCU PEBB hardware is identical to a VSI PEBB hardware. The PEBB IGBT phase-legs are connected to individual inductors and controlled by interleaved IGBT triggering signals.
- DC-filter consisting of 3x1-phase DC-inductors and a buffer DC-capacitor. The additional external buffer capacitor might not be needed for the DCU in combination with standard PEBBs connected to the low DC terminals since the internal DC-link capacitors are sufficient.
- Voltage measurement for feedback of the low DC-voltage to the DCU control (via standard CB analogue inputs). The supply voltage measurement unit (used in the AFE) can be reused for DC-voltage measurement.
- DC-fuses for both the high and low DC-side (standard PEBB DC-link fuses or external fuses of similar type). The PEBB internal DC-fuses are sufficient.
- Optional low (or high) side DC-voltage main and pre-charging contactors including pre-charge resistor. The contactors are controlled from the DCU CB relays (Relay 1 and Relay 3). The contactors are not mandatory, but needed for systems with external DC-voltage sources, e.g. battery systems.

2.2 DCU applications

2.2.1 Low DC-voltage DCU

Low DC-voltage DCU controls/balances the low voltage side to supply lower voltage or equivalently DC loads such as battery storage, fuel cells etc.

The high DC-link voltage side is fed from other source, e.g. AFE (AFG).

A typical single-line diagram for the DCU application in converting a 690 VAC supply voltage down to DC-voltage (600-800 VDC) for supply to DC-fed inverter (rated for

400 VAC supply) is shown in Fig. 3. When only CG/Emotron PEBBs are included in the system there is no need for external fuses, pre-charge circuit contactors nor external DC-capacitor.

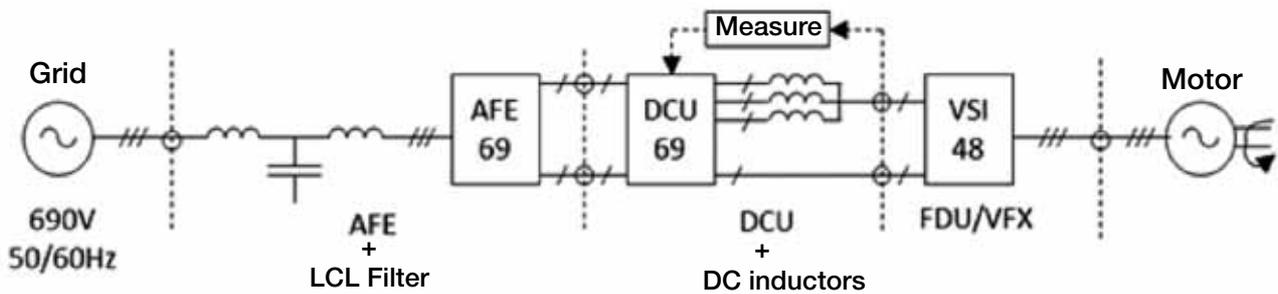


Fig. 3 DCU for interconnecting 690 VAC supply with 400 V inverter.

2.2.2 High DC-link voltage DCU

High DC-link voltage DCU controls/balances the high DC-link voltage from an external low DC-voltage source, e.g. a battery. Typical application is hybrid system.

A typical single-line diagram for the DCU application to connect a battery to the DC-link of an inverter system is shown in Figure 3. Since the battery may need to be

disconnected during maintenance etc. the pre-charge circuitry is mandatory in order to avoid high inrush currents when reconnecting the battery. Also note the external DC-capacitor, in the DC-filter, which is needed to provide a low impedance path for the low side current ripple in order not to flow into the battery.

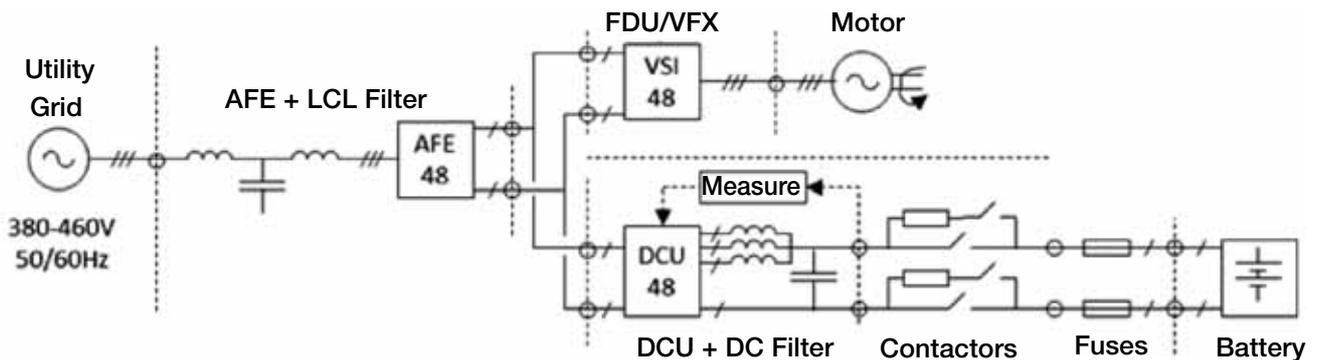


Fig. 4 DCU for interconnecting battery to the DC-link of a common DC-bus 400 V application.

2.2.3 Alternative High DC-link voltage DCU system

Figure X shows an alternative High DC-link voltage DCU system with battery supply, but without grid connection.

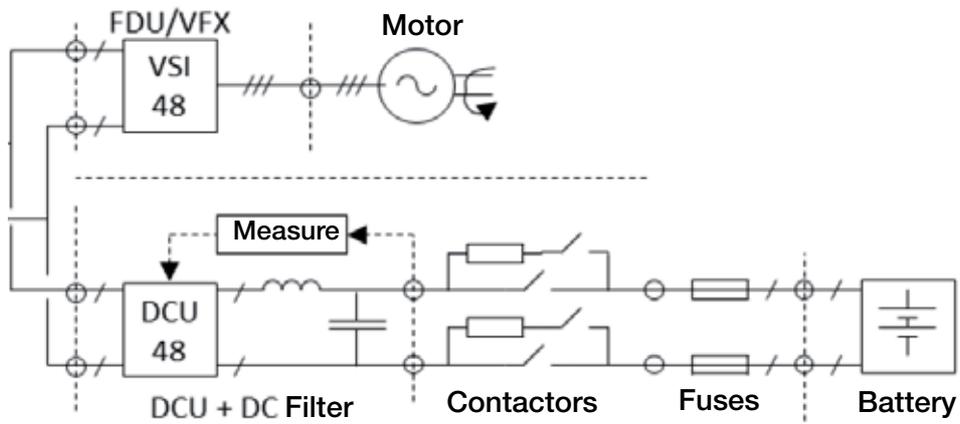


Fig. 5 HV control DCU unit.

2.2.4 DCU for marine application, DE



Fig. 6 DCU48-175 with LC-filter.

2.2.5 Motor test bench with battery, DE

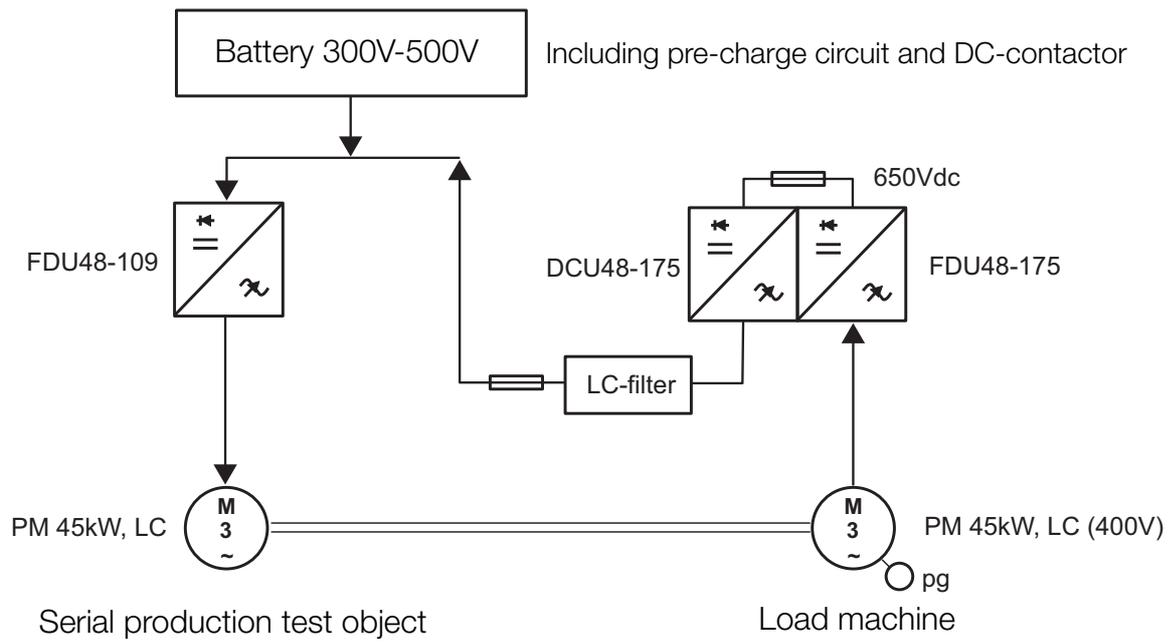


Fig. 7 Principal schema over motor test bench with battery.



Fig. 8 DCU48-175, FDU48-175 and LC-filter.

3. Installation and connections

3.1 Power connections

The DCU consists of a DCU inverter module, a DC-filter consisting of a three-phase interleaved DC-inductor and DC-capacitors, and an external voltage measurement unit (VMU) for measuring the DCU LV-side voltage.

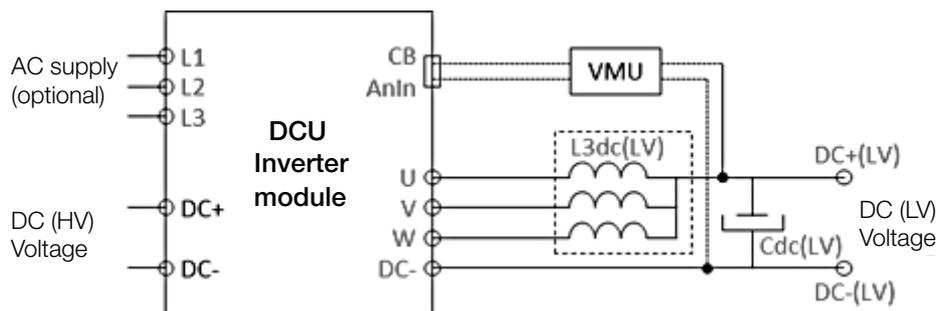


Fig. 9 The DCU inverter module

The DCU inverter module has two (or three) power ports.

- AC grid supply [L1, L2, L3] terminal block (optional). L1, L2, L3 should be connected to the AC power supply if used.
- High voltage DC-supply/output [DC+, DC-] terminal block DC+ and DC- should be connected to the high voltage DC-supply/load.

NOTE: The high voltage DC is internally connected to the DC-link of the DCU inverter module.

- Low voltage DC PWM output [U, V, W, DC-] terminal block U, V, W should be connected to the three phase interleaved DC-inductor terminals. DC- should be connected to the DC-(LV) terminal of the DCU.

The DCU DC-filter consists of a three-phase interleaved DC-inductor and DC-capacitors.

The common side of the interleaved DC-inductor should be connected to the positive terminal of the DC-filter capacitor and to the DC+(LV) terminal of the DCU.

The negative terminal of the DC-filter capacitor should be connected to the DC-(LV) terminal of the DCU.

The inputs of the external voltage measurement unit (VMU) should be connected to the low-side DC(LV) voltage output terminals DC+(LV) and DC-(LV), and the secondary side outputs to the DCU control board analog interface.

PE should be connected to all enclosures at the designated locations.

NOTE: If the DCU Inverter module and the DC-filter are located in separate enclosures then use common cable shield screen around the U, V, W and DC- cables between the enclosures, and with preferably 360° cable shield screen connection at both ends. Keep also the cable between the enclosures as short as possible.

3.2 Control connection

3.2.1 Control board

Fig. 10 shows the layout of the control board which is where the parts most important to the user are located. Although the control board is galvanically isolated from the mains, for safety reasons do not make changes while the mains supply is on!



WARNING!
Always switch off the mains voltage and wait at least **7 minutes** to allow the DC capacitors to discharge before connecting the control signals or changing position of any switches. If the option External supply is used, switch of the mains to the option. This is done to prevent damage on the control board.

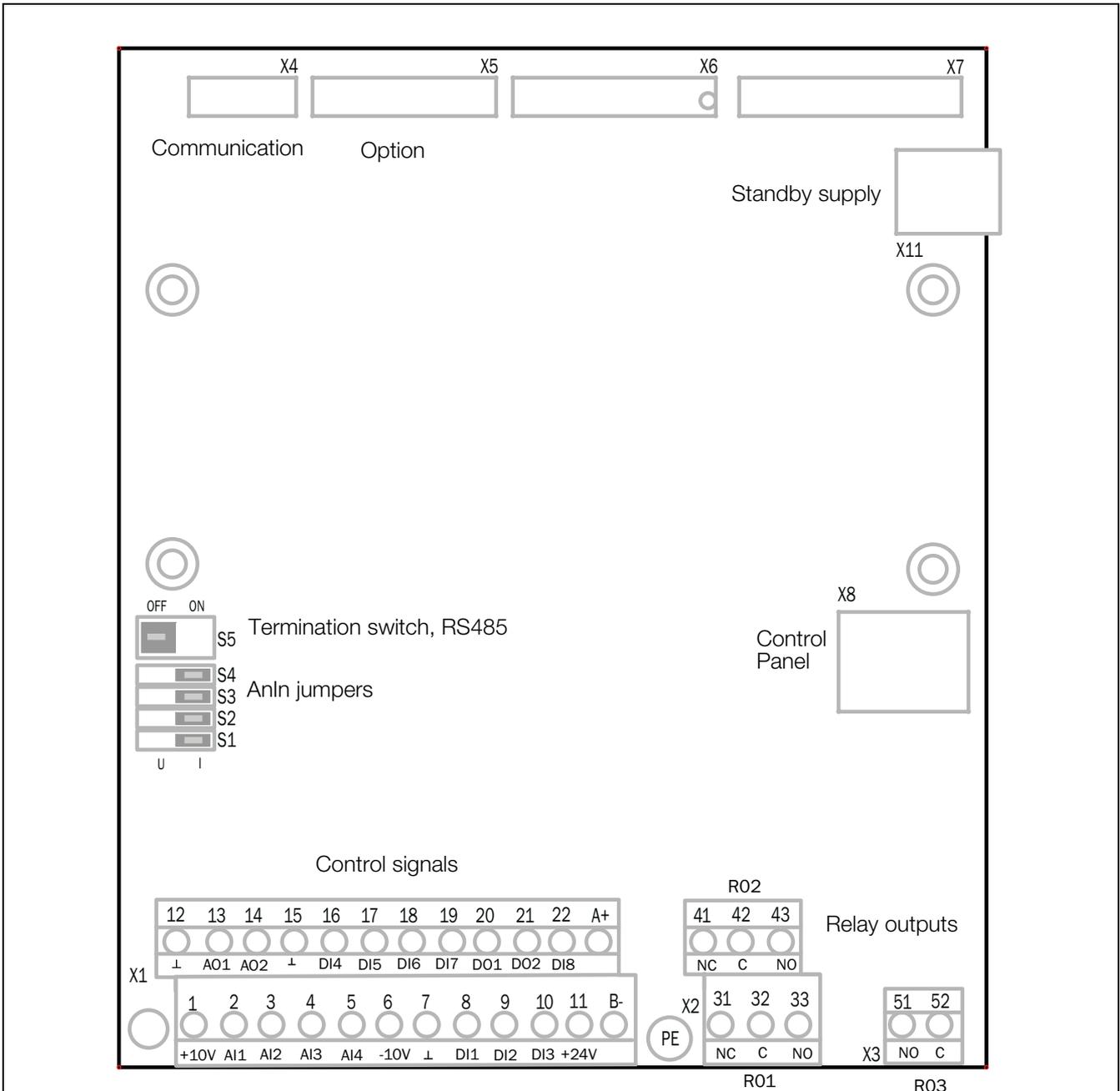


Fig. 10 Control board layout.

NOTE:

AnIn switches (S1 to S4) should be in U position when any particular AnIn is used for supply voltage measurement board (SVMB).

3.2.2 Terminal connections

The terminal strip for connecting the control signals is accessible after opening the front panel.

The table describes the default functions for the signals. The inputs and outputs are programmable for other functions as described in chapter 8, page 45. For signal specifications refer to section 11.6 page 126.

NOTE: The maximum total combined current available for outputs 11, 20 and 21 is 100 mA. Supply voltage measurement board (SVMB) when connected (for example in DCU) takes 50 mA out of that total available (100 mA) current.

NOTE: It is possible to use external 24V DC if connection to Common (15).

Table 5 Control signals

Terminal	Name	Function (Default)
Outputs		
1	+10 V	+10 VDC supply voltage
6	-10 V	-10 VDC supply voltage
7	Common	Signal ground
11	+24 V	+24 VDC supply voltage
12	Common	Signal ground
15	Common	Dig signal ground *
Digital inputs		
8	DigIn 1	RunL (reverse)
9	DigIn 2	RunR (forward)
10	DigIn 3	Enable
16	DigIn 4	Off
17	DigIn 5	Off
18	DigIn 6	Off
19	DigIn 7	Off
22	DigIn 8	RESET
Digital outputs		
20	DigOut 1	Output OK
21	DigOut 2	L2
Analogue inputs		
2	AnIn 1	Process Ref
3	AnIn 2	Off
4	AnIn 3	U (LV)
5	AnIn 4	Off
Analogue outputs		
13	AnOut 1	Process Val

Table 5 Control signals

Terminal	Name	Function (Default)
14	AnOut 2	Current
Integrated RS-485 ¹		
A+	A+	RS-485 Differential transmit and receive
B-	B-	
Relay outputs		
31	N/C 1	Relay 1 output Dedicated for Charge contactor K2.
32	COM 1	
33	N/O 1	
41	N/C 2	Relay 2 output Output OK Active when output voltage/current is under control.
42	COM 2	
43	N/O 2	
51	COM 3	Relay 3 output Dedicated for Main contactor K1.
52	N/O 3	

* Digital signal ground connected to 0V via ferrite (600 Ohm @ 100MHz).

¹ The integrated RS-485 interface is a isolated interface supporting Modbus RTU protocol with baudrates ranging from 2400 bit/s up to 115.2 kbit/s. Termination and fail-safe can be activated via switch S5 when applicable. Note that proper termination and fail-safe is critical for a stable RS-485 network. It is recommended to use screened RS-485 cable which protects the signals from EMI. The cable screen should (in normal cases) be connected to inverter PE via provided screen clamps, see fig. 11. For further information about Modbus RTU protocol and physical network connection see Emotron option manual for Serial communication RS-232/485 available on our website.

NOTE: N/C is opened when the relay is active and N/O is closed when the relay is active.

NOTE! Using potentiometer for reference signal to Analogue input: Possible potentiometer value in range of 1 kΩ to 10 kΩ (¼ Watt) linear, where we advice to use a linear 1 kΩ / ¼ W type potentiometer for best control linearity.



WARNING!

The relay terminals 31-52 are single isolated. Do NOT mix SELV voltage with e.g. 230 VAC on these terminals. A solution when dealing with mixed SELV/system voltage signals is to install an additional I/O board option (see section 10.3 page 121) and connect all SELV voltage signals to the relay terminals of this option board while connecting all 230VAC signals to the control board relay terminals 31 - 52.

Stand by supply interface (SBS)

The control board mounted standby supply, X11 connector, provides the possibility of keeping the communication system up and running without having the 3-phase mains connected. Another advantage is that the system can be set up without mains power. The option will also give backup for communication failure if main power is lost.

The standby supply should be supplied with a 24 VDC $\pm 10\%$ double isolated transformer capable of supplying 1A continuous current. Recommended fuse is 2A. Cable length limited to 30 m. If the cable is longer than 30 m, a shielded cable must be used.

Table 6 X11 terminal

Terminal	Name	Function
1	+	24 VDC $\pm 10\%$
2	-	0 V

NOTE: In case the isolated DC measurement board (that incorporate stand by supply [SBS] functionality) the control-board SBS should not be used. Rather the SBS on the isolated DC measurement board should be used. Failure to comply with this will break DC-link voltage measurement.

3.2.3 Configuration with jumpers and switches

Analogue input configuration (S1 - S4)

The jumpers selections S1 to S4 are used to set the input configuration for the 4 analogue inputs AnIn1, AnIn2, AnIn3 and AnIn4 as described in table 7. See fig. 10 for the location of the jumpers.

NOTE: Jumper for AnIn3 must be in U (Voltage position) when using Voltage measurement board. Jumpers must be in I (Current) position if current source is used for analogue input.

Table 7 Settings selectors S1-S4

Input	Signal type	Selector configuration
AnIn1	Voltage	S1 
	Current (default)	S1 
AnIn2	Voltage	S2 
	Current (default)	S2 
AnIn3	Voltage	S3 
	Current (default)	S3 
AnIn4	Voltage	S4 
	Current (default)	S4 

NOTE: Scaling and offset of AnIn1 - AnIn4 can be configured using the software. See menus [512], [515], [518] and [51B].

NOTE: The 2 analogue outputs AnOut 1 and AnOut 2 can be configured using the software. See menu [530].

RS-485 termination (S5)

Switch S5 is used to activate termination and fail-safe resistors for the integrated RS-485-interface on terminal X1: A+ and B-. See fig. 10 for the location of the switch.

Table 8 Settings switch S5

Input	Termination	Selector S5 configuration
RS-485	OFF (def)	
	ON (Activated)	

NOTE: It is important to have termination and fail-safe activated on at least one node on the network to secure proper function. The termination shall **ONLY** be enabled in the cable ends of a RS-485 network. The termination resistor is used to avoid reflections of transmitted signals and the fail-safe resistors will keep A+ and B- terminals at a steady state when no node is transmitting. It is important not to enable any additional termination apart from the two in each cable end as it will impose as an additional load for a transmitting transceiver and may cause malfunctioning.

3.2.4 Connection example

Fig. 11 gives an overall view of a DCU connection example.

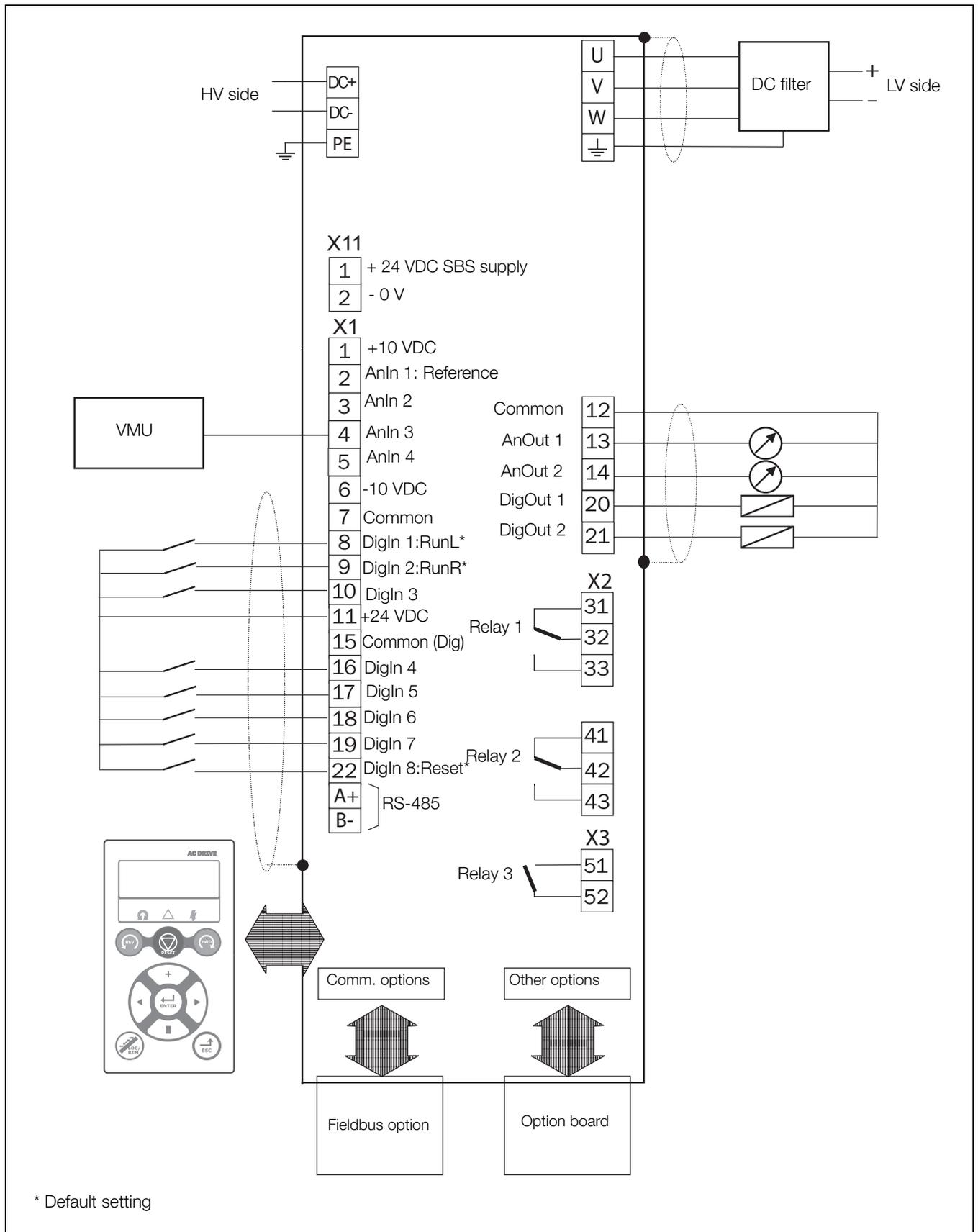


Fig. 11 Connection example.

Connecting of external voltage measurement unit (VMU)

The external voltage measurement unit (VMU) is used for control and protection purposes and correct connections are important for correct functionality of the DCU.

The VMU exists in two different variants i.e. version 1 and version 2, and both may be used in the DCU.

The low-voltage side DC+ should be connected to the VMU.L1 terminal, and DC- should be connected to both VMU.L2 and VMU.L3 terminals.

The VMU output signal VMU.UX and VMU.COM should be connected to the DCU control board user interface analogue input #3 and analogue ground (terminals X1.5 and X1.7). The DCU control board analogue input #3 jumper S3 should be configured in the U-position and parameter [523 AnIn 3 Fc] =U(LV) which corresponds to the default configuration.

The VMU requires a 24 V supply which may be sourced either from the DCU control board (terminals X1.11 and X1.7) but preferably from an external 24 V supply. The VMU 24V supply is internally isolated from the signal voltages. The VMU 24 V supply requires approximately 50mA.

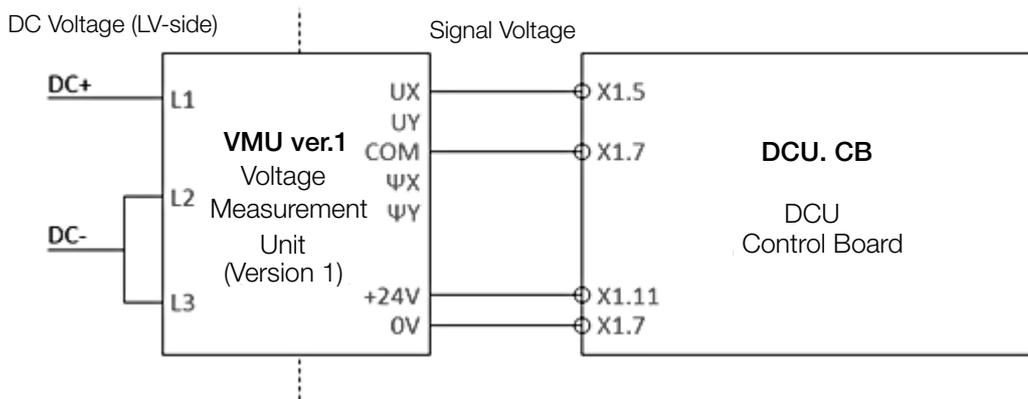


Fig. 12 Connection diagram for VMU version 1.

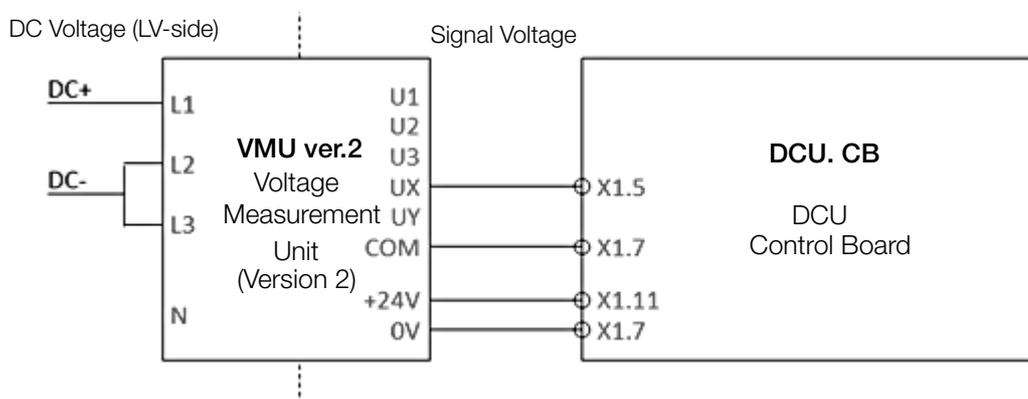


Fig. 13 Connection diagram VMU version 2.

3.2.5 Connecting the control signals

Cables

The standard control signal connections are suitable for stranded flexible wire up to 1.5 mm² (AWG16) and for solid wire up to 2.5 mm² (AWG14).

NOTE: The screening of control signal cables must comply with the immunity levels given in the EMC Directive (reduction of noise level).

NOTE: The control cables must be separated from motor and mains cables.

Table 9 Description of optional terminals in fig. 14 to fig. 18.

Terminals 78, 79	For connection of Motor PTC
------------------	-----------------------------

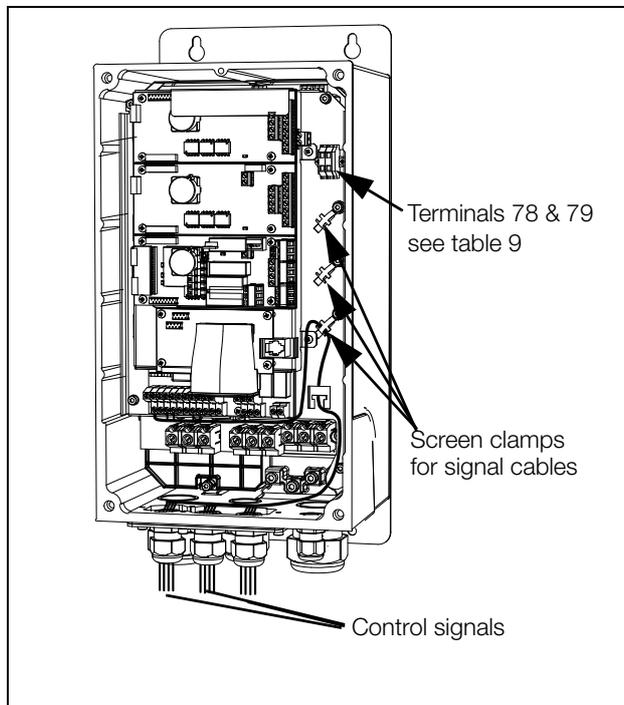


Fig. 14 Connecting the control signals, DCU model 003 to 018, frame size B.

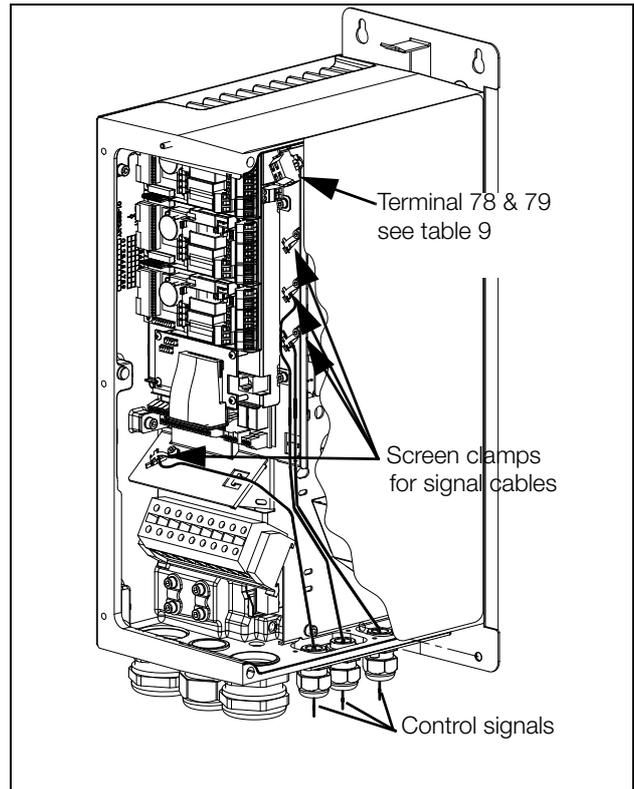


Fig. 15 Connecting the control signals, DCU model 026 to 046, frame size C.

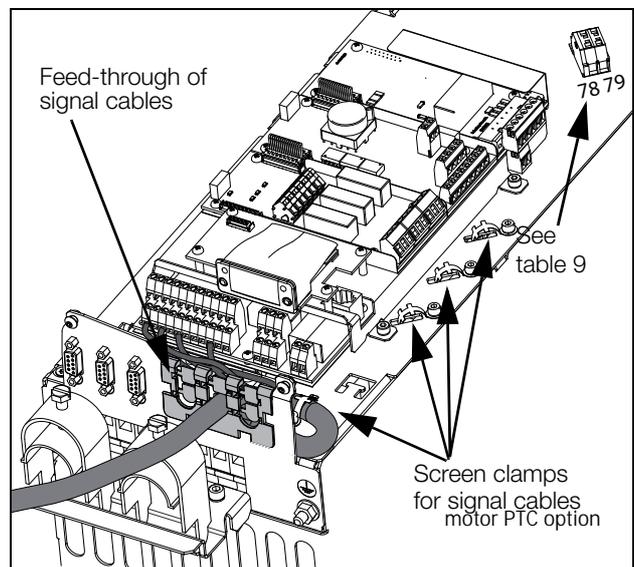


Fig. 16 Connecting the control signals, DCU model 48-025 to 48-058 frame size C2 and model 69-002 to 69-025 frame size C2(69).

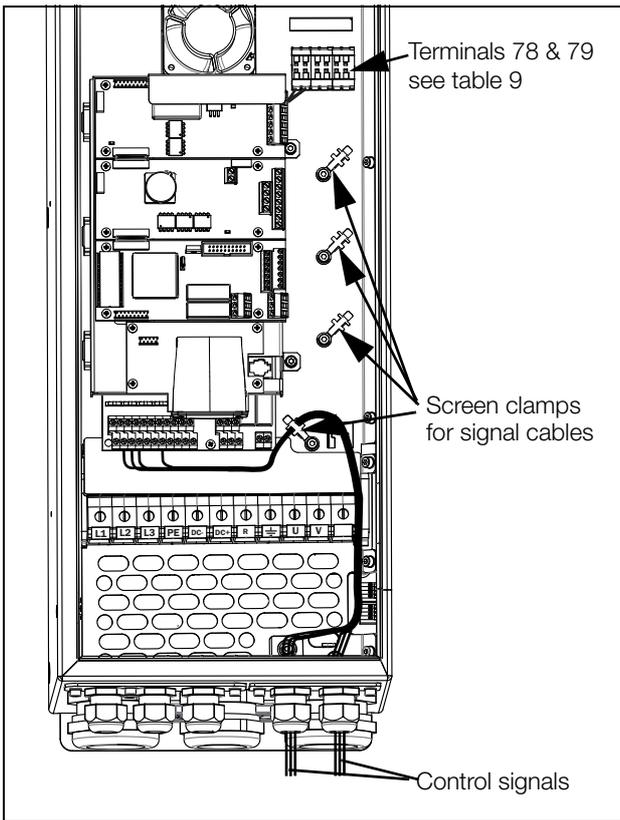


Fig. 17 Connecting the control signals, DCU model 061 to 074, frame size D and model 69-033 to 69-058 frame size D(69).

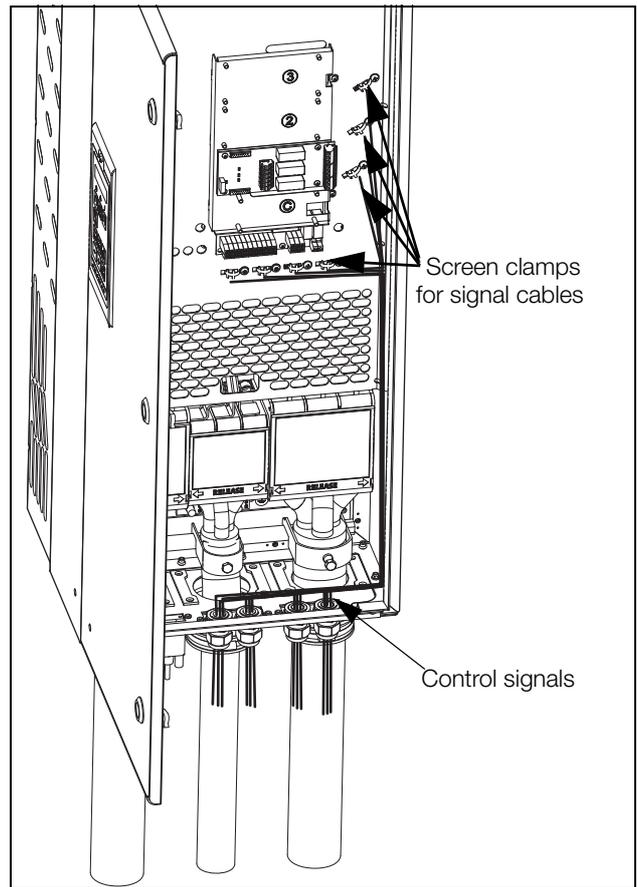


Fig. 19 Connecting the control signals, DCU model 48-090 to 295 and DCU model 69-82 to 200, frame size E, F and F69 (principle drawing).

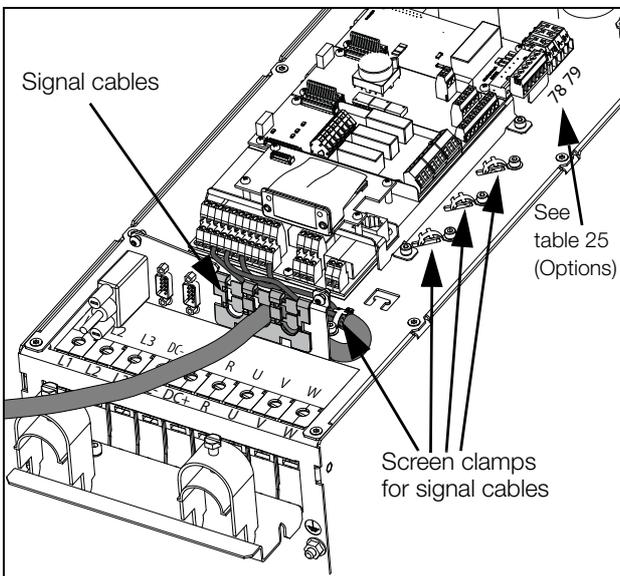


Fig. 18 Connecting the control signals, DCU model 48-060 to 48-105 frame size D2 and model 69-033 to 69-058 frame size D2(69).

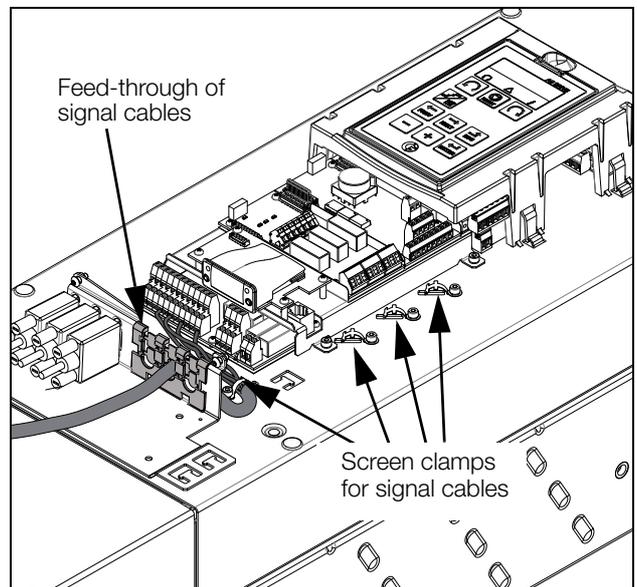


Fig. 20 Connecting the control signals, DCU model 48-142 to 48-365 frame size E2, F2 and FA2 (principle drawing).

NOTE: The screening of control signal cables is necessary to comply with the immunity levels given in the EMC Directive (it reduces the noise level).

NOTE: Control cables must be separated from motor and mains cables.

Types of control signals

Always make a distinction between the different types of signals. Because the different types of signals can adversely affect each other, use a separate cable for each type. This is often more practical because, for example, the cable from a pressure sensor may be connected directly to the DCU.

We can distinguish between the following types of control signals:

Analogue inputs

Voltage or current signals, (0-10 V, 0/4-20 mA) normally used as control signals for speed, torque and PID feedback signals.

Analogue outputs

Voltage or current signals, (0-10 V, 0/4-20 mA) which change slowly or only occasionally in value. In general, these are control or measurement signals.

Digital

Voltage or current signals (0-10 V, 0-24 V, 0/4-20 mA) which can have only two values (high or low) and only occasionally change in value.

Data

Usually voltage signals (0-5 V, 0-10 V) which change rapidly and at a high frequency, generally data signals such as RS-232, RS-485, Profibus, etc.

Relay

Relay contacts (0-250 VAC) can switch highly inductive loads (auxiliary relay, lamp, valve, brake, etc.).

Signal type	Maximum wire size	Tightening torque	Cable type
Ana- logue	Rigid cable: 0.14-2.5 mm ² (AWG 26 - 14)	0.5 Nm (4.4 LB- in)	Screened
Digital	Flexible cable: 0.14-1.5 mm ² (AWG 26 - 16)		Screened
Data			Screened
Relay	Cable with ferrule: 0.25-1.5 mm ² (AWG 24 - 16)		Not screened

Example

The relay output from a DCU which controls an auxiliary relay can, at the moment of switching, form a source of interference (emission) for a measurement signal from, for example, a pressure sensor. Therefore it is advised to separate wiring and screening to reduce disturbances.

Screening

For all signal cables the best results are obtained if the screening is connected to both ends: the DCU side and at the source (e.g. PLC, or computer). See fig. 21.

It is strongly recommended that the signal cables be allowed to cross mains and motor cables at a 90° angle. Do not let the signal cable go in parallel with the mains and motor cable.

Single-ended or double-ended connection?

In principle, the same measures applied to motor cables must be applied to all control signal cables, in accordance with the EMC-Directives.

For all signal cables as mentioned in section the best results are obtained if the screening is connected to both ends. See Fig. 21.

NOTE: Each installation must be examined carefully before applying the proper EMC measurements.

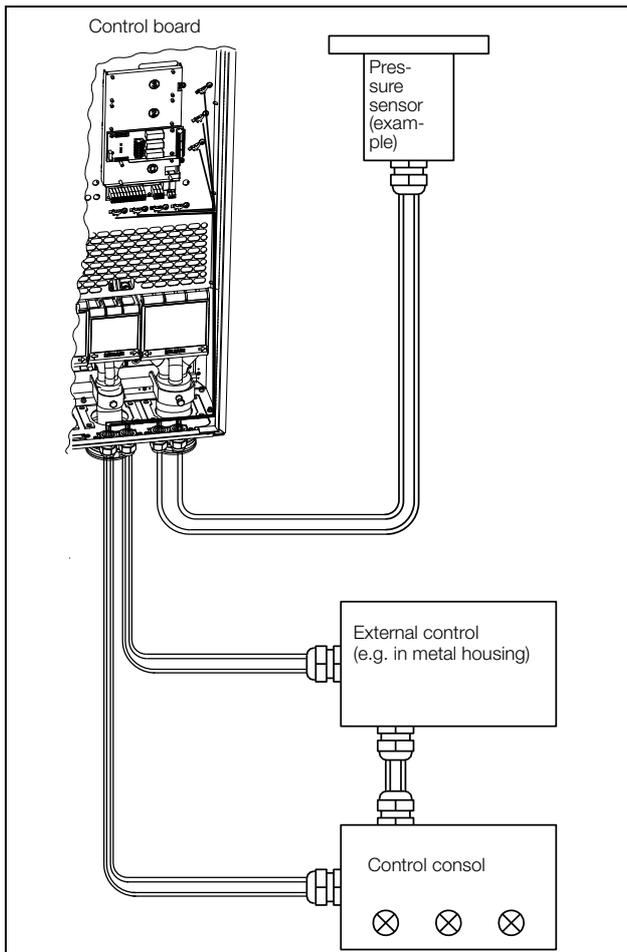


Fig. 21 Electro Magnetic (EM) screening of control signal cables.

Current signals (0)4-20 mA)

A current signal like (0)4-20 mA is less sensitive to disturbances than a 0-10 V signal, because it is connected to an input which has a lower impedance (250 Ω) than a voltage signal (20 k Ω). It is therefore strongly advised to use current control signals if the cables are longer than a few metres.

Twisted cables

Analogue and digital signals are less sensitive to interference if the cables carrying them are "twisted". This is certainly to be recommended if screening cannot be used. By twisting the wires the exposed areas are minimised. This means that in the current circuit for any possible High Frequency (HF) interference fields, no voltage can be induced. For a PLC it is therefore important that the return wire remains in proximity to the signal wire. It is important that the pair of wires is fully twisted over 360°.

3.2.6 Connecting options

The option cards are connected by the optional connectors X4 or X5 on the control board see Fig. 10, page 14 and mounted above the control board. The inputs and outputs of the option cards are connected in the same way as other control signals.

4. Commissioning and getting started

This chapter is a step by step guide that will show you the how to getting started the DCU.

We assume that the DCU is mounted on a wall or in a cabinet.

Section 4.1 describes how to use the function keys on the control panel and section 4.2 describes how to getting started.

4.1 Using the function keys

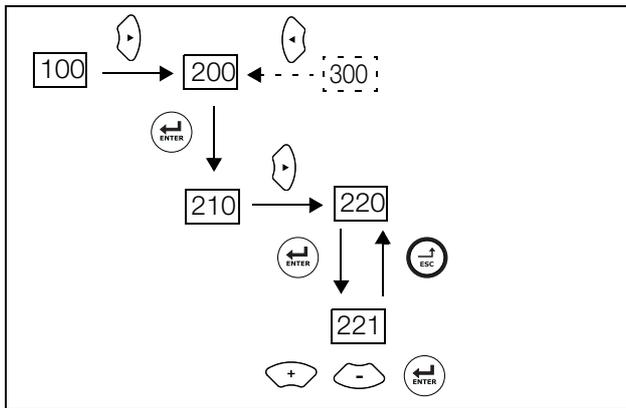


Fig. 22 Example of menu navigation when entering motor voltage.

	step to lower menu level or confirm changed setting
	step to higher menu level or ignore changed setting
	step to next menu on the same level
	step to previous menu on the same level
	increase value or change selection
	decrease value or change selection

4.2 To start the DCU

For commissioning, configuration and first start it is recommended to control the DCU from the control panel.

1. Set “Run/Stop Ctrl [215]” to Keyboard.

Control the operation mode reference via the option parameters, i.e. menu “Ref Ctrl [214]” is set to “Option”, where the process reference value, i.e. menu [310], is sourced from the selected DCU operation mode reference value “U (LV) Ref [O21]”, “I (LV) Ref [O31]” or “U (HV) Ref [O41]”.

The intended DCU operation mode is configured, i.e. the application process source, in menu “Process Source [321]”. “U (LV) Mode” is the default setting in menu [321].

1. Set “Process Source [321]” to “U (LV) Mode”, “I (LV) Mode” or “U (HV) Mode”.
2. Verify the DCU basic settings in settings in parameters LV Setup [O1x]*.
3. Verify and confirm (if possible) the low-side Udc (LV) voltage, i.e. menu “Output volt [717]” and high-side Udc (HV) voltage, i.e. menu “DC voltage [719]”, where especially the Udc (LV) measurement via the external VMU is of importance.**
4. Apply reasonable reference values depending on the configured DCU operation mode.**
5. Start the DCU by pressing green button “FWD” on the Control Panel.
6. Confirm correct operation via the read-outs in menus [71x] and stable sound.
7. Change the reference value up and down and confirm expected changes in the read-outs in menus [71x].

After validation of correct behavior of the DCU:

8. Configure the DCU according to the required control source, i.e. “Ref control [214]”, Run/Stop Ctrl [215], and “Reset Ctrl [216]”.

Stop the DCU by pressing the red button “RESET”.

* Parameter “LV Connect [O13]” defines the control of the optional low-voltage side main and pre-charge contactors where the pre-charge and main contactors are activated in sequence either directly when the high-voltage is present “At Power On”, or when Run command is given “At Run Cmd”, or after the initial voltage ramp have been made “After U_{ramp} ”. For first commissioning it is recommended to use default setting “At Power On”.

** U (LV) Mode Set “U (LV) Ref [O21]” between 15 % and 85 % of high voltage Udc (HV), i.e. “Udc [719]”.

U (HV) Mode Set “U (HV) Ref [O41]” 10 % above the high voltage Udc (HV), i.e. “Udc [719]”.

I (LV) Mode I (LV) Ref [O31] = 0%

5. Main features

5.1 DC/DC controller description

5.1.1 DC low side DC-voltage controller U (LV) - Basic U mode

Fig. 23 is shown the block diagram of the DCU low side DC-voltage U (LV) controller in Basic U mode.

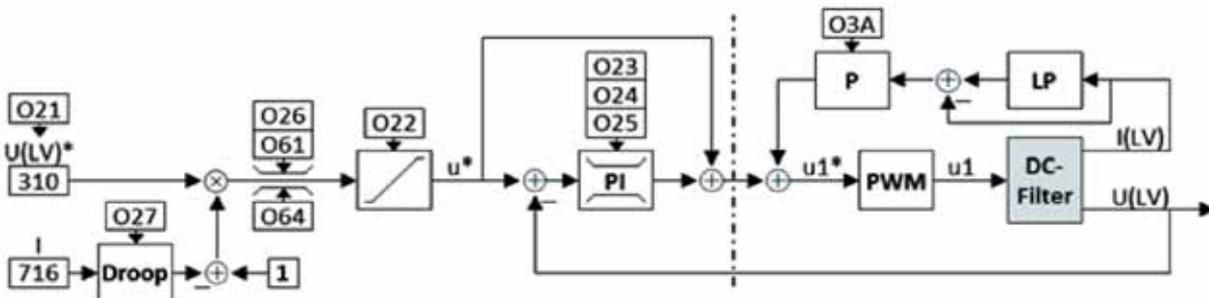


Fig. 23 Block diagram of DCU low side DC-voltage controller U (LV) - Basic U mode.

The low side DC-voltage reference value [310] (Process Reference) is set according to the normal procedure from the [214] selection, i.e. Remote, Keyboard, Com or Option. If [214] is selected to Option then the reference is set from [O21 U (LV) Ref].

The low side DC-voltage droop controller adjusts the voltage reference based on the actual LV-side output current (I), i.e. provides for load sharing. The principle function of the voltage droop control is shown in Fig. 24. In Fig. 24, it can be seen that at 100% output current (related to the LV-side nominal DC current) the internal voltage reference is adjusted according to the value of the voltage droop controller gain [O27].

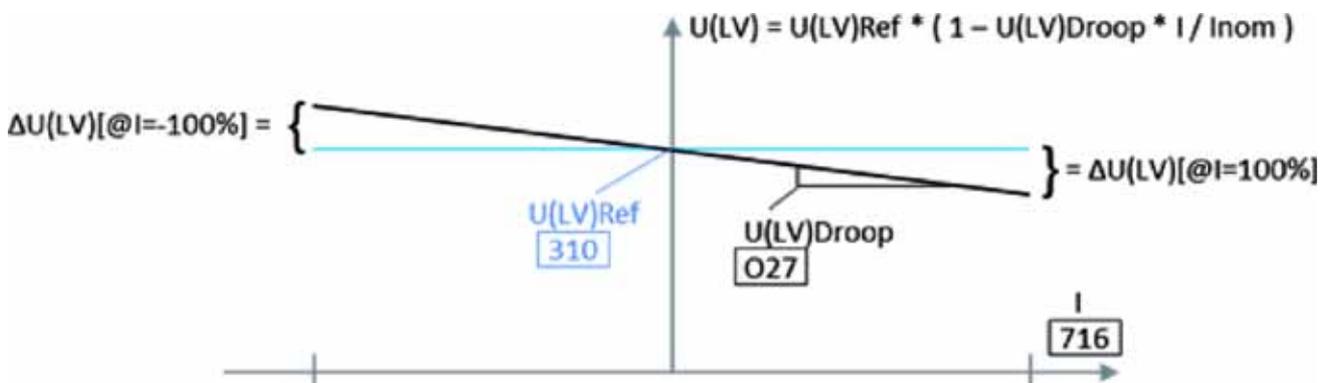


Fig. 24 Low side output voltage droop control.

The adjusted low side voltage reference is then limited (upper margin via [O26] and absolute max/min via [O61/O64]) and the rate of change is limited by a ramping function with ramp time defined in parameter [O22].

The actual reference to the PWM module ($u1^*$) contains three parts:

1. Direct feed-forward of the ramped reference value (u^*) for fast transient control of the low side DC-voltage.
2. PI-controller [O23]-[O25] output from the error voltage obtained from the ramped reference value and the feedback measurement. The integral-part of the PI-controller ensures zero steady-state error and thereby provides for the low side DC-voltage steady-state accuracy.
3. Damping controller [O3A] on the low side DC-current for stability and fast control of the low side current and voltage.

The IGBT PWM trigger signals are generated from triangular carrier wave modulation including DC-link voltage shifting for on-line compensation of variation in the DC-link voltage (HV).

5.1.2 DCU low side DC-voltage controller U (LV) - Cascaded U+I mode

The block diagram of the DCU low DC-voltage U (LV) controller in Cascaded U+I is shown in Fig. 25.

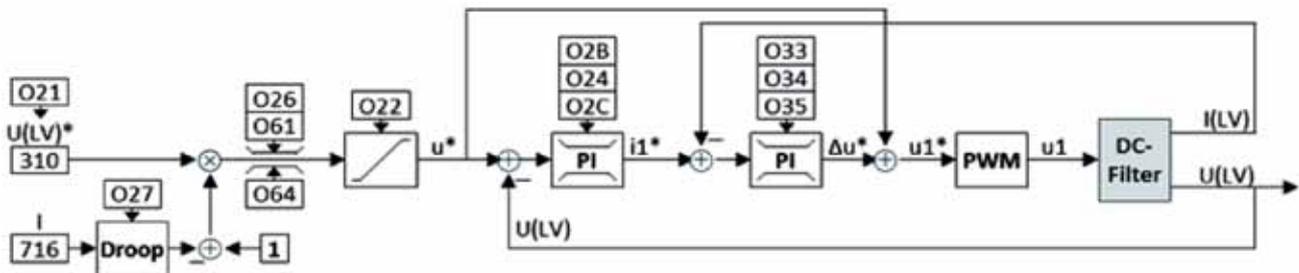


Fig. 25 Block diagram of DCU low side DC-voltage controller U (LV) - Cascaded U+I mode.

The low side DC-voltage reference, drooping and ramping for the Cascaded U+I mode is identical to the Basic U mode.

The actual reference to the PWM module ($u1^*$) contains three parts:

1. Direct feed-forward of the ramped reference value (u^*) for fast transient control of the low side DC-voltage.
2. Cascaded PI-controllers for low side DC-voltage U (HV) and low side DC-current I (LV). The integral-part of the U (LV) PI-controller ensures zero steady-state error and thereby provides for the low side DC-voltage steady-state accuracy.

The IGBT PWM trigger signals are generated from triangular carrier wave modulation including DC-link voltage shifting for on-line compensation of variation in the DC-link voltage (HV).

5.1.3 DCU low side DC-current controller I (LV)

The block diagram of the DCU low side DC-current I (LV) controller is shown in Fig. 26.

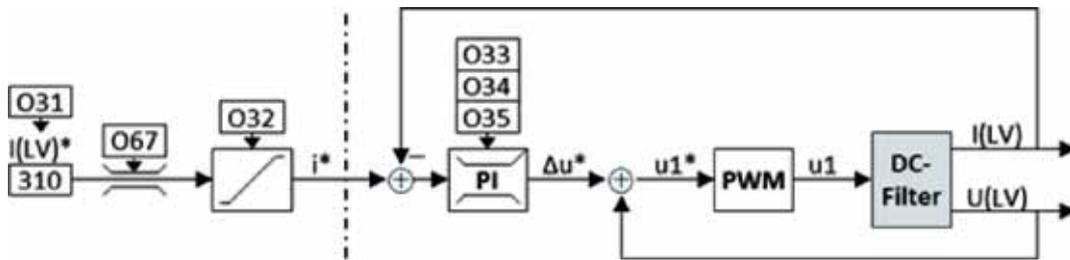


Fig. 26 Block diagram of DCU low side DC-current controller I (LV).

The low side DC-current reference value [310] (Process Reference) is set according to the normal procedure from the [214] selection, i.e. Remote, Keyboard, Com or Option. If [214] is selected to Option then the reference is set from [O31 I (LV) Ref].

The low side current reference is limited (absolute positive and negative max via [O67]) and the rate of change is limited by a ramping function with ramp time defined in parameter [O32].

The actual reference to the PWM module (u_1^*) contains two parts:

1. Direct feed-forward of the low side DC-voltage U (LV) for fast transient control of the low side DC-voltage.
2. Cascaded PI-controllers for low-side DC-voltage U (LV) and low side DC-current I (LV). The integral-part of the U (LV) PI-controller ensures zero steady-state error and thereby provides for the low side DC-voltage steady-state accuracy.

The IGBT PWM trigger signals are generated from triangular carrier wave modulation including DC-link voltage shifting for on-line compensation of variation in the DC-link voltage (HV).

5.1.4 DCU DC-link voltage controller U (HV)

The block diagram of the DCU high side DC-link voltage U (HV) controller is shown in Fig. 27.

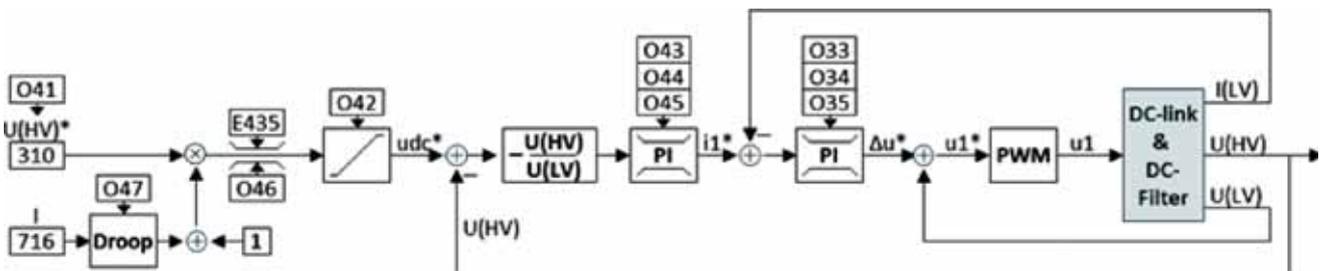


Fig. 27 Block diagram of DCU high side DC-link voltage controller U (HV).

The high side DC-link voltage reference value [310] (Process Reference) is set according to the normal procedure from the [214] selection, i.e. Remote, Keyboard, Com or Option. If [214] is selected to Option then the reference is set from [O41 U (HV) Ref].

The high side DC-link voltage droop controller adjusts the voltage reference based on the actual LV-side output current (I), i.e. provides for load sharing. The principle function of the voltage droop control is shown in Fig. 28.

In Fig. 28, it can be seen that at 100% output current (related to the LV-side nominal DC current) the internal voltage reference is adjusted according to the value of the voltage droop controller gain [O47].

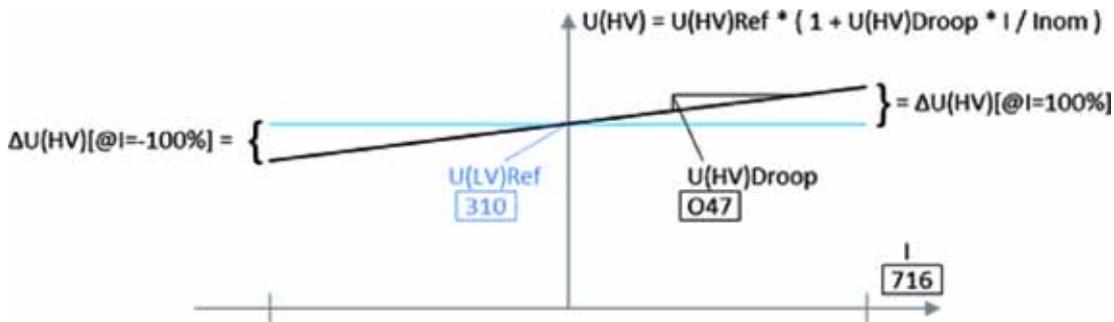


Fig. 28 High side DC-link voltage droop control.

The adjusted high side DC-link voltage reference is then limited (lower margin via [O46] and absolute max via [E435 Inverter Umax]) and the rate of change is limited by a ramping function with ramp time defined in parameter [O42].

The actual reference to the PWM module ($u1^*$) contains two parts:

1. Direct feed-forward of the low side DC-voltage U (LV) for fast transient control of the high side DC-link voltage.
2. Cascaded PI-controllers for high-side DC-link voltage U (HV) and low side DC-current I (LV). The integral-part of the U (HV) PI-controller ensures zero steady-state error and thereby provides for the high side DC-link voltage steady-state accuracy.

The IGBT PWM trigger signals are generated from triangular carrier wave modulation including DC-link voltage shifting for on-line compensation of variation in the DC-link voltage (HV).

5.1.5 DCU main/pre-charge contactors controller

The optional pre-charge circuitry including main and pre-charge contactors is controlled from the DCU. Note that the pre-charge is always closed prior to closing the main contactor during connection and that the main contactor is always opened prior to the opening of the pre-charge contactor during disconnection.

Three different operating modes for the pre-charge circuit for connecting and disconnecting the DC- load, i.e. VSI or battery, are available:

1. At power on, i.e. the DC-load is connected immediately after charge up of the DC-link.
2. At run command, i.e. the DC-load is connected immediately prior to the start of DCU operation and disconnected immediately after the DCU is stopped. This mode requires a few seconds delay from run command to the actual start of switching in order to close the pre-charge and main contactors in a controlled way before the DCU starts.
3. After ramping of the low side DC-voltage, i.e. the DC-load is connected first after the DCU has controlled the low side DC-voltage to the reference value. The DC-load is disconnected immediately after the DCU is stopped.

It should be noted that this operating mode is only applicable to the DCU (LV) configuration.

The state-machine for the pre-charge control is shown in Fig. 29.

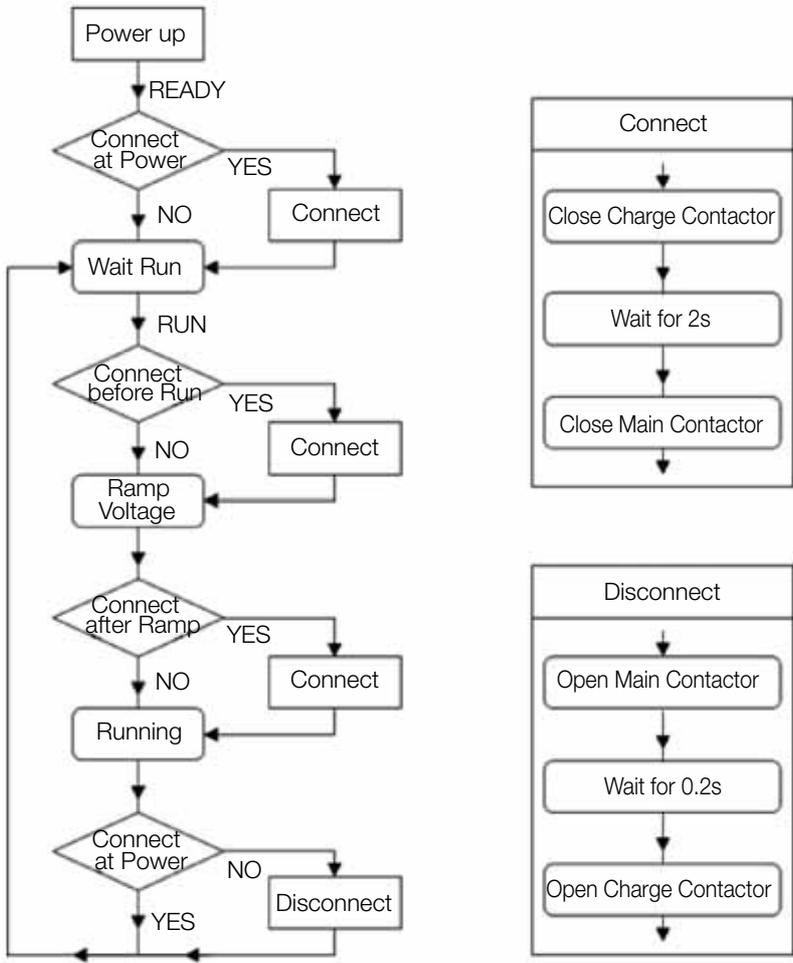


Fig. 29 State-machine for the main/pre-charge contactors.

6. Communication

The DCU provides possibility for different types of communication:

- Galvanic isolated Modbus RTU via RS-485 interface on X1 terminal on control board. See “3.2 Control connection” on page 14.
- Modbus RTU via RS-232 interface behind the control panel (not galvanic isolated).
- Wireless interfaces provided by the connected control panel.
 - Control panel with WiFi (optional) provides Modbus/TCP.
 - Control panel with BLE (optional) enables connectivity with mobile application.
- Fieldbuses as Profibus DP, DeviceNET and CANopen.
- Industrial Ethernet as Modbus/TCP, Profinet IO, EtherCAT, and EtherNet/IP.

For available communication options see “10. Options” on page 121.

6.1 Modbus RTU

Preferably use the isolated RS-485 interface for serial communication. This port is galvanically isolated. The protocol used for data exchange is based on the Modbus RTU protocol, originally developed by Modicon.

The DCU acts as a slave with selectable address in a master-slave configuration. The communication is half-duplex. It has a standard non return zero (NRZ) format.

The baud rate of the RS-485 interface is adjustable between 2400 to 115200.

The character frame format (always 11 bits) has:

- one start bit
- eight data bits
- two stop bits
- no parity

The DCU has also an asynchronous serial communication interface, RS-232, behind the control panel.

Please note that this port is not galvanically isolated.

It is possible to temporarily connect a personal computer with for example the software EmoSoftCom (programming and monitoring software) to the RS-232 connector on the control panel. This can be useful when copying parameters between DCUs etc. For permanent connection of a personal computer you have to use one of the communication option boards.

NOTE: This RS-232 port is not isolated.

NOTE: Communication Fault detection can cause the drive to give a warning or trip when the Control Panel is removed (see menus [2645] and [2646]), or when Control Panel port communication is faulty (see menus [2647] and [2648]).



WARNING!

Correct and safe use of a RS-232 connection depends on the ground pins of both ports being the same potential.

Problems can occur when connecting two ports of e.g. machinery and computers where both ground pins are not the same potential. This may cause hazardous ground loops that can destroy the RS-232 ports.

The RS-232 connection behind the control panel is not galvanically isolated.

Note that the control panel RS-232 connection can safely be used in combination with commercial available isolated USB to RS-232 converters.

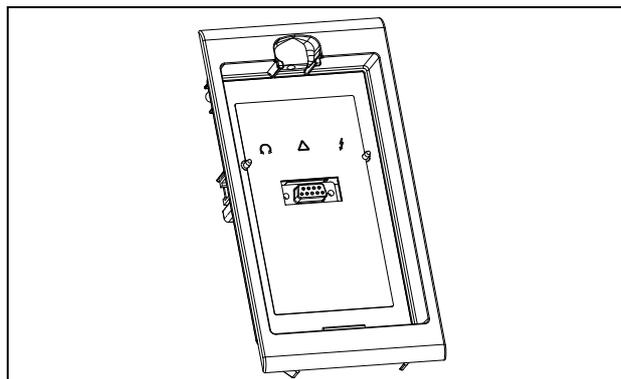


Fig. 30 RS-232 connector behind the control panel.

6.2 Parameter sets

Communication information for the different parameter sets.

The different parameter sets in the DCU have the following DeviceNet instance numbers, Profibus slot/index numbers, Profinet IO index and EtherCAT index numbers:

Param. set	Modbus/ DeviceNet Instance number	Profibus Slot/Index	Profinet IO index	EtherCAT and CANopen index (hex)
A	43001–43899	168/160 to 172/38	19385 - 20283	4bb9 - 4f3b
B	44001–44899	172/140 to 176/18	20385 - 21283	4fa1 - 5323
C	45001–45899	176/120 to 179/253	21385 - 22283	5389 - 5706
D	46001–46899	180/100 to 183/233	22385 - 23283	5771 - 5af3

Parameter set A contains parameters 43001 to 43899. The parameter sets B, C and D contains the same type of information. For example parameter 43123 in parameter set A contain the same type of information as 44123 in parameter set B.

6.3 Start and stop commands

Set start and stop commands via serial communication.

Modbus/DeviceNet Instance number	Function
42901	Reset
42902	Run, active together with either RunR or RunL to perform start.
42903	RunR
42904	RunL

Note! Bipolar reference mode is activated if both RunR and RunL is active.

6.4 Reference signal

When menu “Reference Control [214]” is set to “Com” the following parameter data should be used:

Default	0
Range	-16384 to 16384
Corresponding to	-100% to 100% ref

Communication information

Modbus /DeviceNet Instance number	42905
Profibus slot /Index	168/64
EtherCAT index (hex)	4b59
Profinet IO index	19289
Fieldbus format	Int
Modbus format	Int

6.4.1 Process value

It is also possible to send the Process value feedback signal over a bus (e.g. from a process or temperature sensor) for use with PID Process controller [380].

Set menu “Process Source [321]” to F(Bus). Use following parameter data for the process value:

Default	0
Range	-16384 to 16384
Corresponding to	-100% to 100% process value

Communication information

Modbus /DeviceNet Instance number	42906
Profibus slot /Index	168/65
EtherCAT index (hex)	4b5a
Profinet IO index	19290
Fieldbus format	Int
Modbus format	Int

Example

See Emotron Fielbus manual for detailed information.

We would like to control the DCU over a bus system using the first two bytes of the Basic Control Message by setting menu “[2661] FB Signal 1” to 49972. Further, we also want to transmit a 16 bit signed reference and a 16 bit process value. This is done by setting menu “[2662] FB Signal 2” to 42905 and menu “[2663] FB Signal 3” to 42906.

Note! It is possible to view the transmitted process value in control panel menu Operation [710]. The presented value is depending on settings in menus “Process Min [324]” and “Process Max [325]”.

6.5 Description of the EInt formats

Eint is only used with Modbus-RTU and Modbus-TCP protocols.

A parameter with Eint format can be represented in two different formats (F). Either as a 15 bit unsigned integer format (F= 0) or a Emotron floating point format (F=1). The most significant bit (B15) indicates the format used. See detailed description below.

All parameters written to a register may be rounded to the number of significant digits used in the internal system.

The matrix below describes the contents of the 16-bit word for the two different EInt formats:

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
F=1	e3	e2	e1	e0	m10	m9	m8	m7	m6	m5	m4	m3	m2	m1	m0
F=0	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0

If the format bit (B15) is 0, then all bits may be treated as a standard unsigned integer (UInt)

If the format bit is 1, then is the number interpreted as this:

Value = M * 10^E, where M=m10..m0 represents a two- complement signed mantissa and E= e3..e0 represents a two- complement signed exponent.

NOTE: Parameters with EInt format may return values both as 15 bit unsigned int (F=0) or in Emotron floating point (F=1).

Example, resolution

If you write the value 1004 to a register and this register has 3 significant digits, it will be stored as 1000.

In the Emotron floating point format (F=1), one 16-bit word is used to represent large (or very small numbers) with 3 significant digits.

If data is read or written as a fixed point (i.e. no decimals) number between 0-32767, the 15 bit Unsigned integer format (F=0) may be used.

Detailed description of Emotron floating point format

e3-e0 4-bit signed exponent. Gives a value range:
 -8..+7 (binary 1000 .. 0111)
 m10-m0 11-bit signed mantissa.Gives a value range:
 -1024..+1023 (binary 10000000000..01111111111)

A signed number should be represented as a two complement binary number, like below:

Value Binary

-8	1000
-7	1001
..	
-2	1110
-1	1111
0	0000
1	0001
2	0010
..	
6	0110
7	0111

The value represented by the Emotron floating point format is m·10^e.

To convert a value from the Emotron floating point format to a floating point value, use the formula above.

To convert a floating point value to the Emotron floating point format, see the C-code example below.

Example, floating point format

The number 1.23 would be represented by this in Emotron floating point format,

```
F EEEE MMMMMMMMMMMM
1 1110 00001111011
F=1 -> floating point format used
E=-2
M=123
```

The value is then 123x10⁻² = 1.23

Example 15bit unsigned int format

The value 72.0 can be represented as the fixed point number 72. It is within the range 0-32767, which means that the 15-bit fixed point format may be used.

The value will then be represented as:

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0

Where bit 15 indicates that we are using the fixed point format (F=0).

Programming example:

```
typedef struct
{
    int m:11; // mantissa, -1024..1023
    int e: 4; // exponent -8..7
    unsigned int f: 1; // format, 1->special emoint format
}    eint16;
//-----
unsigned short int float_to_eint16(float value)
{
    eint16 etmp;
    int dec=0;

    while (floor(value) != value && dec<16)
    {
        dec++; value*=10;
    }
    if (value>=0 && value<=32767 && dec==0)
        *(short int *)&etmp=(short int)value;
    else if (value>=-1000 && value<0 && dec==0)
    {
        etmp.e=0;
        etmp.f=1;
        etmp.m=(short int)value;
    }
    else
    {
        etmp.m=0;
        etmp.f=1;
        etmp.e=-dec;
        if (value>=0)
            etmp.m=1; // Set sign
        else
            etmp.m=-1; // Set sign
        value=fabs(value);
        while (value>1000)
        {
            etmp.e++; // increase exponent
            value=value/10;
        }
        value+=0.5; // round
        etmp.m=etmp.m*value; // make signed
    }
    return (*(unsigned short int *)&etmp);
}
//-----
float eint16_to_float(unsigned short int value)
{
    float f;
    eint16 evalue;

    evalue=*(eint16 *)&value;
    if (evalue.f)
    {
        if (evalue.e>=0)
            f=(int)evalue.m*pow10(evalue.e);
        else
            f=(int)evalue.m/pow10(abs(evalue.e));
    }
    else
        f=value;

    return f;
}
//-----
```

7. Operation via the Control Panel

This chapter describes how to use the control panel. The DCU can be delivered with a control panel or a blank panel.

7.1 General

The control panel displays the status of the DCU and is used to set all the parameters. It is also possible to control the motor directly from the control panel. The control panel can be built-in or located externally via serial communication. The DCU can be ordered without the control panel. Instead of the control panel there will be a blank panel.

NOTE: The DCU can run without the control panel being connected. However the settings must be such that all control signals are set for external use.

7.2 Control panel with 4-line display

This control panel with 4-line display is equipped with real time clock function. This means that actual date and time will be shown at e.g. a trip condition. There is also an optional Control panel with Bluetooth communication available. See chapter 10. Options on page 121 for more information.

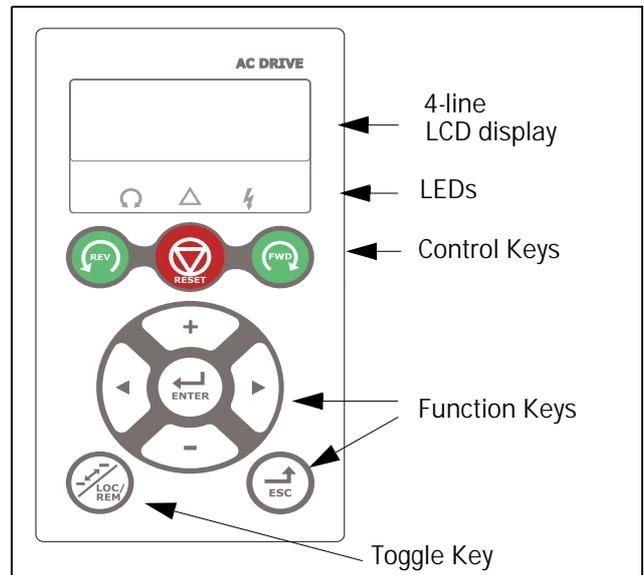


Fig. 31 Control panel with 4-line display, LEDs and Keys.

7.2.1 The display

The display is back lit and consists of 4 rows, each with space for 20 characters. The display is divided into following areas. The different areas in the display are described below:

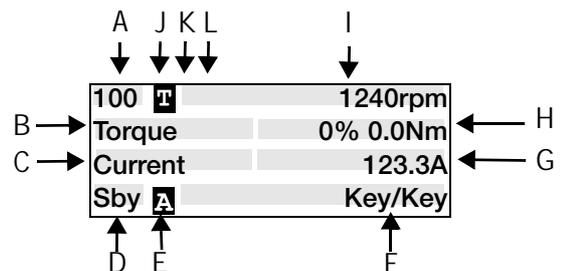


Fig. 32 The display.

Area A: Shows the actual menu number (3 or 4 digits).

Area B: Menu name or heading (Except in menus 100+ mode), 8 characters field.

Area C: Edit Cursor if editing or heading in menu [100], 8 characters field.

Area D *: Shows the status of the DCU (3 digits). The following status indications are possible:

Table 10

Digits	Description	Bit*
Stp	DCU is stopped	0
Run	DCU runs	1
Trp	Tripped	4
STO	Operating Safe Torque Off, flashing when activated	5
VL	Operating at voltage limit	6
CL	Operating at current limit	8
OT	Operating at temperature limit	10
LV	Operating at low voltage	12
Sby	Operating from Standby power supply	13
LCL	Operating with low cooling liquid level	14
Slp	Sleep mode	15

*) The status shown in Area D on the control panel can be read via a fieldbus or serial communication, e.g. using Modbus address no 30053, see [72B] in Chapter 12. page 129.

It is also possible to read all status indications, not just the highest prioritized one, via a fieldbus or serial communication, e.g. using Modbus address no 30180 and 30182. This information is also shown in EmoSoftCom PC-tool (optional) see menu "Area D stat [72B]". Area I:Active Motor set M1 - M4 (Set in menu [212]).

Area E: Shows active parameter set: **A**, **B**, **C**, or **D** [72B].

Area F: Active control source.

Area G: Parameter value, shows the setting or selection in the active menu, 12 characters field.

This area is empty at the 1st level and 2nd level menu. This area also shows warnings and alarm messages. In some situations this area could indicate "+++" or "---" see further information in the Instruction manual.

Area H: Signal values shown in menu [100], 12 characters field.

Area I: Preferred read-out value (chosen in menu [110])

Area J: Shows if the menu is in the toggle loop and/or the DCU is set for Local operation.

T = in Toggle loop

L T = in Local operation and Toggle loop

L = Local operation

Area K: First row character 7 show an inverted **B** in case a Bluetooth connection is active.

Area L: First row character 8 show a WiFi symbol in case a WiFi connection is active.

NOTE:

In area B and area C only 8 characters are available, this means that some texts will be shortened.

7.2.2 Menu [100] Start Window

This menu is displayed at every power-up. During operation, the menu [100] will automatically be displayed when the keyboard is not operated for 5 minutes.

Menu “[100] Start Window” displays the settings made in menu “[110], 1st line”, “[120], 2nd line” and “[130], 3rd line”.

100	T	1240rpm	← First line - set in Menu [110].
Torque		0% 0.0Nm	← Second line - set in Menu [120].
Current		123.3A	← Third line - set in Menu [130].
Sby	A	Key/Key	

Extended signal monitoring

If you hold the  key when in menu [100] following window will appear, as long as the key is pressed.

Here First, Second and Third line are shown as selected in menu [100].

Then additional information will be displayed, selected in the menus [140], [150] and [160] according to below.

100	T	0rpm	← First line - set in Menu [110].
3.9V		0.0A	← Second line - set in Menu [120].
0.0°C		0.0Hz	← Third line - set in Menu [130].
Sby	A	A/Rem/Rem/--	← Fourth line - set in Menu [140].
			← Fifth line - set in Menu[150].
			← Sixth line - set in Menu[160]

Use menu “[170] View mode” to select active type of menu [100] presentation, select if “Normal 100” or “Always 100+” Extended signal monitoring” shall be shown at power-up. A third choice is menu “Normal100wo” = menu [100] without explaining text at second and third line.

7.2.3 Editing mode

All other menus (read and read/write menus) are used in following way.

221	T	1240rpm	← Shows Menu number to the left and to the right signal selected in menu [110].
Motor Volts			← Shows menu name to the left
M1		380V	← Shows menu value to the right and if it is a Motor parameter active Motor set (M1 in this case) is displayed to the left.
Run	A	Key/Key	← Shows Drive status/Parameter set and Control source as in menu [100]

During editing, preferred view will not be displayed and the cursor will appear blinking to the left. See also below.

211	T		← Preferred view is not shown during editing.
Language		English	←  = blinking during editing
Run	A	Loc/Loc	

7.2.4 Fault logger

As real-time clock is available, line 2 will show trip/warning message and line three will show date and time when the trip condition occurred.

810	1240rpm
Ext trip	
2017-01-25	12:34.40
Run	Rem/Rem

7.2.5 Real Time clock

In this 4-line Control panel there is a built in Real time clock. This means that actual date and time will be shown at e.g. a trip condition. There is a built-in capacitor to be able to keep the clock running if the power disappears.

In case of loss of power, the backup time for the Real time clock function is at least 60 days. Actual date and time will be set from factory. However as the backup time is only around 60 days, it is recommended to set the Date and time during commissioning. Date and time is shown and can be set in following menus.

Clock [930]

This menu group displays actual time and date, read only. Time and date are factory set to CET (Central European mean time). Adjust if required in following sub-menus.

930	1240rpm
Clock	
2017-01-23	12:34.40
Run	Key/Key

Time [931]

Actual time, displayed as HH:MM:SS. Adjustable setting.

931	1240rpm
Time	
	12:34.40
Run	Key/Key

Unit	hh:mm:ss (hours: minutes: seconds)
------	------------------------------------

Date [932]

Actual date, displayed as YYYY-MM-DD. Adjustable setting.

932	1240rpm
Date	
	2017-01-23
Run	Key/Key

Unit:	YYYY-MM-DD (year-month-day)
-------	-----------------------------

Weekday [933]

Display of actual weekday, read only.

933	1240rpm
Weekday	
	Monday
Run	Key/Key

7.2.6 LED indicators

The symbols on the control panel have the following functions:

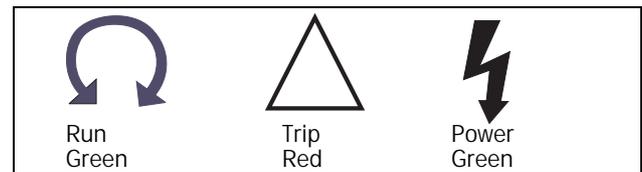


Fig. 33 LED indications.

Table 11 LED indication

Symbol	Function		
	ON	FLASHING	OFF
POWER (green)	Power on	-----	Power off
TRIP (red)	Tripped	Warning/Limit	No warning or trip
RUN (green)	Motor shaft rotates	Motor speed increase/decrease	Motor stopped

7.2.7 Control keys

The control keys are used to give the Run, Stop or Reset commands directly. As default these keys are disabled, set for remote control. Activate the control keys by selecting Keyboard in the menus “Ref Control [214]”, “Run/Stop Control [215]” and “Reset Ctrl [216]”.

If the Enable function is programmed on one of the digital inputs, this input must be active to allow Run/Stop commands from the control panel.

Table 12 Control keys

	RUN L	gives a start with left rotation
	STOP/RESET	stops or resets
	RUN R	gives a start with right rotation

NOTE: It is not possible to simultaneously activate the Run/Stop commands from the keyboard and remotely from the terminal strip (terminals 1-22).

7.2.8 The Toggle and Loc/Rem Key



This key has two functions: Toggle and switching between Loc/Rem function.

Press one second to use the toggle function

Press and hold the toggle key for more than five seconds to switch between Local and Remote function, depending on the settings in [2171] and [2172].

When editing values, the toggle key can be used to change the sign of the value, see section 7.5, page 43.

Toggle function

Using the toggle function makes it possible to easily step through selected menus in a loop. The toggle loop can contain a maximum of ten menus. As default the toggle loop contains the menus needed for Quick Setup. You can use the toggle loop to create a quick-menu for the parameters that are most importance to your specific application.

NOTE: Do not keep the Toggle key pressed for more than five seconds without pressing either the +, - or Esc key, as this may activate the Loc/Rem function of this key instead. See menu [217].

Add a menu to the toggle loop

1. Go to the menu you want to add to the loop.
2. Press the Toggle key and keep it pressed while pressing the + key.

Delete a menu from the toggle loop

1. Go to the menu you want to delete using the toggle key.
2. Press the Toggle key and keep it pressed while pressing the - key.

Delete all menus from the toggle loop

1. Press the Toggle key and keep it pressed while pressing the Esc key.
2. Confirm with Enter.

Default toggle loop

Fig. 34 shows the default toggle loop. This loop contains the necessary menus that need to be set before starting. Press Toggle to enter menu [211] then use the Next key to enter the sub menus [212] to [21A] and enter the parameters. When you press the Toggle key again, menu [221] is displayed.

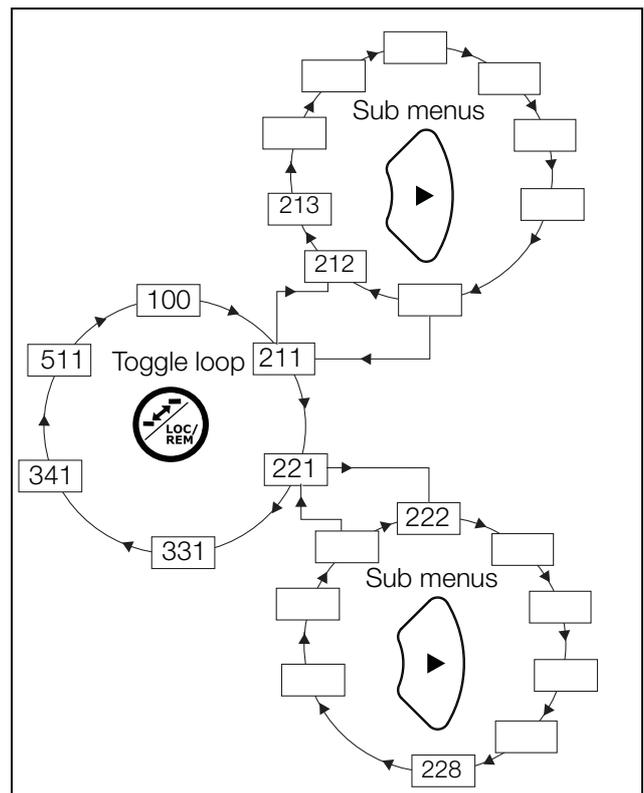


Fig. 34 Toggle loop example.

Indication of menus in toggle loop

Menus included in the toggle loop are indicated with a **T** in area B in the display.

Loc/Rem function

The Loc/Rem function of this key is disabled as default. Enable the function in menu [2171] and/or [2172].

With the function Loc/Rem you can change between local and remote control of the DCU from the control panel. The function Loc/Rem can also be changed via the DigIn, see menu "Digital inputs [520]".

Change control mode

1. Press the Loc/Rem key for five seconds, until Local? or Remote? is displayed.
2. Confirm with Enter.
3. Cancel with Esc.

Local mode

Local mode is used for temporary operation. When switched to LOCAL operation, the DCU is controlled via the defined Local operation mode, i.e. [2171] and [2172]. The actual status of the DCU will not change, e.g. Run/Stop conditions and the actual speed will remain exactly the same. When the DCU is set to Local operation, the display will show **T** in area B in the display.

Remote mode

When the DCU is switched to REMOTE operation, the DCU will be controlled according to selected control methods in the menu's "Reference Control [214]", "Run/Stop Control [215]" and "Reset Control [216]". To monitor the actual Local or Remote status of the DCU control, a "Loc/Rem" signal is available on the Digital Outputs or Relays. When the DCU is set to Local, the signal on the DigOut or Relay will be active/high, in Remote the signal will be inactive/low. See menu "Digital Outputs [540]" and "Relays [550]".

7.2.9 Function keys

The function keys operate the menus and are also used for programming and read-outs of all the menu settings.

Table 13 Function keys

	ENTER key:	<ul style="list-style-type: none"> - step to a lower menu level - confirm a changed setting
	ESCAPE key:	<ul style="list-style-type: none"> - step to a higher menu level - ignore a changed setting, without confirming
	PREVIOUS key:	<ul style="list-style-type: none"> - step to a previous menu within the same level - go to more significant digit in edit mode
	NEXT key:	<ul style="list-style-type: none"> - step to a next menu within the same level - go to less significant digit in edit mode
	- key:	<ul style="list-style-type: none"> - decrease a value - change a selection
	+ key:	<ul style="list-style-type: none"> - increase a value - change a selection
	TOGGLE and LOC/REM key:	<ul style="list-style-type: none"> - Toggle between menus in the toggle loop - Switching between local and remote control - Change the sign of a value

7.3 The menu structure

The menu structure consists of 4 levels:

Main Menu 1st level	The first character in the menu number.
2nd level	The second character in the menu number.
3rd level	The third character in the menu number.
4th level	The fourth character in the menu number.

This structure is consequently independent of the number of menus per level.

For instance, a menu can have one selectable menu (Set/View Reference Value [310]), or it can have 17 selectable menus (menu Speeds [340]).

NOTE: If there are more than 10 menus within one level, the numbering continues in alphabetic order.

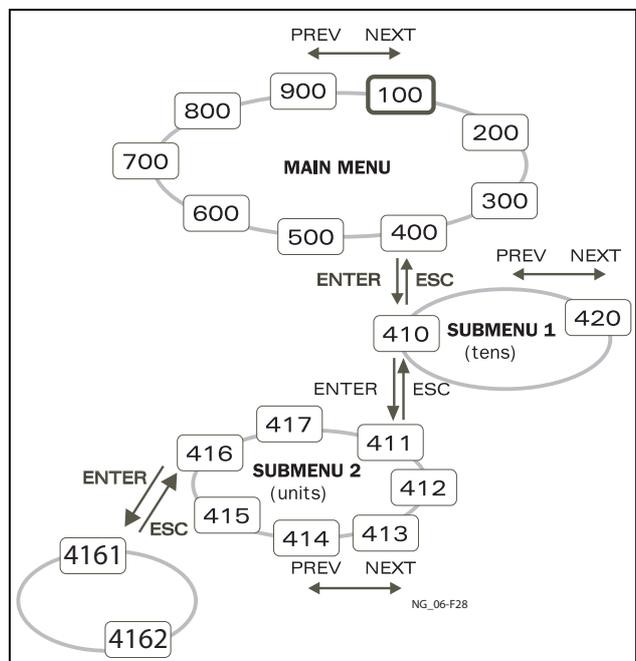


Fig. 35 Menu structure.

7.3.1 The main menu

This section gives you a short description of the functions in the Main Menu.

For Emotron VFX and FDU refer to the standard instruction manual.

100 Start Window

Displayed at power-up. It displays the actual process value as default. Programmable for many other read-outs.

200 Main Setup

Main settings to get the DCU operable. The motor data settings are the most important. Also option utility and settings.

300 Process and Application Parameters

Settings more relevant to the application such as Reference Speed, torque limitations, PID control settings, etc.

500 Inputs/Outputs and Virtual Connections

All settings for inputs and outputs are entered here.

600 Logical Functions and Timers

All settings for conditional signals are entered here.

700 View Operation and Status

Viewing all the operational data like frequency, load, power, current, etc.

800 View Trip Log

Viewing the last 10 trips in the trip memory.

900 System data

Electronic type label for viewing the software version and DCU type.

000 DCDC option

Main DCU specific settings and configuration parameters.

7.4 Programming during operation

Most of the parameters can be changed during operation without stopping the DCU. Parameters that can not be changed are marked with a lock symbol in the display.

NOTE: If you try to change a function during operation that only can be changed when the motor is stopped, the message "Stop First" is displayed.

7.5 Editing values in a menu

Most values in the third row in a menu can be changed in two different ways. Enumerated values like the baud rate can only be changed with alternative 1.

2621	T	0rpm
Baudrate		
		38400
Stp	A	Key/Key

Alternative 1

When you press the + or - keys to change a value, the cursor is flashing to the left in the display and the value is increased or decreased when you press the appropriate key. If you keep the + or - keys pressed, the value will increase or decrease continuously. When you keep the key pressed the change speed will increase. The Toggle key is used to change the sign of the entered value. The sign of the value will also change when zero is passed. Press Enter to confirm the value.

331	T	0rpm
Acc Time		
		10.0s
Stp	A	Key/Key

Alternative 2

Press the + or - key to enter edit mode. Then press the Prev or Next key to move the cursor to the right most position of the value that should be changed. The cursor will make the selected character flashes. Move the cursor using the Prev or Next keys. When you press the + or - keys, the character at the cursor position will increase or decrease. This alternative is suitable when you want to make large changes, i.e. from 2 s to 400 s.

To change the sign of the value, press the toggle key. This makes it possible to enter negative values (Only valid for certain parameters).

Example: When you press Next the 4 will flash.

331	T	0rpm
Acc Time		
		10.0s ← Flashing
Stp	A	Key/Key

Press Enter to save the setting and Esc to leave the edit mode.

7.6 Copy current parameter to all sets

When a parameter is displayed, press the Enter key for 5 seconds. Now the text To all sets? is displayed. Press Enter to copy the setting for current parameter to all sets.

7.7 Programming example

This example shows how to program a change of the Acc. Time set from 10.0 s to 12.0 s.

The flashing cursor indicates that a change has taken place but is not saved yet. If at this moment, the power fails, the change will not be saved. Use the ESC, Prev, Next or the Toggle keys to proceed and to go to other menus.

<div> <p>100 T 0rpm Torque 0% 0.0Nm Current 0.0A Stp A Key/Key</p> </div>	Menu 100 appears after power-up.
<div> </div>	Press "Next" key for menu [200].
<div> <p>200 T 0rpm Main setup Stp A Key/Key</p> </div>	
<div> </div>	Press "Next" key for menu [300].
<div> <p>300 T 0rpm Process Stp A Key/Key</p> </div>	
<div> </div>	Press "Enter" key for menu [310].
<div> <p>310 T 0rpm Set/View ref 0rpm Stp A Key/Key</p> </div>	
<div> </div>	Press "Next" key twice for menu [330].

<div> <p>330 T 0rpm Start/Stop Stp A Key/Key</p> </div>	
<div> </div>	Press "Enter" for menu [331].
<div> <p>331 T 0rpm Acc Time 10.0s Stp A Key/Key</p> </div>	
<div> </div>	Press "+" key
<div> <p>331 T 0rpm Acc Time 12.0s Stp A Key/Key</p> </div>	Keep "+" key pressed until desired value has been reached.
<div> </div>	Save the changed value by pressing "Enter" key.
<div> <p>331 T 0rpm Acc Time 12.0s Stp A Key/Key</p> </div>	

Fig. 36 Programming example

8. Functional description

This chapter describes the menus and parameters in the software. See chapter 7.2 Control panel with 4-line display page 37 in chapter Operation for detailed information about the Control panel.

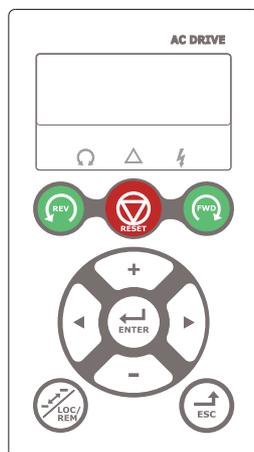


Fig. 37 LCD display

8.1 Menus

Following chapters describes the menus and parameters in the software. You will find a short description of each function and information about default values, ranges, etc. There are also tables containing communication information. You will find the parameter number for all available fieldbus options as well as the enumeration for the data.

On our home page in the download area, you could find a "Communication information" list and a list to note "Parameter set" information.

NOTE: Functions marked with the sign  cannot be changed during Run Mode.

8.1.1 Description of menu table layout

Following two kinds of tables are used in this chapter.

332 ②	 ①	Dec Time ③
Default:		④
⑤	⑥	⑦

222 ②	 ①	Motor Freq ③
Default:		50 Hz ④
Range:		20.0 - 300.0 Hz
Resolution		⑦

1. Parameter cannot be changed during operation.
2. Parameter only for viewing.
3. Menu information as displayed on control panel. For explanation of display text and symbols, see chapter 7. Operation via the Control Panel page 37.
4. Factory setting of parameter (also showed on display).
5. Available settings for the menu, listed selections.
6. Communication integer value for the selection. For use with communication bus interface (only if selection type parameters).
7. Description of selection alternative, setting or range (min - max value).

8.1.2 Resolution of settings

The resolution for all range settings described in this chapter is 3 significant digits. Exceptions are speed values which are presented with 4 significant digits. table 14 shows the resolutions for 3 significant digits.

Table 14

3 Digit	Resolution
0.01-9.99	0.01
10.0-99.9	0.1
100-999	1
1000-9990	10
10000-99900	100

8.1.3 1st Line [110]

Sets the content of the first line in the menu “[100] Start Window”.

110		1st Line
Default:		Process Val
Dependent on menu		
Process Val	0	Process value
Process Ref	3	Process reference
EI Power	5	Electrical power
Current	6	Current
Output volt	7	Output voltage
DC Voltage	9	DC voltage
IGBT Temp	10	IGBT temperature
VSD Status	12	DCU status
Run Time	13	Run Time
Energy	14	Energy
Mains Time	15	Mains time
Unit Name	17	Unit name
Time	18	Time
Date	19	Date

2nd Line [120]

Sets the content of the second line in the menu “[100] Start Window”. Same selection as in menu [110].

120		2nd Line
Default:		Current

3rd Line [130]

Sets the content of the third line in the menu “[100] Start Window”. Same selection as in menu [110].

130		3rd Line
Default:		Output Volt

4th Line [140]

Sets the content of the fourth line in the menu “[100] Start Window”. Same selection as in menu [110].

140		4th Line
Default:		VSD Status

5th Line [150]

Sets the content of the fifth line in the menu “[100] Start Window”. Same selection as in menu [110].

150		5th Line
Default:		DC Voltage

6th Line [160]

Sets the content of the sixth line in the menu “[100] Start Window”. Same selection as in menu [110].

160		6th Line
Default:		IGBT Temp

View mode [170]

Select how menu [100] shall be displayed.

170		View mode
Default:		Always 100+
Normal 100		Preferred view as set in menu 110, 120, 130
Always 100+		Extended signal monitoring as set in menus 110 - 160
Normal 100wo		As Normal 100 without text at second and third lines.

8.2 Main Setup [200]

The Main Setup menu contains the most important settings to get the DCU operational and set up for the application. It includes different sub menus concerning the control of the unit, motor data and protection, utilities and automatic resetting of faults. This menu will instantaneously be adapted to build in options and show the required settings.

8.2.1 Operation [210]

Selections concerning the used motor, DCU mode, control signals and serial communication are described in this submenu and is used to set the DCU up for the application.

Language [211]

Select the language used on the LC Display. Once the language is set, this selection will not be affected by the Load Default command.

211 Language		
Default:		English
English	0	English selected
Svenska	1	Swedish selected
Nederlands	2	Dutch selected
Deutsch	3	German selected
Français	4	French selected
Español	5	Spanish selected
Русский	6	Russian selected
Italiano	7	Italian selected
Česky	8	Czech selected
Turkish	9	Turkish selected
Polski	11	Polish selected

Reference control [214]

To control the speed of the motor, the DCU needs a reference signal. This reference signal can be controlled by a remote source from the installation, the keyboard of the DCU, or via communication (RS485, Fieldbus, or Wireless interfaces). Select the required reference control for the application in this menu.

214 Ref control		
Default:		Option
Remote	0	The reference signal comes from the analogue inputs of the terminal strip (terminals 1-22).
Keyboard	1	Reference is set with the + and - keys on the Control Panel. Can only be done in menu "Set/View reference [310]".
Com	2	The reference is set via communication (RS485, Fieldbus, or Wireless interfaces).
Option	3	This sets the process reference value from the corresponding reference value for the active operation mode, i.e. the process reference [310] is [310] = [O21], if [321] = U (LV) Mode [310] = [O31], if [321] = I (LV) Mode [310] = [O41], if [321] = U (HV) Mode

NOTE: Selection Option enables true on-the-fly operation mode change, since the actual reference value is updated simultaneously.

Run/Stop Control [215]

This function is used to select the source for run and stop commands.

215 Run/Stp Ctrl		
Default:		Keyboard
Remote	0	The start/stop signal comes from the digital inputs of the terminal strip (terminals 1-22). For settings, see menu group [520].
Keyboard	1	Start and stop is set on the Control Panel.
Com	2	The start/stop is set via communication, i.e. via RS485, Fieldbus, or wireless interface. See Fieldbus or RS-232/485 option manual for details.

Reset Control [216]

When the DCU is stopped due to a failure, a reset command is required to make it possible to restart the DCU. Use this function to select the source of the reset signal.

216		Reset Ctrl
Default:		Remote+Keyb
Remote	0	The command comes from the inputs of the terminal strip (terminals 1-22).
Keyboard	1	The command comes from the command keys of the Control Panel.
Com	2	The command comes from communication (RS485, Fieldbus, wireless).
Remote + Keyb	3	The command comes from the inputs of the terminal strip (terminals 1-22) or the keyboard.
Com + Keyb	4	The command comes from communication (RS485, Fieldbus, wireless) or the keyboard.
Rem+Keyb +Com	5	The command comes from the inputs of the terminal strip (terminals 1-22), the keyboard or communication (RS485, Fieldbus, wireless).

Local/Remote key function [217]

The Toggle key on the keyboard, see section 7.2.8, page 41, has two functions and is activated in this menu. As default the key is just set to operate as a Toggle key that moves you easily through the menus in the toggle loop. The second function of the key allows you to easily swap between Local and normal operation (set up via [214] and [215]) of the DCU Local mode can also be activated via a digital input. If both [2171] and [2172] is set to Standard, the function is disabled.

2171		LocRefCtrl
Default:		Standard
Standard	0	Local reference control set via [214]
Remote	1	Local reference control via remote
Keyboard	2	Local reference control via keyboard
Com	3	Local reference control via communication

2172		LocRunCtrl
Default:		Standard
Standard	0	Local Run/Stop control set via [215]
Remote	1	Local Run/Stop control via remote
Keyboard	2	Local Run/Stop control via keyboard
Com	3	Local Run/Stop control via communication

Lock Code? [218]

To prevent the keyboard being used or to change the setup of the DCU and/or process control, the keyboard can be locked with a password. This menu, "Lock Code [218]", is used to lock and unlock the keyboard. Enter the password "291" to lock/unlock the keyboard operation. If the keyboard is not locked (default) the selection "Lock Code?" will appear. If the keyboard is already locked, the selection "Unlock Code?" will appear.

When the keyboard is locked, parameters can be viewed but not changed. The reference value can be changed and the DCU can be started, stopped and reversed if these functions are set to be controlled from the keyboard.

218		Lock code?
Default:		0
Range:		0-9999

Remote Signal Level/Edge [21A]

In this menu you select the way to control the inputs for RunR, RunL and Reset that are operated via the digital inputs on the terminal strip. The inputs are default set for level-control, and will be active as long as the input is made and kept high. When edge-control is selected, the input will be activated by the low to high transition of the input.

21A		Level / Edge
Default:		Level
Level	0	The inputs are activated or deactivated by a continuous high or low signal. Is commonly used if, for example, a PLC is used to operate the DCU.
Edge	1	The inputs are activated by a transition; for Run and Reset from "low" to "high" and for Stop from "high" to "low".



CAUTION!

Level controlled inputs **DO NOT** comply with the Machine Directive if the inputs are directly used to start and stop the machine.

Supply Type [21C]

Set supply voltage type.

21C		Supply Type
Default:		AC Supply
AC Supply	0	Normal AC supply
AFE Supply	1	DC supply voltage by AFE
DC Supply	2	DC supply voltage
AC/DC Suppl	3	AC/DC supply voltage

When changing to / from the "AFE Supply" selection, the following parameters are set to following values:

Menu	to AFE	from AFE
[523] DigIn 3	Sleep	Off
[542] DigOut 3	Run	Brake
[527] DigIn 7	Off	Off
[561] VIO 1 Dest	External Trip	Off
[562] VIO 1 Source	!D1	Off
[6151] CD 1	DigIn 7	Run

Motor PWM [22E]

Menus for advanced setup of motor modulation properties (PWM = Pulse Width Modulation).

Note: Menus [22E1] - [22E3] are only visible if [22A] is set to "Advanced".

PWM Fswitch [22E1]

Set the PWM switching frequency reference of the DCU.

22E1		PWM Fswitch
Default:		3000 Hz
Range		3.00 - 6.00kHz
Resolution		0.01kHz

NOTE: At switching frequencies >3 kHz derating may become necessary.

NOTE: If the heat sink temperature gets too high the switching frequency is decreased to avoid tripping. This is done automatically in the DCU. The default switching frequency is 3 kHz.

PWM Mode [22E2]

22E2		PWM Mode
Default:		Standard
Standard	0	Standard
Sine Filt	1	Sine Filter mode for use with output Sine Filters

NOTE: Switching frequency is fixed when "Sine Filt" is selected. This means that it is not possible to control the switching frequency based on temperature.

PWM Random [22E3]

22E3		PWM Random
Default:		Off
Off	0	Random modulation is Off.
On	1	Random modulation is active. Random frequency variation range is $\pm 1/8$ of level set in [E22E1].

Udc filter [22E4]

Activating the Udc filter makes the drive less responsive to fast Udc changes. This can be useful to improve system stability when connected to a weak power grid but may reduce the dynamics of motor control.

22E4		Udc filter
Default:		Off
Off	0	The Udc filter is not active.
On	1	The Udc filter is active.

8.2.2 Thermal Protection [230]

Thermal Protection [234]

This menu selects active sensors for PTC motor protection and activates/deactivates PT100 motor protection. Select active PT100 sensors in menu [236]. The PTC sensor connected to the first board is activated if two boards are installed but only one PTC sensor is activated.

Only visible if one or two PTC/PT100 option boards are installed. The motor thermistors (PTC) must comply with DIN 44081/44082. Please refer to the manual for the PTC/PT100 option board.

234		Thermal Prot
Default:		Off
Off	0	PTC and PT100 motor protection are disabled.
1xPTC	1	Activates one PTC sensor.
PT100	2	Activates PT100 protection.
1xPTC+ PT100	3	Activate one PTC sensor and PT100 protection.
2xPTC	4	Activates two PTC sensors.
2xPTC+ PT100	5	Activates PTC sensors and PT100 protection.

NOTE: PTC option and PT100 selections can only be selected in menu [234] if one or two option boards are mounted.

NOTE: If you select the PTC option, the PT100 inputs as motor protection are ignored.

Motor Class [235]

Only visible if the PTC/PT100 option board is installed. Set the class of motor used. The trip levels for the PT100 sensor will automatically be set according to the setting in this menu.

235		Motor Class
Default:		F 140°C
A 100°C	0	
E 115°C	1	
B 120°C	2	
F 140°C	3	
F Nema 145°C	4	
H 165°C	5	

NOTE: This menu is only valid for PT 100.

PT100 Inputs [236]

Sets which of PT100 inputs (3 inputs per board) that should be used for thermal protection. Deselecting not used PT100 inputs on the PTC/PT100 option board in order to ignore those inputs, i.e. extra external wiring is not needed if port is not used.

236 PT100 Inputs		
Default:		PT100 1+2+3
PT100 1	1	Channel 1 used for PT100 protection
PT100 2	2	Channel 2 used for PT100 protection
PT100 1+2	3	Channel 1+2 used for PT100 protection
PT100 3	4	Channel 3 used for PT100 protection
PT100 1+3	5	Channel 1+3 used for PT100 protection
PT100 2+3	6	Channel 2+3 used for PT100 protection
PT100 1+2+3	7	Channel 1+2+3 used for PT100 protection
PT100 1-4	8	Channel 1 - 4 used for PT100 protection
PT100 1-5	9	Channel 1 - 5 used for PT100 protection
PT100 1-6	10	Channel 1 - 6 used for PT100 protection

NOTE: This menu is only active if PT100 is enabled in menu [234].

8.2.3 Parameter Set Handling [240]

There are four different parameter sets available in the DCU. These parameter sets can be used to set the DCU up for different processes or applications such as different motors used and connected, activated PID controller, different ramp time settings, etc.

A parameter set consists of all parameters with the exception of the Global parameters. The Global parameters are only able to have one value for all parameter sets.

Following parameters are Global: [211] Language, [217] Local Remote, [218] Lock Code, [220] Motor Data, [241] Select Set and [260] Serial Communication.

NOTE: Actual timers are common for all sets. When a set is changed the timer functionality will change according to the new set, but the timer value will stay unchanged.

Select Set [241]

Here you select the parameter set. Every menu included in the parameter sets is designated A, B, C or D depending on the active parameter set. Parameter sets can be selected from the keyboard, via the programmable digital inputs or via serial communication. Parameter sets can be changed during the run.

241 Select Set		
Default:		A
A	0	Fixed selection of one of the 4 parameter sets A, B, C or D.
B	1	
C	2	
D	3	
DigIn	4	Parameter set is selected via a digital input. Define which digital input in menu "[520] Digital inputs".
Com	5	Parameter set is selected via serial communication.
Option	6	The parameter set is set via an option. Only available if the option can control the selection.

The active set can be viewed with function [271] VSD status.

Copy Set [242]

This function copies the content of a parameter set into another parameter set.

242 Copy Set		
Default:		A>B
A>B	0	Copy set A to set B
A>C	1	Copy set A to set C
A>D	2	Copy set A to set D
B>A	3	Copy set B to set A
B>C	4	Copy set B to set C
B>D	5	Copy set B to set D
C>A	6	Copy set C to set A
C>B	7	Copy set C to set B
C>D	8	Copy set C to set D
D>A	9	Copy set D to set A
D>B	10	Copy set D to set B
D>C	11	Copy set D to set C

NOTE: The actual value of menu [310] will not be copied into the other set.

A>B means that the content of parameter set A is copied into parameter set B.

Load Default Values Into Set [243]

With this function three different levels (factory settings) can be selected for the four parameter sets. When loading the default settings, all changes made in the software are set to factory settings. This function also includes selections for loading default settings to the four different Motor Data Sets.

243 Default>Set		
Default:		A
A	0	Only the selected parameter set will revert to its default settings.
B	1	
C	2	
D	3	
ABCD	4	All four parameter sets will revert to the default settings.
Factory	5	All settings, except [211], [261] and [923], will revert to the default settings.

NOTE: Trip log hour counter and other VIEW ONLY menus are not regarded as settings and will be unaffected.

NOTE: If "Factory" is selected, the message "Sure?" is displayed. Press the + key to display "Yes" and then Enter to confirm.

Copy All Settings to Control Panel [244]

All the settings can be copied into the control panel including the motor data. Start commands will be ignored during copying.

244 Copy to CP		
Default:		No Copy
No Copy	0	Nothing will be copied
Copy	1	Copy all settings

NOTE: The actual value of menu [310] will not be copied into control panel memory set.

Load Settings from Control Panel [245]

This function can load all four parameter sets from the control panel to the DCU. Parameter sets from the source DCU are copied to all parameter sets in the target DCU i.e. A to A, B to B, C to C and D to D.

Start commands will be ignored during loading.

245 Load from CP		
Default:		No Copy
No Copy	0	Nothing will be loaded.
A	1	Data from parameter set A is loaded.
B	2	Data from parameter set B is loaded.
C	3	Data from parameter set C is loaded.
D	4	Data from parameter set D is loaded.
ABCD	5	Data from parameter sets A, B, C and D are loaded.

NOTE: Loading from the control panel will not affect the value in menu [310].

ComFlt Set [246]

This menu specifies the parameter set that should be loaded when a communication error occurs, if the communication fault mode is set to change parameter set (See menus [2641], [2643] and [2647]). The digital output / relay “ComFlt Set” is activated when a communication error changes the parameter set.

NOTE: Menu [241] must be set to “Com” (5) for this menu [246] to be active.

246  ComFlt Set		
Default:		Keep Last
A	0	Data from parameter set A is loaded.
B	1	Data from parameter set B is loaded.
C	2	Data from parameter set C is loaded.
D	3	Data from parameter set D is loaded.
DigIn	4	Parameter set is selected via a digital input. Define which digital input in menu [520] Digital inputs.
Keep Last	5	Do not change parameter set.

8.2.4 Trip Autoreset/Trip Conditions [250]

The benefit of this feature is that occasional trips that do not affect the process will be automatically reset. Only when the failure keeps on coming back, recurring at defined times and therefore cannot be solved by the DCU, will the unit give an alarm to inform the operator that attention is required.

For all trip functions that can be activated by the user you can select to control the motor down to zero speed according to set deceleration ramp to avoid water hammer.

Also see section 9.2, page 115.

Autoreset example

In an application it is known that the main supply voltage sometimes disappears for a very short time, a so-called “dip”. That will cause the DCU to trip an “Undervoltage alarm”. Using the Autoreset function, this trip will be acknowledged automatically.

- Enable the Autoreset function by making the reset input continuously high.
- Activate the Autoreset function in the menu [251], Number of trips.
- In menu [2525] Undervoltage, select the trip conditions that shall be allowed to be automatically reset by the Autoreset function, after the set delay time has expired.

Number of Trips [251]

Any number set above 0 activates the Autoreset. This means that after a trip, the DCU will restart automatically according to the number of attempts selected. No restart attempts will take place unless all conditions are normal.

If the Autoreset counter (not visible) contains more trips than the selected number of attempts, the Autoreset cycle will be interrupted. No Autoreset will then take place.

If there are no trips for more than 10 minutes, the Autoreset counter decreases by one.

If the maximum number of trips has been reached, the trip message hour counter (8x0 menu) is marked with an "A". Trip can be reset with a normal reset, but to re-activate the auto-reset functionality the auto-reset counter must be reset. This is done by de-activate the always high remote-reset input and then activate it again.

Example

- Number of allowed autoreset attempts [251]= 5.
- Within 10 minutes 6 trips occur.
- At the 6th trip there is no autoreset, because the autoreset counter is set to allow only 5 attempts to autoreset a trip.
- To reset the autoreset counter, de-activate the always high remote-reset input and then activate it again.
- The autoreset counter is now zeroed.

251 No of Trips	
Default:	0 (no Autoreset)
Range:	0–10 attempts

NOTE: An auto reset is delayed by the remaining ramp time.

Drive protection [252]

Over temperature [2521]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2521 Over temp	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

NOTE: An auto reset is delayed by the remaining ramp time.

Over volt D [2522]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2522 Over volt D	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

NOTE: An auto reset is delayed by the remaining ramp time.

Over volt G [2523]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2523 Over volt G	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Over volt [2524]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2524 Over volt	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Under voltage [2525]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2525 Under volt	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Over current F [2526]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2526 Over curr F	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Power Fault [2527]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2527 Power Fault	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Liquid cooling low level [2528]

Delay time starts counting when the fault disappears. When the time delay has elapsed, the alarm will be reset if the function is active.

2528 LC Level	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Motor protection [253]

PT100 [2535]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2535		PT100
Default:		Trip
Trip	0	The motor will coast
Deceleration	1	The motor will decelerate

PTC [2537]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2537		PTC
Default:		Off
Range:		Off, 1–3600 s (Off=0)

External Motor Temperature [253A]

Delay time starts counting when the fault disappears. When the time delay has elapsed, the alarm will be reset if the function is active.

253A		Ext MotTemp
Default:		Off
Range:		Off, 1–3600 s (Off=0)

Comm & I/O [254]

Communication Error [2541]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2541		Com Error
Default:		Off
Range:		Off, 1–3600 s (Off=0)

AnIn<Offset [2543]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2543		AnIn<Offset
Default:		Off
Range:		Off, 1–3600 s (Off=0)

External Trips [258]

External Trip 1 [2581]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2581		Ext Trip 1
Default:		Off
Range:		Off, 1–3600 s (Off=0)

External Trip 2 [2583]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2583		Ext Trip 2
Default:		Off
Range:		Off, 1–3600 s (Off=0)

External Trip 3 [2585]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2585		Ext Trip 3
Default:		Off
Range:		Off, 1–3600 s (Off=0)

External Trip 4 [2587]

Delay time starts counting when the fault is gone. When the time delay has elapsed, the alarm will be reset if the function is active.

2587		Ext Trip 4
Default:		Off
Range:		Off, 1–3600 s (Off=0)

8.2.5 Serial Communication [260]

The integrated RS485 interface on terminal X1: A+ and B- will always be enabled regardless of setting in menu [261] Comm type. Further, it may be used in parallel to any Fieldbus option on X4 interface.

Menu [262] RS232/485 and its sub menus are used to configure the integrated RS485 interface.

This function is to define the communication parameters for serial communication. There are two types of options available for serial communication, RS232/485 (Modbus/RTU) and fieldbus modules (CANopen, Profibus, DeviceNet, Modbus/TCP, Profinet IO, EtherCAT and EtherNet/IP).

For more information see chapter 6. Communication page 33 and respective option manual.

Comm Type [261]

Select RS232/485 [262] or Fieldbus [263].

261		Com Type
Default:		RS232/485
RS232/485	0	Integrated RS485 interface enabled. Fieldbus interface on X4 disabled (RESET).
Fieldbus	1	Fieldbus selected (CANopen, Profibus, DeviceNet, Modbus/TCP, Profinet IO, EtherCAT or EtherNet/IP). Integrated RS485 interface enabled (can be used in parallel to fieldbus option).

NOTE: Toggling the setting in this menu will perform a soft reset (re-boot) of the Fieldbus module.

RS232/485 [262]

Press Enter to set up the parameters for RS-232/485 (Modbus/RTU) communication.

262	RS232/485
-----	-----------

Baud rate [2621]

Set the baud rate for the communication.

NOTE: This address is only used for the integrated/isolated RS485 option.

2621		Baudrate
Default:		9600
2400	0	Selected baud rate
4800	1	
9600	2	
19200	3	
38400	4	
57600	5	
115200	6	

Address [2622]

Enter the unit address for the DCU

NOTE: This address is only used for the integrated/isolated RS485 option.

2622		Address
Default:		1
Selection:		1-247

Fieldbus [263]

Press Enter to set up the parameters for fieldbus communication.

263	Fieldbus
-----	----------

Address [2631]

Enter/view the unit/node address of the DCU. Read and write access for CANopen, Profibus, DeviceNet. Read - only for EtherCAT.

2631		Address
Default:		62
Range:		CANopen 1-127, Profibus 0-126, DeviceNet 0-63
Node address valid for CANopen (RW), Profibus(RW), DeviceNet (RW) and EtherCAT (RO).		

Process Data Mode [2632]

Enter the mode of process data (cyclic data). For further information, see the Fieldbus option manual.

NOTE: For CANopen module this menu is forced to "8".

2632 PrData Mode		
Default:		Basic
None	0	Control/status information is not used.
Basic	4	4 byte process data control/status information is used.
Extended	8	4 byte process data (same as Basic setting) + additional proprietary protocol for advanced users is used.

Read/Write [2633]

Select read/write to control the inverter over a Fieldbus network. For further information, see the Fieldbus option manual.

2633 Read/Write		
Default:		RW
RW	0	Read and write
Read	1	Read only
Valid for process data. Select R (read only) for logging process without writing process data. Select RW in normal cases to control inverter.		

Additional Process Values [2634]

Define the number of additional process values sent in cyclic messages.

NOTE: For CANopen module this menu is forced to "Basic".

2634 AddPrValues	
Default:	0
Range:	0-8

CANBaudrate [2635]

Set the baud rate for CANopen Fieldbus.

NOTE: Used for CANopen module only

2635 CANBaudrate	
Default:	8
0	10 kbps
1	20 kbps
2	50 kbps
3	Reserve
4	100 kbps
5	125 kbps
6	250 kbps
7	500 kbps
8	1 Mbps
9	Auto *

* Under normal traffic conditions, i.e. with cyclic bus traffic above 2 Hz, the baudrate should be detected within 5 seconds.

NOTE: The automatic baud rate detection will NOT work if there is no traffic on the network.

Communication Fault [264]

Main menu for communication fault/warning settings. For further details please see the Fieldbus option manual.

Menus [2641] and [2642] are specifically used for Fieldbus option mounted on interface X4.

Menus [2643] and [2644] are specifically used for integrated RS485 interface on X1: A+ and B-.

Communication Fault Mode [2641]

Selects action if a Fieldbus fault is detected.

2641 ComFlt Mode		
Default:	Off	
Off	0	No communication supervision.
Trip	1	Fieldbus selected: The DCU will trip if: 1. The internal communication between the control board and fieldbus option is lost for time set in parameter [2642]. 2. If a serious network error has occurred.
Warning	2	Fieldbus selected: The DCU will give a warning if: 1. The internal communication between the control board and fieldbus option is lost for time set in parameter [2642]. 2. If a serious network error has occurred.
Change PSet	3	Same as Warning but combined with a change of parameter set according to the setting in [264].

NOTE: Menu [214] and/or [215] must be set to COM to activate the communication fault function.

Communication Fault Time [2642]

Defines the delay time for the Fieldbus trip/warning.

2642 ComFlt Time	
Default:	0,5 s
Range:	0.1-15 s

485 Fault Mode [2643]

Selects action for timeout on integrated RS485 interface on X1: A+ and B-.

2643 485Flt Mode		
Default:	Off	
Off	0	No communication supervision.
Trip	1	The DCU will trip if there is no communication for time set in parameter [2644].
Warning	2	The DCU will give a warning if there is no communication for time set in parameter [2644].
Change Pset	3	Same as Warning but combined with a change of parameter set according to the setting in [246].

NOTE: Menu [214] and/or [215] must be set to COM to activate the communication fault function.

485 Fault Time [2644]

Defines the delay time for the integrated RS485 trip/warning.

2644 485Flt Time	
Default:	0.5 s
Range:	0.1-15 s

Keyboard Communication Fault Mode [2645]

When keyboard is removed in drive running condition and "[214] Ref Control" or "[215] Run/Stop Ctrl" is set to "Keyboard" the drive should come to stop.

2645 KbdComFMode		
Default:	Trip	
Off	0	No supervision of keyboard.
Trip	1	The drive will trip after time set in parameter [2646] if keyboard/control board is removed.
Warning	2	The drive will give a warning after time set in parameter [2646] if the keyboard/control board is removed.

Keyboard Communication Fault Time [2646]

Defines the delay time for detection of a removed control panel provided that 2645 is either trip or warning.

2646 KbdComFTime	
Default:	2 s
Range:	0.1 s - 15 s

Communication fault for control panel port

This feature enables communication fault for external controlling equipment connected to the CP port. Most importantly this enables detection if a wireless connection, via BLE or WiFi CP, is disconnected.

Fault is only enabled if all of following conditions are met:

- "[214] Ref Control" or "[215] Run/Stp Ctrl" is set to "Com".
- A device connected to the CP port has written to any of the communication command registers:
 - Run (2 or 42902)
 - RunR (3 or 42903)
 - RunL (4 or 42904)
 - Reference (42905)
- Communication command Run and one or both of RunR or RunL are set.
- Function enabled (Trip or Warning) in menu "[2647] CPportFMode"
- No communication on the control panel port for "[2648] CPportFTime" X seconds.

Control Panel port Fault Mode [2647]

2647 CPportFMode		
Default:		Trip
Off	0	No supervision of the control panel.
Trip	1	The drive will trip after time set in parameter [2648] if control panel is removed.
Warning	2	The drive will give a warning after time set in parameter [2648] if the control panel is removed.
Change Pset	3	Same as Warning but combined with a change of parameter set according to the setting in [246].

Control Panel port Fault Time [2648]

2648 CPportFTime	
Default:	10.0 s
Range:	0.1 s - 15.0 s

Ethernet [265]

Settings for Ethernet module (Modbus/TCP, Profinet IO). For further information, see the Fieldbus option manual.

NOTE: The Ethernet module must be re-booted to activate the below settings. For example by toggling parameter [261]. Non-initialized settings indicated by flashing display text.

IP Address [2651]

2651 IP Address	
Default:	0.0.0.0

MAC Address [2652]

2652 MAC Address	
Default:	An unique number for the Ethernet module.

Subnet Mask [2653]

2653 Subnet Mask	
Default:	0.0.0.0

Gateway [2654]

2654 Gateway	
Default:	0.0.0.0

DHCP [2655]

2655 DHCP		
Default:		Off
Off	0	
On	1	

Fieldbus Signals [266]

Defines mapping for additional process values. For further information, see the Fieldbus option manual.

FB S1/Wr1 - FB S8/Wr8 [2661]-[2668]

Used to create a block of parameters which can be written via communication.

2661 FB S1/Wr1	
Default:	0
Range:	0-65535

FB S9/Rd1 - FB S16/Rd8 [2669]-[266G]

Used to create a block of parameters which can be read via communication.

2669 FB S9/Rd1	
Default:	0
Range:	0-65535

NOTE: For Modbus all 16 fieldbus mappings can be used either as read or write. Configuration of register map is made menu [2661]-[266G] or Modbus range 42801-42816. Register read/write access is made in Modbus range 42821-42836.

FB Status [269]

Sub menus showing status of Fieldbus parameters. Please see the Fieldbus manual for detailed information.

269 FB Status	
---------------	--

8.2.6 Wireless [270]

Parameters for configuring wireless communication links such as WiFi or Bluetooth Low Energy (BLE). Changing any of these parameters will trigger a reconfiguration action that could result in a slight delay of pressed buttons / menu change.

Wireless Mode [271]

Available options depend on capability of the connected control panel.

271 WirelessMode		
Default		Off
Off	0	Wireless interfaces turned off
WiFi	1	WiFi interface enabled
BLE	2	Bluetooth Low Energy interface enabled

WiFi Options [272]

This menu is hidden unless menu "WirelessMode [271]" is set to WiFi.

After a sub-menu has been changed the response from the WiFi module can be observed in menu [272A] WiFi Status. If everything went well a "Config OK" is expected to be shown for 60 seconds.

WiFi Mode [2721]

Configures the 2.4 GHz WiFi interface of the control panel to either act as an AccessPoint (allowing clients to connect to the drive) or as station (i.e. connect to an already existing WiFi network as a client).

NOTE: Only one client can connect and communicate with the drive at same time.

2721 WiFi Mode		
Default		AccessPoint
AccessPoint	0	Configure WiFi interface to act as an Access Point (AP) allowing client devices like mobile phones or tablets to connect to the network provided by the Drive. Remaining WiFi parameters [272X] will decide the properties of the provided WiFi network.
Station	1	Configure WiFi interface to connect to an existing WiFi network provided by an external Router/AP. Remaining WiFi parameters [272X] will be used to select the network to connect to and to provide the required credentials.

Channel [2722]

Sets the WiFi channel to operate on in AccessPoint mode. Menu hidden in Station mode (will adopt to the channel used by AP/Router connected to).

NOTE: Only channels 1-11 should be used in US.

2722 Channel	
Default	5
0 - 13	2.4 GHz WiFi channels to be used in AccessPoint mode.

Encryption [2723]

Selects the encryption standard to be used for the transmitted WiFi data.

2723 Encryption		
Default		WPA-2
Open	0	No encryption of the wireless link
WEP	1	WEP encryption
WPA-2	2	WPA-2 encryption

DHCP [2724]

Selects how IP properties are handled. Static implies user give address while DHCP implies that DHCP server on network assign an IP address. In case [2721] WiFi Mode is AccessPoint, DHCP is automatically selected.

2724 DHCP		
Default		Static
Static	0	Static implies user set IP properties via menus [2727 - 2729].
DHCP	1	Server on network assign IP properties.

SSID [2725]

First 16 chars of network name to connect to if "[2721] WiFi Mode" = Station or SSID network name to broadcast if "[2721] WiFi Mode" = AccessPoint.

2725 SSID	
Default	Emotron_<5 random digits>

Password [2726]

Password to login to router/AP when "[2721] WiFi Mode" = Station or Password for clients to use if "[2721] WiFi Mode" = AccessPoint. In case [2723] Encryption is WPA2 minimum password length is 8 characters. In case of WEP only 5 or 13 character passwords are accepted.

If incorrect length of the password is entered, the PPU displays "Invalid Pwd" message for two seconds and remains in edit mode with last entered password.

NOTE: The password should be entered left aligned.

Can't be read via field bus and not visible after entered.

2726 Password	
Default	12345678

NOTE: Accepts only 32 - 126 ascii char in menus SSID [2725] and Password [2726] entry as IEEE standard speaks of 'printable ASCII characters' (in the range of 32 to 126).

IP Address [2727]

Shows static address to use if "[2724] DHCP" is set to Static. Shows assigned address if "[2724] DHCP" is set to DHCP. This is the IP address given to the Drive, use this address in client software to connect to the DCU.

2727 IP Address	
Default	192.168.1.1

Subnet Mask [2728]

Shows static subnet mask to use if "[2724] DHCP" is set to Static. Shows assigned subnet mask if "[2724] DHCP" is set to DHCP.

2728 Subnet Mask	
Default	255.255.255.0

Gateway [2729]

Shows assigned gateway if DHCP is selected in menu "[2724] DHCP".

2729 Gateway	
Default	192.168.1.1

WiFi Status [272A]

Status of WiFi module is shown in this menu "[272A] WiFi Status". Status is set directly from control panel (that host the WiFi module).

272A WiFi Status		
Default		OK
OK	0	No error
Mode error	1	Initialization failure of AP/Station mode
AP pwd err	2	AP password faulty
SSID error	3	SSID length error
SecPar error	4	Security parameters or SSID supplied is wrong
Sta Disconn	5	Disconnect from router/AP in station mode
NetConf err	6	Network configuration error (IP or DHCP)
Config OK	7	If no error, this is shown 60 seconds after configuration update, then it goes back to OK.

Bluetooth (BLE) options [273]

This menu is hidden if BLE not selected in menu "[271] WirelessMode".

BluetoothID [2731]

Shows bluetooth device ID if connected control panel have bluetooth capability.

2731 BluetoothID	
Default	0

NOTE: Default is 0 or if a BLE control panel is used an eight digit unique ID used in the broadcast name.

Paring key [2732]

Six digit numeric for the control panel BLE pairing with mobile or other BLE device.

2732 Paring Key	
Default	123456

Security [274]

Possibility to limit access to control board (CB) registers from the wireless interfaces.

Security mode [2741]

Sets the security mode to be used.

2741 Sec. Mode		
Default:		Open
Open	0	All requests from wireless clients should be forwarded by the control panel to control board.
Password	1	Wireless client must supply a password before access to control board registers is granted. Once access is given it will last as long as the session.

Password [2742]

Configuration of the password to be written by the client to open up wireless access (eight (8) chars).

This menu is only shown if menu "Security mode [2741]" is set to Password (1).

2742 Password	
Default:	" " (i.e. an empty string)

NOTE: The password should be entered left aligned.

8.3 Process and Application Parameters [300]

These parameters are mainly adjusted to obtain optimum process or machine performance.

The read-out, references and actual values depends on selected process source, [321]:

Table 15

Selected process source	Unit for reference and actual value	Resolution
U(LV) Mode	V	3 digits
U(HV) Mode	V	3 digits
I(LV) Mode	%	3 digits

8.3.1 Set/View Reference Value [310]

View reference value

As default the menu [310] is in view operation. The value of the active reference signal is displayed. The value is displayed according to selected process source, [321].

Set reference value

If the function “Reference Control [214]” is set to “Keyboard”, the reference value can be set in menu “Set/View Ref [310]” or as a motor potentiometer with the + and - keys (default) on the control panel. Selection is made with parameter Keyboard Reference Mode in menu [369]. Reference value according to the Mode Settings in table 15.

310 Set/View ref	
Default:	300 V
Dependent on:	Process Source [321].
U(LV) Mode	0 - U(LV)MaxLim [O61]
U(HV) Mode	0 - U(HV)MaxLim [O6A]
I(LV) Mode	+/- I(LV)MaxLim [O67]

NOTE: The actual value in menu [310] is not copied, or loaded from the control panel memory when Copy Set [242], Copy to CP [244] or Load from CP [245] is performed.

NOTE: Write access to this parameter is only allowed when menu “Ref Control [214]” is set to Keyboard. When Reference control source “COM” is used, see chapter 6. Communication page 33.

8.3.2 Process Settings [320]

With these functions, the DCU can be set up to fit the application. The menus [110], [120], [310], [362]-[368] and [711] use the process unit selected in [321].

Process Source [321]

Select the signal source for the process value that controls the DCU application.

321 Proc Source		
Default:	U (LV) Mode	
U (LV) Mode	0	Operation mode for controlling the LV-side voltage, and is configured via parameters in menus [O2x].
U (HV) Mode	6	Operation mode for controlling the HV-side voltage, and is configured via parameters in menus [O4x].
I (LV) Mode	8	Operation mode for controlling the LV-side current, and is configured via parameters in menus [O3x].

8.3.3 Preset References [360]

Motor Potentiometer [361]

Sets the properties of the motor potentiometer function. See the parameter “DigIn1 [521]” for the selection of the motor potentiometer function.

361 Motor Pot		
Default:	Non Volatile	
Volatile	0	After a stop, trip or power down, the DCU will start always from zero speed (or minimum speed, if selected).
Non volatile	1	Non Volatile. After a stop, trip or power down of the DCU, the reference value at the moment of the stop will be memorized. After a new start command the output speed will resume to this saved value.

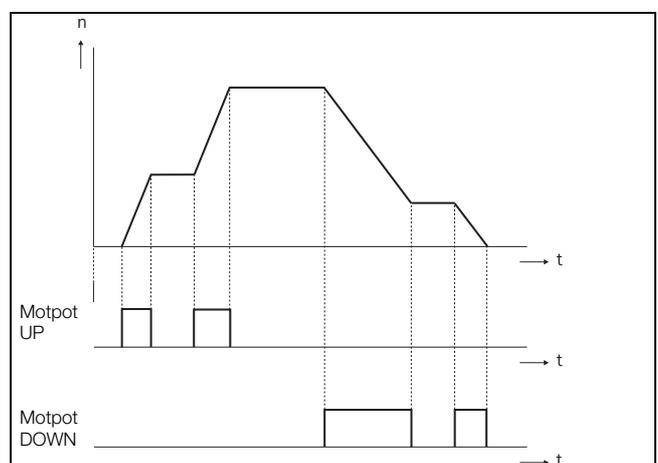


Fig. 38 MotPot function.

Preset Ref 1 [362] to Preset Ref 7 [368]

Preset speeds have priority over the analogue inputs. Preset speeds are activated by the digital inputs. The digital inputs must be set to the function Pres. Ref 1, Pres. Ref 2 or Pres. Ref 4.

Depending on the number of digital inputs used, up to 7 preset speeds can be activated per parameter set. Using all the parameter sets, up to 28 preset speeds are possible.

362 Preset Ref 1	
Default:	300 V
Dependent on:	Process Source [321].
U(LV) Mode	0 - U(LV)MaxLim [O61]
U(HV) Mode	0 - U(HV)MaxLim [O6A]
I(LV) Mode	+/- I(LV)MaxLim [O67]

The same settings are valid for the menus:

- “[363] Preset Ref 2”
- “[364] Preset Ref 3”
- “[365] Preset Ref 4”
- “[366] Preset Ref 5”
- “[367] Preset Ref 6”
- “[368] Preset Ref 7”

The selection of the presets is as in table 16.

Table 16

Preset Ctrl3	Preset Ctrl2	Preset Ctrl1	Output Speed
0	0	0	Analogue reference
0	0	1 ¹⁾	Preset Ref 1
0	1 ¹⁾	0	Preset Ref 2
0	1	1	Preset Ref 3
1 ¹⁾	0	0	Preset Ref 4
1	0	1	Preset Ref 5
1	1	0	Preset Ref 6
1	1	1	Preset Ref 7

¹⁾ = selected if only one preset reference is active

1 = active input

0 = non active input

NOTE: If only Preset Ctrl3 is active, then the Preset Ref 4 can be selected. If Presets Ctrl2 and 3 are active, then the Preset Ref 2, 4 and 6 can be selected.

Keyboard reference mode [369]

This parameter sets how the reference value [310] is edited.

369 Key Ref Mode		
Default:	Normal	
Normal	0	The reference value is edited as a normal parameter (the new reference value is activated when Enter is pressed after the value has been changed).
MotPot	1	The reference value is edited using the motor potentiometer function (the new reference value is activated directly when the key + or - is pressed).
MotPot+	2	This selection makes it possible to update the reference in “[310]” directly from the [100]-menu. Pressing +/- in the [100]-menu changes the menu to [310] and there you can continue to press +/- to update the reference. When no key has been pressed for a second the menu returns to [100] automatically.

8.4 Process Protection [400]

8.4.1 Trip text [430]

ExtTrip1 Text [430]

Used for custom external trip messages of maximum 16 characters. Editing of the message text is done according to the same principles as described for the Unit name [923].

431	ExtTrip1Text
Default:	Ext Trip 1

ExtTrip2 Text [432]

Used for custom external trip messages of maximum 16 characters. Editing of the message text is done according to the same principles as described for the Unit name [923].

432	ExtTrip2Text
Default:	Ext Trip 2

ExtTrip3 Text [433]

Used for custom external trip messages of maximum 16 characters. Editing of the message text is done according to the same principles as described for the Unit name [923].

433	ExtTrip3Text
Default:	Ext Trip 3

ExtTrip4 Text [434]

Used for custom external trip messages of maximum 16 characters. Editing of the message text is done according to the same principles as described for the Unit name [923].

434	ExtTrip4Text
Default:	Ext Trip 4

8.5 I/Os and Virtual Connections [500]

Main menu with all the settings of the standard inputs and outputs of the DCU.

8.5.1 Analogue Inputs [510]

Submenu with all settings for the analogue inputs.

AnIn1 Function [511]

Sets the function for Analogue input 1. Scale and range are defined by AnIn1 Advanced settings [513].

AnIn1 is default selection for analogue reference.

511	AnIn1 Fc	
Default:	Process Ref	
Off	0	Input is not active
Process Ref	4	Reference value is set for control in process units, see Process Source [321] and Process Unit [322].
U (LV)	7	Low-side output voltage measurement input.

NOTE: When AnInX Func=Off, the connected signal will still be available for Comparators [610].

NOTE: AnIn1 default configuration "User Bipol V" and range = ±1000V.

Adding analogue inputs

If more than one analogue input is set to the same function, the values of the inputs can be added together. In the following examples we assume that Process Source [321] is set to Speed.

Example 1: Add signals with different weight (fine tuning).

Signal on AnIn1 = 10 mA

Signal on AnIn2 = 5 mA

[511] AnIn1 Function = Process Ref.

[512] AnIn1 Setup = 4-20 mA

[5134] AnIn1 Function Min = Min (0 rpm)

[5136] AnIn1 Function Max = Max (1500 rpm)

[5138] AnIn1 Operation = Add+

[514] AnIn2 Function = Process Ref.

[515] AnIn2 Setup = 4-20 mA

[5164] AnIn2 Function Min = Min (0 rpm)

[5166] AnIn2 Function Max = User defined

[5167] AnIn2 Value Max = 300 rpm

[5168] AnIn2 Operation = Add+

Calculation:

$$\text{AnIn1} = (10-4) / (20-4) \times (1500-0) + 0 = 562.5 \text{ rpm}$$

$$\text{AnIn2} = (5-4) / (20-4) \times (300-0) + 0 = 18.75 \text{ rpm}$$

The actual process reference will be:

$$+562.5 + 18.75 = 581 \text{ rpm}$$

Analogue Input Selection via Digital Inputs

When two different external Reference signals are used, e.g. 4-20mA signal from control centre and a 0-10 V locally mounted potentiometer, it is possible to switch between these two different analogue input signals via a Digital Input set to "AnIn Select".

AnIn1 is 4-20 mA

AnIn2 is 0-10 V

DigIn3 is controlling the AnIn selection; HIGH is 4-20 mA, LOW is 0-10 V

"[511] AnIn1 Fc" = Process Ref;
set AnIn1 as reference signal input

"[512] AnIn1 Setup" = 4-20mA;
set AnIn1 for a current reference signal

"[513A] AnIn1 Enabl" = DigIn;
set AnIn1 to be active when DigIn3 is HIGH

"[514] AnIn2 Fc" = Process Ref;
set AnIn2 as reference signal input

"[515] AnIn2 Setup" = 0-10V;
set AnIn2 for a voltage reference signal

"[516A] AnIn2 Enabl" = !DigIn;
set AnIn2 to be active when DigIn3 is LOW

"[523] DigIn3=AnIn";
set DigIn3 as input for selection of AI reference

Subtracting analogue inputs

Example 2: Subtract two signals

Signal on AnIn1 = 8 V

Signal on AnIn2 = 4 V

[511] AnIn1 Function = Process Ref.

[512] AnIn1 Setup = 0-10 V

[5134] AnIn1 Function Min = Min (0 rpm)

[5136] AnIn1 Function Max = Max (1500 rpm)

[5138] AnIn1 Operation = Add+

[514] AnIn2 Function = Process Ref.

[515] AnIn2 Setup = 0-10 V

[5164] AnIn2 Function Min = Min (0 rpm)

[5166] AnIn2 Function Max = Max (1500 rpm)

[5168] AnIn2 Operation = Sub-

Calculation:

$AnIn1 = (8-0) / (10-0) \times (1500-0) + 0 = 1200 \text{ rpm}$

$AnIn2 = (4-0) / (10-0) \times (1500-0) + 0 = 600 \text{ rpm}$

The actual process reference will be:

$+1200 - 600 = 600 \text{ rpm}$

AnIn1 Setup [512]

The analogue input setup is used to configure the analogue input in accordance with the signal used that will be connected to the analogue input. With this selection the input can be determined as current (4-20 mA) or voltage (0-10 V) controlled input. Other selections are available for using a threshold (live zero), a bipolar input function, or a user defined input range. With a bipolar input reference signal, it is possible to control the motor in two directions. See fig. 39.

NOTE: The selection of voltage or current input is done with S1. When the switch is in voltage mode only the voltage menu items are selectable. With the switch in current mode only the current menu items are selectable.

512 AnIn1 Setup		
Default:	4-20 mA	
Dependent on	Setting of switch S1	
4-20mA	0	The current input has a fixed threshold (Live Zero) of 4 mA and controls the full range for the input signal. See fig. 41.
0-20mA	1	Normal full current scale configuration of the input that controls the full range for the input signal. See fig. 40.
User mA	2	The scale of the current controlled input, that controls the full range for the input signal. Can be defined by the advanced AnIn Min and AnIn Max menus.
User Bipol mA	3	Sets the input for a bipolar current input, where the scale controls the range for the input signal. Scale can be defined in advanced menu AnIn Bipol.
0-10V	4	Normal full voltage scale configuration of the input that controls the full range for the input signal. See fig. 40.
2-10V	5	The voltage input has a fixed threshold (Live Zero) of 2 V and controls the full range for the input signal. See fig. 41.
User V	6	The scale of the voltage controlled input, that controls the full range for the input signal. Can be defined by the advanced AnIn Min and AnIn Max menus.
User Bipol V	7	Sets the input for a bipolar voltage input, where the scale controls the range for the input signal. Scale can be defined in advanced menu AnIn Bipol.

NOTE: Always check the needed set up when the setting of S1 is changed; selection will not adapt automatically.

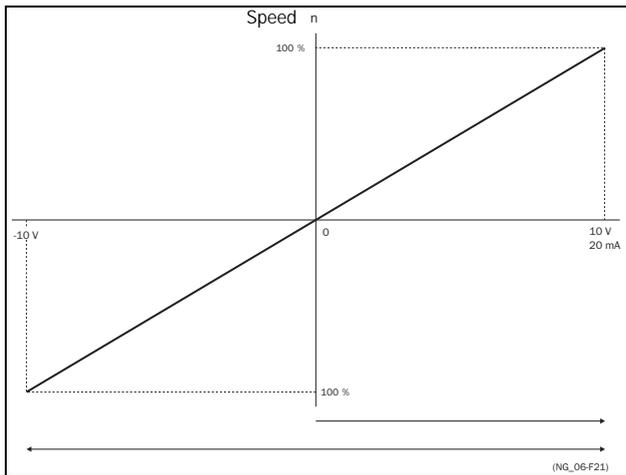


Fig. 39

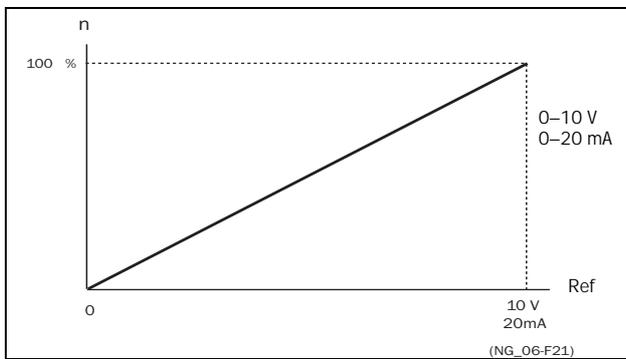


Fig. 40 Normal full-scale configuration

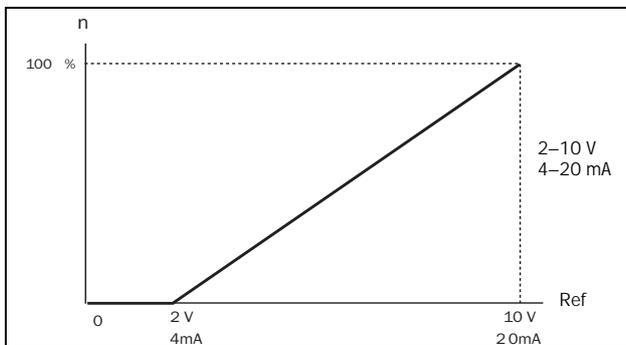


Fig. 41 2–10 V/4–20 mA (Live Zero)

AnIn1 Advanced [513]

NOTE: The different menus will automatically be set to either “mA” or “V”, based on the selection in AnIn 1 Setup [512].

513 AnIn1 Advan

AnIn1 Min [5131]

Parameter to set the minimum value of the external reference signal. Only visible if [512] = User mA/V.

5131 AnIn1 Min

Default:	0 V/4.00 mA
Range:	0.00–20.00 mA 0–10.00 V

AnIn1 Max [5132]

Parameter to set the maximum value of the external reference signal. Only visible if [512] = User mA/V.

5132 AnIn1 Max

Default:	10.00 V/20.00 mA
Range:	0.00–20.00 mA 0–10.00 V

Special function: Inverted reference signal

If the AnIn minimum value is higher than the AnIn maximum value, the input will act as an inverted reference input, see fig. 42.

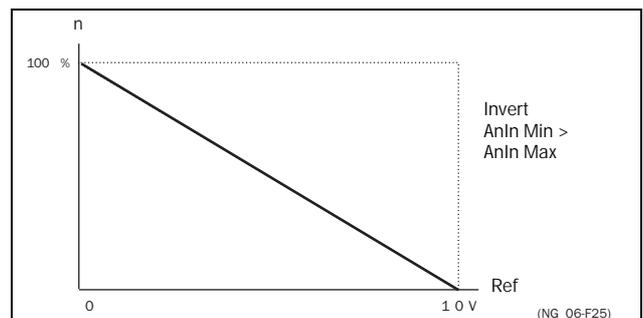


Fig. 42 Inverted reference

AnIn1 Bipol [5133]

This menu is only displayed if AnIn1 Setup is set to User Bipol mA or User Bipol V. The window will automatically show mA or V range according to selected function. The range is set by changing the positive maximum value; the negative value is automatically adapted accordingly.

5133 AnIn1 Bipol	
Default:	10.00 V/20.00 mA
Range:	0.0–20.0 mA, 0.00–10.00 V

AnIn1 Function Min [5134]

With AnIn1 Function Min the physical minimum value is scaled to selected process unit. The default scaling is dependent of the selected function of AnIn1 [511].

5134 AnIn1 FcMin		
Default:		Min
Min	0	Min value
Max	1	Max value
User defined	2	Define user value in menu [5135]

Table 17 shows corresponding values for the min and max selections depending on the function of the analogue input [511].

Table 17

AnIn Function	Min	Max
Process Ref	Process Min [324]	Process Max [325]
Process Value	Process Min [324]	Process Max [325]

AnIn1 Function Value Min [5135]

With AnIn1 Function ValMin you define a user-defined value for the signal. Only visible when user-defined is selected in menu [5134].

5135 AnIn1 VaMin	
Default:	0.000
Range:	-10000.000 – 10000.000

AnIn1 Function Max [5136]

With AnIn1 Function Max the physical maximum value is scaled to selected process unit. The default scaling is dependent of the selected function of AnIn1 [511]. See table 17.

5136 AnIn1 FcMax		
Default:		Max
Min	0	Min value
Max	1	Max value
User defined	2	Define user value in menu [5137]

AnIn1 Function Value Max [5137]

With AnIn1 Function VaMax you define a user-defined value for the signal. Only visible when user-defined is selected in menu [5136].

5137 AnIn1 VaMax	
Default:	0.000
Range:	-10000.000 – 10000.000

NOTE: With AnIn Min, AnIn Max, AnIn Function Min and AnIn Function Max settings, loss of feedback signals (e.g. voltage drop due to long sensor wiring) can be compensated to ensure an accurate process control.

Example:

Process sensor is a sensor with the following specification:

Range: 0–3 bar

Output: 2–10 mA

Analogue input should be set up according to:

[512] AnIn1 Setup = User mA

[5131] AnIn1 Min = 2 mA

[5132] AnIn1 Max = 10 mA

[5134] AnIn1 Function Min = User-defined

[5135] AnIn1 VaMin = 0.000 bar

[5136] AnIn1 Function Max = User-defined

[5137] AnIn1 VaMax = 3.000 bar

AnIn1 Operation [5138]

5138 AnIn1 Oper		
Default:		Add+
Add+	0	Analogue signal is added to selected function in menu [511].
Sub-	1	Analogue signal is subtracted from selected function in menu [511].

AnIn1 Filter [5139]

If the input signal is unstable (e.g. fluctuation reference value), the filter can be used to stabilize the signal. A change of the input signal will reach 63% on AnIn1 within the set AnIn1 Filter time. After 5 times the set time, AnIn1 will have reached 100% of the input change. See fig. 43.

5139 AnIn1 Filt	
Default:	0.1 s
Range:	0.001 – 10.0 s

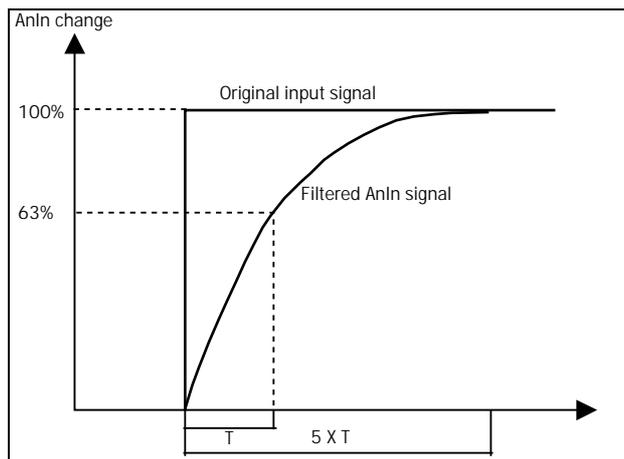


Fig. 43

AnIn1 Enable [513A]

Parameter for enable/disable analogue input selection via digital inputs (DigIn set to function AnIn Select).

513A AnIn1 Enabl		
Default:	On	
On	0	AnIn1 is always active
!DigIn	1	AnIn1 is only active if the digital input is low.
DigIn	2	AnIn1 is only active if the digital input is high.

AnIn2 Function [514]

Parameter for setting the function of Analogue Input 2.
Same function as “AnIn1 Fc [511]”.

514 AnIn2 Fc	
Default:	Off
Selection:	Same as in menu [511]

AnIn2 Setup [515]

Parameter for setting the function of Analogue Input 2.
Same functions as “AnIn1 Setup [512]”.

515 AnIn2 Setup	
Default:	4 – 20 mA
Dependent on	Setting of switch S2
Selection:	Same as in menu [512].

AnIn2 Advanced [516]

Same functions and submenus as under “AnIn1 Advan [513]”.

516 AnIn2 Advan	
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AnIn3 Function [517]

Parameter for setting the function of Analogue Input 3.
Same function as “AnIn1 Fc [511]”.

517 AnIn3 Fc	
Default:	U (LV)
Selection:	Same as in menu [511]

AnIn3 Setup [518]

Same functions as “AnIn1 Setup [512]”.

518 AnIn3 Setup	
Default:	0-10 V
Dependent on	Setting of switch S3
Selection:	Same as in menu [512].

AnIn3 Advanced [519]

Same functions and submenus as under “AnIn1 Advan [513]”.

519	AnIn3 Advan
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AnIn4 Function [51A]

Parameter for setting the function of Analogue Input 4.

Same function as “AnIn1 Fc [511].”

51A	AnIn4 Fc
Default:	Off
Selection:	Same as in menu [511]

AnIn4 Set-up [51B]

Same functions as “AnIn1 Setup [512].”

51B	AnIn4 Setup
Default:	4-20 mA
Dependent on	Setting of switch S4
Selection:	Same as in menu [512].

AnIn4 Advanced [51C]

Same functions and submenus as under “AnIn1 Advan [513]”.

51C	AnIn4 Advan
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AI Flt Mode [51D]

In this menu AI fault modes can be selected.

51D	AI Flt Mode	
Default:	Off	
Off	0	No analog input supervision
Trip	1	The DCU will trip if the analog input signal is below 75% of the configured minimum value.
Warning	2	The DCU will give a warning if the analog input signal is below 75% of the configured minimum value.

8.5.2 Digital Inputs [520]

Submenu with all the settings for the digital inputs.

NOTE: Additional inputs will become available when the I/O option boards are connected.

Digital Input 1 [521]

To select the function of the digital input.

On the standard control board there are eight digital inputs.

If the same function is programmed for more than one input that function will be activated according to “OR” logic if nothing else is stated.

521	DigIn 1	
Default:	RunL	
Off	0	The input is not active.
Ext. Trip1	3	Be aware that if there is nothing connected to the input, the DCU will trip at “External trip” immediately. NOTE: The External Trip is active low. NOTE: Activated according to “AND” logic.
Stop	4	Stop command according to the selected Stop mode in menu [33B]. NOTE: The Stop command is active low. NOTE: Activated according to “AND” logic.
Enable	5	Enable command. General start condition to run the DCU. If made low during running the output of the DCU is cut off immediately, causing the motor to coast to zero speed. NOTE: If none of the digital inputs are programmed to “Enable”, the internal enable signal is active. NOTE: Activated according to “AND” logic.
RunR	6	Run Right command (positive speed). The output of the DCU will be a clockwise rotary field.
RunL	7	Run Left command (negative speed). The output of the DCU will be a counter-clockwise rotary field.
Ext. Trip2	8	Be aware that if there is nothing connected to the input, the DCU will trip at “External trip” immediately. NOTE: The External Trip is active low. NOTE: Activated according to “AND” logic.
Reset	9	Reset command. To reset a Trip condition and to enable the Autoreset function.
Preset Ctrl1	10	To select the Preset Reference.
Preset Ctrl2	11	To select the Preset Reference.
Preset Ctrl3	12	To select the Preset Reference.

MotPot Up	13	Increases the internal reference value according to the set Acc MotPot time [333]. Has the same function as a “real” motor potentiometer, see fig. 38.
MotPot Down	14	Decreases the internal reference value according to the set Dec MotPot time [334]. See MotPot Up.
Ext. Trip3	21	Be aware that if there is nothing connected to the input, the DCU will trip at “External trip” immediately. NOTE: The External Trip is active low. NOTE: Activated according to “AND” logic.
Ext. Trip4	22	Be aware that if there is nothing connected to the input, the DCU will trip at “External trip” immediately. NOTE: The External Trip is active low. NOTE: Activated according to “AND” logic.
Set Ctrl 1	23	Activates other parameter set. See table 18 for selection possibilities.
Set Ctrl 2	24	Activates other parameter set. See table 18 for selection possibilities.
Ext Mot Temp	27	Be aware that if there is nothing connected to the input, the DCU will trip at “External Motor Temp” immediately. NOTE: The External Motor Temp is active low.
Loc/Rem	28	Activate local mode defined in [2171] and [2172].
LC Level	30	Liquid cooling low level signal. NOTE: The Liquid Cooling Level is active low.
Sleep	32	Possible to enter sleep mode through Dign.
Timer 1	34	Timer 1 will be activated on the rising edge of this signal.
Timer 2	35	Timer 2 will be activated on the rising edge of this signal.
Timer 3	36	Timer 3 will be activated on the rising edge of this signal.
Timer 4	37	Timer 4 will be activated on the rising edge of this signal.

Table 18

Parameter Set	Set Ctrl 1	Set Ctrl 2
A	0	0
B	1	0
C	0	1
D	1	1

NOTE: To activate the parameter set selection, menu 241 must be set to Dign.

Digital Input 2 [522] to Digital Input 8 [528]

Same function as “DigIn 1 [521]”.

522 DigIn 2	
Default:	RunR
Selection:	Same as in menu Dign 1 [521]

523 DigIn 3	
Default:	Enable
Selection:	Same as in menu Dign 1 [521]

For DigIn 4 to 7 the default function is Off. Default function for DigIn 8 is Reset.

Additional digital inputs [529] to [52H]

529 B1 Digin 1	
Default:	Off
Selection:	Same as in menu Dign 1 [521]

Additional digital inputs with I/O option board installed, “B1 DigIn 1 [529]” - “B3 DigIn 3 [52H]”. B stands for board and 1 to 3 is the number of the board which is related to the position of the I/O option board on the option mounting plate. The functions and selections are the same as “DigIn 1 [521]”.

8.5.3 Analogue Outputs [530]

Submenu with all settings for the analogue outputs. Selections can be made from application and DCU values, in order to visualize actual status. Analogue outputs can also be used as a mirror of the analogue input. Such a signal can be used as:

- a reference signal for the next DCU in a Master/Slave configuration (see fig. 44).
- a feedback acknowledgement of the received analogue reference value.

AnOut1 Function [531]

Sets the function for the Analogue Output 1. Scale and range are defined by AnOut1 Advanced settings [533].

531 AnOut1 Fc		
Default:		Process Val
Process Val	0	Actual process value according to Process feedback signal.
Process Ref	3	Actual process reference value.
Current	6	Actual current.
El power	7	Actual electrical power.
Output volt	8	Actual output voltage.
DC Voltage	9	Actual DC link voltage.
AnIn1	10	Mirror of received signal value on AnIn1.
AnIn2	11	Mirror of received signal value on AnIn2.
AnIn3	12	Mirror of received signal value on AnIn3.
AnIn4	13	Mirror of received signal value on AnIn4.
AnMux1	16	Result of configured AnMux1 logical block, see [621].
AnMux2	17	Result of configured AnMux2 logical block, see [622].
IGBT Temp	18	Temperature of drive IGBT, see [71A].

NOTE: When selections AnIn1, AnIn2 AnIn4 is selected, the setup of the AnOut (menu [532] or [535]) has to be set to 0-10V or 0-20mA. When the AnOut Setup is set to e.g. 4-20mA, the mirroring is not working correct.

AnOut 1 Setup [532]

Preset scaling and offset of the output configuration.

532 AnOut1 Setup		
Default:		4-20mA
4-20mA	0	The current output has a fixed threshold (Live Zero) of 4 mA and controls the full range for the output signal. See fig. 41.
0-20mA	1	Normal full current scale configuration of the output that controls the full range for the output signal. See fig. 40.
User mA	2	The scale of the current controlled output that controls the full range for the output signal. Can be defined by the advanced AnOut Min and AnOut Max menus.
User Bipol mA	3	Sets the output for a bipolar current output, where the scale controls the range for the output signal. Scale can be defined in advanced menu AnOut Bipol.
0-10V	4	Normal full voltage scale configuration of the output that controls the full range for the output signal. See fig. 40.
2-10V	5	The voltage output has a fixed threshold (Live Zero) of 2 V and controls the full range for the output signal. See fig. 41.
User V	6	The scale of the voltage controlled output that controls the full range for the output signal. Can be defined by the advanced AnOut Min and AnOut Max menus.
User Bipol V	7	Sets the output for a bipolar voltage output, where the scale controls the range for the output signal. Scale can be defined in advanced menu AnOut Bipol.

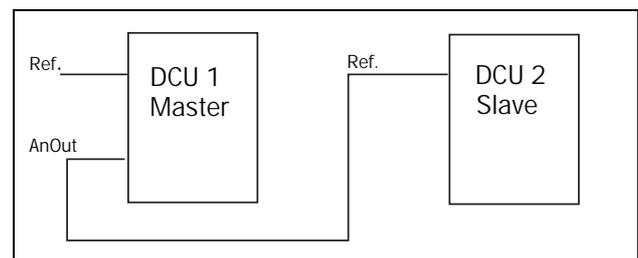


Fig. 44

AnOut1 Advanced [533]

With the functions in the AnOut1 Advanced menu, the output can be completely defined according to the application needs. The menus will automatically be adapted to “mA” or “V”, according to the selection in “AnOut1 Setup [532]”.

533	AnOut 1 Advan
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AnOut1 Min [5331]

This parameter is automatically displayed if User mA or User V is selected in menu “AnOut 1 Setup [532]”. The menu will automatically adapt to current or voltage setting according to the selected setup. Only visible if [532] = User mA/V.

5331	AnOut 1 Min
Default:	4 mA
Range:	0.00 – 20.00 mA, 0 – 10.00 V

AnOut1 Max [5332]

This parameter is automatically displayed if User mA or User V is selected in menu “AnOut1 Setup [532]”. The menu will automatically adapt to current or voltage setting according to the selected setup. Only visible if [532] = User mA/V.

5332	AnOut 1 Max
Default:	20.00 mA
Range:	0.00–20.00 mA, 0–10.00 V

AnOut1 Bipol [5333]

Automatically displayed if User Bipol mA or User Bipol V is selected in menu AnOut1 Setup. The menu will automatically show mA or V range according to the selected function. The range is set by changing the positive maximum value; the negative value is automatically adapted accordingly. Only visible if [512] = User Bipol mA/V.

5333	AnOut1Bipol
Default:	20mA
Range:	-10.00–10.00 V, -20.0–20.0 mA

AnOut1 Function Min [5334]

With AnOut1 Function Min the physical minimum value is scaled to selected presentation. The default scaling is dependent of the selected function of “AnOut1 [531]”.

5334	AnOut1FcMin	
Default:		Min
Min	0	Min value
Max	1	Max value
User defined	2	Define user value in menu [5335]

Table 19 shows corresponding values for the min and max selections depending on the function of the analogue output [531].

Table 19

AnOut Function	Min Value	Max Value
Process Value	Process Min [324]	Process Max [325]
Process Ref	Process Min [324]	Process Max [325]
Current	0 A	Motor Current [224]
EI Power	0 W	Motor Power [223]
Output Voltage	0 V	Motor Voltage [221]
DC voltage	0 V	1000 V
AnIn1	AnIn1 Function Min	AnIn1 Function Max
AnIn2	AnIn2 Function Min	AnIn2 Function Max
AnIn3	AnIn3 Function Min	AnIn3 Function Max
AnIn4	AnIn4 Function Min	AnIn4 Function Max

*) Fmin is dependent on the set value in menu “Minimum Speed [341]”.

Example

Set the AnOut function for Motorfrequency to 0Hz, set AnOut functionMin [5334] to “User-defined” and AnOut1 VaMin[5335] = 0.0. This results in an analogue output signal from 0/4 mA to 20mA: 0Hz to Fmot.

This principle is valid for all Min to Max settings.

AnOut1 Function Value Min [5335]

With AnOut1 Function VaMin you define a user-defined value for the signal. Only visible when user-defined is selected in menu [5334].

5335 AnOut1VaMin	
Default:	0.000
Range:	-10000.000–10000.000

AnOut1 Function Max [5336]

With AnOut1 Function Max the physical minimum value is scaled to selected presentation. The default scaling is dependent on the selected function of AnOut1 [531]. See Table 19.

5336 AnOut1FcMax		
Default:		Max
Min	0	Min value
Max	1	Max value
User defined	2	Define user value in menu [5337]

NOTE: It is possible to set AnOut1 up as an inverted output signal by setting AnOut1 Min > AnOut1 Max. See fig. 42, page 67.

AnOut1 Function Value Max [5337]

With AnOut1 Function VaMax you define a user-defined value for the signal. Only visible when user-defined is selected in menu [5334].

5337 AnOut1VaMax	
Default:	0.000
Range:	-10000.000–10000.000

AnOut2 Function [534]

Sets the function for the Analogue Output 2.

534 AnOut2 Fc	
Default:	Current
Selection:	Same as in menu [531]

AnOut2 Setup [535]

Preset scaling and offset of the output configuration for analogue output 2.

535 AnOut2 Setup	
Default:	4-20mA
Selection:	Same as in menu [512]

AnOut2 Advanced [536]

Same functions and submenus as under AnOut1 Advanced [533].

536 AnOut2 Advan	
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8.5.4 Digital Outputs [540]

Submenu with all the settings for the digital outputs.

Digital Out 1 [541]

Sets the function for the digital output 1.

NOTE: The definitions described here are valid for the active output condition.

541 DigOut 1		
Default:		Output OK
Off	0	Output is not active and constantly low.
On	1	Output is made constantly high, i.e. for checking circuits and trouble shooting.
Run	2	Running. The DCU output is active = produces current for the motor.
Stop	3	The DCU output is not active.
At Process	6	The output = Reference.
No Trip	8	No Trip condition active.
Trip	9	A Trip condition is active.
AutoRst Trip	10	Autoreset trip condition active.
Limit	11	A Limit condition is active.
Warning	12	A Warning condition is active.
Ready	13	The DCU is ready for operation. This means that the DCU is powered up and healthy.
$T = T_{lim}$	14	The torque is limited by the torque limit function.
$I > I_{nom}$	15	The output current is higher than the motor nominal current [224].
AnIn<Offset	17	One of the AnIn input signals is lower than 75% of the configured minimum value.
CA1	24	Analogue comparator 1 output.
CA2	25	Analogue comparator 2 output.
CA3	26	Analogue comparator 3 output.
CA4	27	Analogue comparator 4 output.
L1	28	Logic 1 expression output
L2	29	Logic 2 expression output
L3	30	Logic 3 expression output
L4	31	Logic 4 expression output
F1	32	Flip flop 1 output
F2	33	Flip flop 2 output
F3	34	Flip flop 3 output
F4	35	Flip flop 4 output

Operation	36	Run command is active or DCU running. The signal can be used to control the mains contactor if the DCU is equipped with Standby supply option.
T1Q	37	Timer 1 output
T2Q	38	Timer 2 output.
T3Q	39	Timer 3 output
T4Q	40	Timer 4 output
Sleeping	41	Sleeping function activated
Loc/Rem	57	Local/Rem mode indication Local = 1, Remote = 0
Standby	58	Standby supply option is active
PTC Trip	59	Trip when function is active
PT100 Trip	60	Trip when function is active
Overvolt	61	Overvoltage due to high main voltage
Overvolt G	62	Overvoltage due to generation mode
Overvolt D	63	Overvoltage due to deceleration
V-Limit	67	Overvoltage limit function active
C-Limit	68	Overcurrent limit function active
Overtemp	69	Over temperature warning
Low voltage	70	Low voltage warning
DigIn 1	71	Digital input 1
DigIn 2	72	Digital input 2
DigIn 3	73	Digital input 3
DigIn 4	74	Digital input 4
DigIn 5	75	Digital input 5
DigIn 6	76	Digital input 6
DigIn 7	77	Digital input 7
DigIn 8	78	Digital input 8
ManRst Trip	79	Active trip that needs to be manually reset
Com Error	80	Serial communication lost
External Fan	81	The DCU requires external cooling. Internal fans are active.
LC Pump	82	Activate liquid cooling pump
LC HE Fan	83	Activate liquid cooling heat exchanger fan
LC Level	84	Liquid cooling low level signal active
Com Active	87	Fieldbus communication active.
Output OK	90	Output voltage/current control is active.
NOT1	91	NOT gate 1 output
NOT2	92	NOT gate 2 output
NOT3	93	NOT gate 3 output
NOT4	94	NOT gate 4 output
NOT5	95	NOT gate 5 output

NOT6	96	NOT gate 6 output
NOT7	97	NOT gate 7 output
NOT8	98	NOT gate 8 output
CTR1	99	Counter 1 output
CTR2	100	Counter 2 output
CLK1	101	Clock logic 1 output
CLK2	102	Clock logic 2 output
STO Active	107	STO is active. The digital output reflects the signal reported to the control board, while the control board internally and PPU ignore the STO during power up, power down and standby.
ComFlt Set	109	Parameter set is changed in accordance with menu [246] due to a communication fault.
Charge Relay	111	Charge relay control signal.
Main Relay	112	Main relay control signal.
Output Limit	113	Output DC-voltage/current is in limit.

Digital Out 2 [542]

NOTE: The definitions described here are valid for the active output condition.

Sets the function for the digital output 2.

542 DigOut 2	
Default:	L2
Selection:	Same as in menu DigOut 1 [541].

NOTE: Logic 2 configured to give a 1s trip pulse at a trip event and uses Timer2 and NOT gate 1.

8.5.5 Relays [550]

Submenu with all the settings for the relay outputs. The relay mode selection makes it possible to establish a “fail safe” relay operation by using the normal closed contact to function as the normal open contact.

NOTE: Additional relays will become available when I/O option boards are connected. Maximum 3 boards with 3 relays each.

Relay 1 [551]

Sets the function for the relay output 1. Same function as digital output 1 [541] can be selected.

Relay 1 is reserved for Charge relay control.

551 Relay 1	
Default:	Charge relay
Selection:	Same as in menu DigOut 1 [541].

Relay 2 [552]

NOTE: The definitions described here are valid for the active output condition.

Sets the function for the relay output 2.

552 Relay 2	
Default:	Output OK
Selection:	Same as in menu DigOut 1 [541].

Relay 3 [553]

Sets the function for the relay output 3.

Relay 3 is reserved for Main relay control.

553 Relay 3	
Default:	Main realy
Selection:	Same as in menu DigOut 1 [541].

Board Relay [554] to [55C]

These additional relays are only visible if an I/O option board is fitted in slot 1, 2, or 3. The outputs are named B1 Relay 1–3, B2 Relay 1–3 and B3 Relay 1–3. B stands for board and 1–3 is the number of the board which is related to the position of the I/O option board on the option mounting plate. See menu DigOut 1 [541].

NOTE: Visible only if optional board is detected or if any input/output is activated.

Relay Advanced [55D]

This function makes it possible to ensure that the relay will also be closed when the DCU is malfunctioning or powered down.

Example

A process always requires a certain minimum flow. To control the required number of pumps by the relay mode NC, the e.g. the pumps can be controlled normally by the pump control, but are also activated when the DCU is tripped or powered down.

55D	Relay Advan
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Relay 1 Mode [55D1]

55D1		Relay1 Mode
Default:	N.O	
N.O	0	The normal open contact of the relay will be activated when the function is active.
N.C	1	The normally closed contact of the relay will act as a normal open contact. The contact will be opened when function is not active and closed when function is active.

Relay Modes [55D2] to [55D6]

Same function as for “Relay 1 Mode [55D1]”.

8.5.6 Virtual Connections [560]

Functions to enable eight internal connections of comparator, timer and digital signals, without occupying physical digital in/outputs. Virtual connections are used to wireless connection of a digital output function to a digital input function. Available signals and control functions can be used to create your own specific functions.

Example of start delay

The motor will start in RunR 10 seconds after DigIn1 gets high. DigIn1 has a time delay of 10 s.

Menu	Parameter	Setting
[521]	DigIn1	Timer 1
[561]	VIO 1 Dest	RunR
[562]	VIO 1 Source	T1Q
[641]	Timer1 Trig	DigIn 1
[642]	Timer1 Mode	Delay
[643]	Timer1 Delay	0:00:10

NOTE: When a digital input and a virtual destination are set to the same function, this function will act as an OR logic function.

Virtual Connection 1 Destination [561]

With this function the destination of the virtual connection is established. When a function can be controlled by several sources, e.g. VC destination or Digital Input, the function will be controlled in conformity with “OR logic”. See DigIn for descriptions of the different selections.

561		VIO 1 Dest
Default:	Off	
Selection:	Same selections as for Digital Input 1, menu [521].	

Virtual Connection 1 Source [562]

With this function the source of the virtual connection is defined. See DigOut 1 for description of the different selections.

562		VIO 1 Source
Default:	Off	
Selection:	Same as for menu [541].	

Virtual Connections 2-8 [563] to [56G]

Same function as virtual connection 1 [561] and [562].

8.6 Logical Functions and Timers [600]

With the Comparators, Logic Functions and Timers, conditional signals can be programmed for control or signalling features. This gives you the ability to compare different signals and values in order to generate monitoring/controlling features.

8.6.1 Comparators [610]

The comparators available make it possible to monitor different internal signals and values, and visualize via digital relay outputs, when a specific value or status is reached or established.

Analogue comparators [611] - [614]

There are 4 analogue comparators that compare any available analogue value (including the analogue reference inputs) with two adjustable levels. The two levels available are Level HI and Level LO. There are two analogue comparator types selectable, an analogue comparator with hysteresis and an analogue window comparator.

The analogue hysteresis type comparator uses the two available levels to create a hysteresis for the comparator between setting and resetting the output. This function gives a clear difference in switching levels, which lets the process adapt until a certain action is started. With such a hysteresis, even an unstable analogue signal can be monitored without getting a nervous comparator output signal. Another feature is the possibility to get a fixed indication that a certain level has been passed. The comparator can latch by setting Level LO to a higher value than Level HI.

The analogue window comparator uses the two available levels to define the window in which the analogue value should be within for setting the comparator output. The input analogue value of the comparator can also be selected as bipolar, i.e. treated as signed value or unipolar, i.e. treated as absolute value.

Refer to fig. 49, page 82 where these functions are illustrated.

Analogue Comparator 1 Setup [611]

Analogue comparator 1, parameter group.

Analogue Comparator 1 Value [6111]

Selection of the analogue value for Analogue Comparator 1 (CA1).

Analogue comparator 1 compares the selectable analogue value in menu [6111] with the constant Level HI in menu [6112] and constant Level LO in menu [6113]. If Bipolar type[6115] input signal is selected then the comparison is made with sign otherwise if unipolar selected then comparison is made with absolute values.

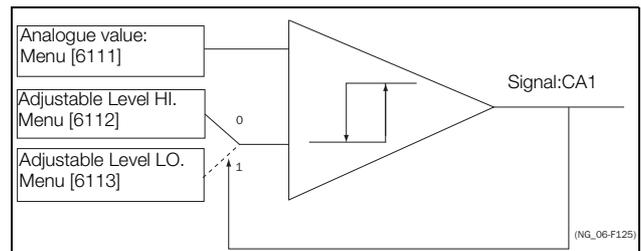


Fig. 45 Analogue comparator type Hysteresis

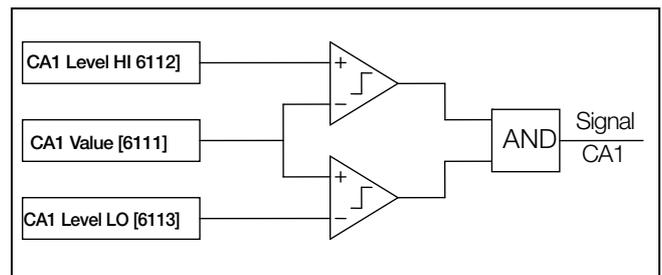


Fig. 46 Analogue comparator type "Window"

The output signal can be programmed as a virtual connection source and to the digital or relay outputs.

6111 CA1 Value		
Default:		Speed
Process Val	0	Set by Process settings [321] and [322]
EI Power	4	kW
Current	5	A
Output volt	6	V
DC Voltage	8	V
IGBT Temp	9	°C
PT100_1	10	°C
PT100_2	11	°C
PT100_3	12	°C
Energy	13	kWh
Run Time	14	h
Mains Time	15	h
AnIn1	16	%
AnIn2	17	%
AnIn3	18	%
AnIn4	19	%
Process Ref	20	Set by Process settings [321] and [322]
Process Err	21	
PT100_4	22	°C
PT100_5	23	°C
PT100_6	24	°C
AnMux1	25	%
AnMux2	26	%

Example

Create automatic RUN/STOP signal via the analogue reference signal. Analogue current reference signal, 4-20 mA, is connected to Analogue Input 1. “AnIn1 Setup”, menu [512] = 4-20 mA and the threshold is 4 mA. Full scale (100%) input signal on “AnIn 1” = 20 mA. When the reference signal on “AnIn1” increases 80% of the threshold (4 mA x 0.8 = 3.2 mA), the DCU will be set in RUN mode. When the signal on “AnIn1” goes below 60% of the threshold (4 mA x 0.6 = 2.4 mA) the DCU is set to STOP mode. The output of CA1 is used as a virtual connection source that controls the virtual connection destination RUN.

Menu	Function	Setting
511	AnIn1 Function	Process reference
512	AnIn1 Set-up	4-20 mA, threshold is 4 mA
341	Min Speed	0
343	Max Speed	1500
6111	CA1 Value	AnIn1
6112	CA1 Level HI	16% (3.2mA/20mA x 100%)
6113	CA1 Level LO	12% (2.4mA/20mA x 100%)
6114	CA1 Type	Hysteresis
561	VIO 1 Dest	RunR
562	VIO 1 Source	CA1
215	Run/Stp Ctrl	Remote

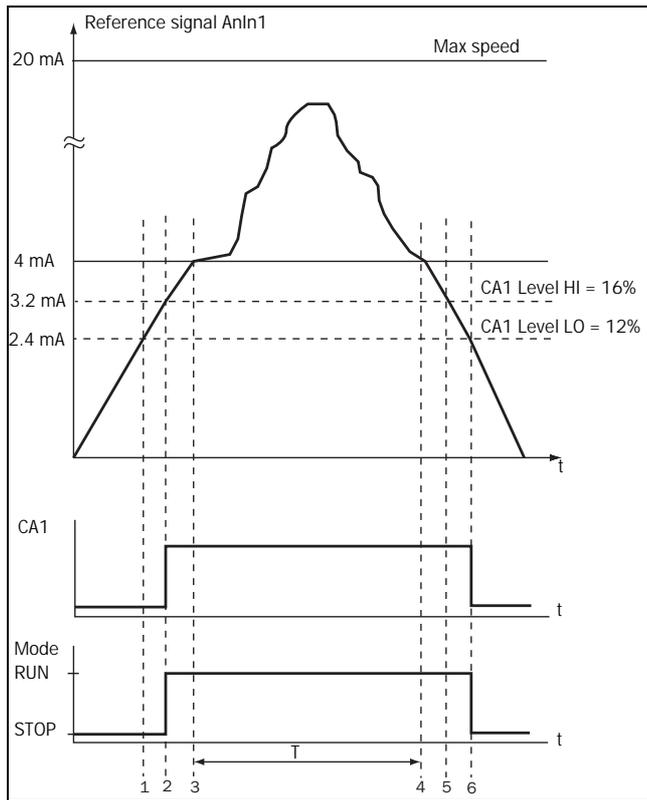


Fig. 47

No.	Description
1	The reference signal passes the Level LO value from below (positive edge), the comparator CA1 output stays low, mode=RUN.
2	The reference signal passes the Level HI value from below (positive edge), the comparator CA1 output is set high, mode=RUN.
3	The reference signal passes the threshold level of 4 mA, the motor speed will now follow the reference signal.
T	During this period the motor speed will follow the reference signal.
4	The reference signal reaches the threshold level, motor speed is 0 rpm, mode = RUN.
5	The reference signal passes the Level HI value from above (negative edge), the comparator CA1 output stays high, mode =RUN.
6	The reference signal passes the Level LO value from above (negative edge), the comparator CA1 output=STOP.

Analogue Comparator 1, Level High [6112]

Sets the analogue comparator high level, with range according to the selected value in menu [6111].

6112 CA1 LevelHI	
Default:	300 rpm
Range:	See min/max in table below.

Min/Max setting range for menu [6112]

Mode	Min	Max	Decimals
Process Val	Set by Process settings [321]		3
El Power, kW	0	Motor $P_n \times 4$	0
Current, A	0	Motor $I_n \times 4$	1
Output volt, V	0	1000	1
DC voltage, V	0	1250	1
IGBT temp, °C	0	100	1
PT 100_1_2_3, °C	-100	300	1
PT 100_4_5_6, °C	-100	300	1
Energy, kWh	0	1000000	0
Run time, h	0	65535	0
Mains time, h	0	65535	0
AnIn 1-4, %	0	100	0
AnMux 1-2, %	0	100	0
Process Ref	Set by Process settings [321] and [322]		3
Process Err	Set by Process settings [321] and [322]		3

NOTE: If Bipolar selected [6115] then Min value is equal to -Max in the table.

Example

This example describes, both for hysteresis and window type comparator, the normal use of the constant level high and low.

Menu	Function	Setting
343	Max Speed	1500
561	VC1 Dest	Timer 1
562	VC1 Source	CA1
6111	CA1 Value	Speed
6112	CA1 Level HI	300 rpm
6113	CA1 Level LO	200 rpm
6114	CA1 Type	Hysteresis

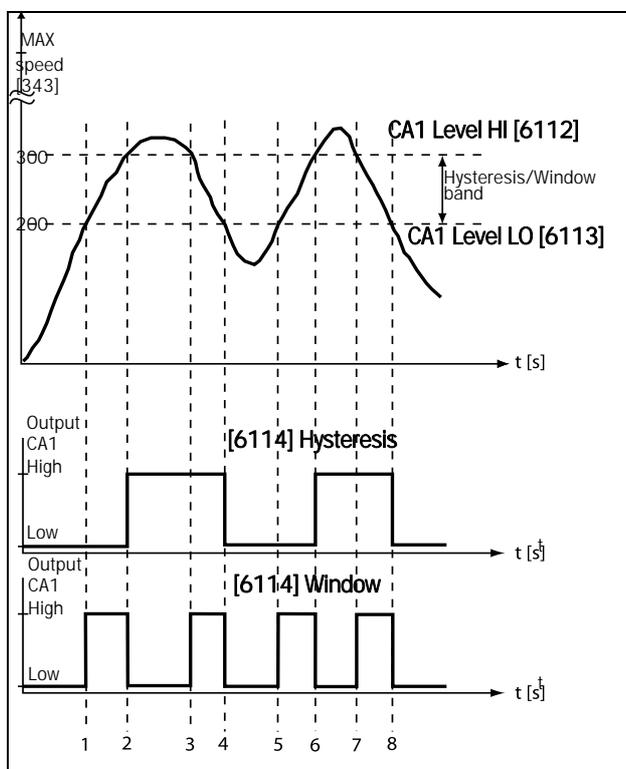


Fig. 48

Table 20 Comments to fig. 48 regarding Hysteresis selection.

No.	Description	Hysteresis
1	The reference signal passes the Level LO value from below (positive edge), the comparator CA1 does not change, output stays low.	—
2	The reference signal passes the Level HI value from below (positive edge), the comparator CA1 output is set high.	↑
3	The reference signal passes the Level HI value from above (negative edge), the comparator CA1 does not change, output stays high.	—
4	The reference signal passes the Level LO value from above (negative edge), the comparator CA1 is reset, output is set low.	↓
5	The reference signal passes the Level LO value from below (positive edge), the comparator CA1 does not change, output stays low.	—
6	The reference signal passes the Level HI value from below (positive edge), the comparator CA1 output is set high.	↑
7	The reference signal passes the Level HI value from above (negative edge), the comparator CA1 does not change, output stays high.	—
8	The reference signal passes the Level LO value from above (negative edge), the comparator CA1 is reset, output is set low.	↓

Table 21 Comments to fig. 48 regarding Window selection.

No.	Description	Window
1	The reference signal passes the Level LO value from below (signal inside Window band), the comparator CA1 output is set high.	↑
2	The reference signal passes the Level LO value from above (signal outside Window band), the comparator CA1 is reset, output is set low.	↓
3	The reference signal passes the Level HI value from above (signal inside Window band), the comparator CA1 output is set high.	↑
4	The reference signal passes the Level LO value from above (signal outside Window band), the comparator CA1 is reset, output is set low.	↓
5	The reference signal passes the Level LO value from below (signal inside Window band), the comparator CA1 output is set high.	↑
6	The reference signal passes the Level HI value from below (signal outside Window band), the comparator CA1 is reset, output is set low.	↓
7	The reference signal passes the Level HI value from above (signal inside Window band), the comparator CA1 output is set high.	↑
8	The reference signal passes the Level LO value from above (signal outside Window band), the comparator CA1 is reset, output is set low.	↓

Analogue Comparator 1, Level Low [6113]

Sets the analogue comparator low level, with unit and range according to the selected value in menu [6111].

6113 CA1 LevelLO	
Default:	200 rpm
Range:	Range as [6112].

Analogue Comparator 1, Type [6114]

Selects the analogue comparator type, i.e. Hysteresis or Window type. See fig. 49 and fig. 50.

6114 CA1 Type		
Default:		Hysteresis
Hysteresis	0	Hysteresis type comparator
Window	1	Window type comparator

Analogue Comparator 1, Polarity [6115]

Selects how the selected value in [6111] should be handled prior to the analogue comparator , i.e. as absolute value or handled with sign. See fig. 49

6115 CA1 Polar		
Default:		Unipolar
Unipolar	0	Absolute value of [6111] used
Bipolar	1	Signed value of [6111] used

Example

See fig. 49 and fig. 50 for different principle functionality of comparator features 6114 and 6115.

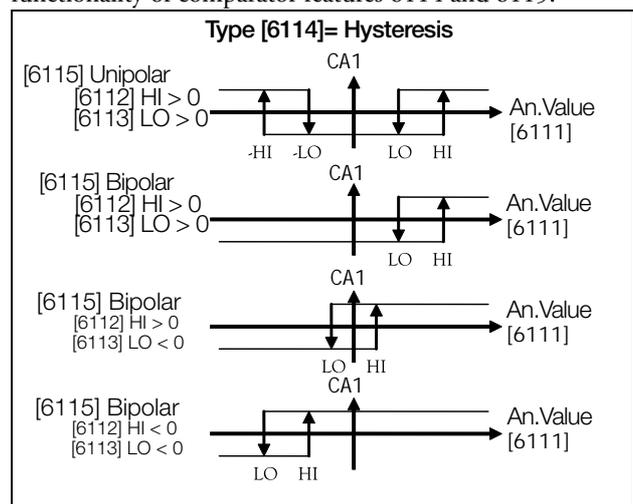


Fig. 49 Principle functionality of comparator features for "Type [6114] = Hysteresis" and "Polar [6115]".

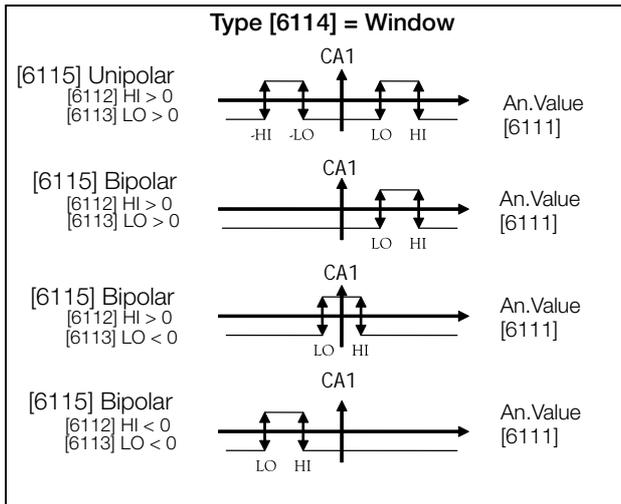


Fig. 50 Principle functionality of comparator features for "Type [6114] = Window" and "Polar [6115]".

NOTE: When "Unipolar" is selected, absolute value of signal is used.

NOTE: When "Bipolar" is selected in [6115] then:
1. Functionality is not symmetrical .
2. Ranges for high/low are bipolar

Analogue Comparator 1 Set Delay [6116]

The output signal for the analogue comparator 1 is delayed with the set value in this menu. See fig. 51.

6116 CA1 Set Dly	
Default:	0 s
Range:	0 - 36000 s

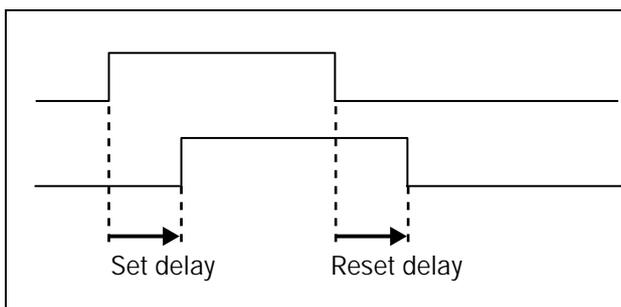


Fig. 51 Set/reset delay for output signal.

Analogue Comparator 1 Reset Delay [6117]

The reset of the output signal for the analogue comparator 1 is delayed with the set time in this menu. See fig. 51.

6117 CA1 Res Dly	
Default:	0 s
Range:	0 - 36000 s

Analogue Comparator 1 Timer Value [6118]

The actual timer value for analogue comparator 1 is viewed in this menu.

6118 CA1 Tmr Val	
Default:	0 s
Range:	0 - 36000 s

Setup Analogue Comparators 2-4 [612] - [614]

Refer to the descriptions for Analogue Comparator 1. See Chapter 12, page 129 regarding defaults.

8.6.2 Analogue Multiplexer [620]

The Analogue Mux compares two configurable analogue input signals (InA and InB) and generates a virtual analogue output. Output behavior depends on the configured operator. Output can be used as source for analogue output or input value to analogue comparators.

Since both input and output is limited to range -100% to 100% some operations might overflow. Result is always limited within the range. Consequently some operators have a "divided by 2" variant to always produce overflow safe variants (result is always within the range).

Analogue Multiplexer 1 [621]

AnMux1 InA [6211]

First input to the AnMux1. Select one of AnIn1 - 4.

6211 AnMux1 InA		
Default:	AnIn1	
AnIn1	0	%
AnIn2	1	%
AnIn3	2	%
AnIn4	3	%

AnMux1 InB [6212]

Second input to AnMux1. Select one of AnIn1 - 4.

6212 AnMux1 InB		
Default:	AnIn2	
AnIn1	0	%
AnIn2	1	%
AnIn3	2	%
AnIn4	3	%

Analogue Multiplexer 1 Operator [6213]

Operator of the Analogue Mux 1. The names shown on the control panel will be changed according to the following.

6213 AnMux1 Op		
Default:	Off	
Off	0	No output
MIN(A,B)	1	Minimal value of InA and InB
MAX(A,B)	2	Max value of InA and InB
A+B	3	Sum of InA and InB
(A+B)/2	4	Sum of InA and InB that is overflow safe
A-B	5	Difference of InA and InB
(A-B)/2	6	Difference of InA and InB that is overflow safe
B-A	7	Difference of InB and InA
(B-A)/2	8	Difference of InB and InA that is overflow safe
ABS(A-B)	9	Absolute value of difference of InA and InB.
ABS(A-B)/2	10	Absolute value of difference of InA and InB that is overflow safe

Analogue Multiplexer 2 [622]

The same function as in Analog Mux1[621].

AnMux2 InA [6221]

The function is the same as in Analogue Mux InA value [6211].

6221 AnMux2 InA		
Default:	AnIn1	
AnIn1	0	%
AnIn2	1	%
AnIn3	2	%
AnIn4	3	%

AnMux2 InB [6222]

The function is the same as in Analogue Mux InB value [6212].

6222 AnMux2 InB		
Default:	AnIn2	
AnIn1	0	%
AnIn2	1	%
AnIn3	2	%
AnIn4	3	%

Analogue Multiplexer 2 Operator [6223]

Operator of the Analogue Mux 2. The function is the same as in Operator [6213].

6223 AnMux2 Op	
Default:	Off
Selections:	Same as in menu Operator [6213].

8.6.3 Not Gate [630]

Output of the NOT gate is the inverted signal of the selected input. NOT gates are used when some other function (logic expression, digital out, virtual IO) needs the inverted signal.

NOT1 Input [631]

631 NOT1 Input	
Default:	CA2
Selection:	Same as in menu DigOut 1 [541].

NOT2 Input [632] - NOT8 Input [638]

Refer to the descriptions for NOT1 Input [631]. For default values see chapter 12, page 129.

8.6.4 Logic output [640]

Logic Output 1 [641]

By means of an expression editor, the input signals can be logically combined into the logics function to create a logic output signal.

The expression editor has the following features:

- All available digital output signals can be used as input to the logic block.
- The following logical operators are available:
 - "+" : OR operator
 - "&" : AND operator
 - "^" : EXOR operator
 - "." : This close the expression

Expressions according to the following truth table can be made (see also the example below):

Input		Result		
A	B	& (AND)	+ (OR)	^(EXOR)
0	0	0	0	0
0	1	0	1	1
1	0	0	1	1
1	1	1	1	0

The output signal can be programmed to the relay outputs or used as a virtual connection source [560].

The logic expression must be programmed by means of the menus [641] to [641B], and its actual appearance can be viewed in menu [641], with example below:

641	Orpm
Logic 1	
	((0&1)&0)&1
Sby A	Rem/Rem

Menu [641] shows the actual values of the four selected input signals set in menus [6412], [6414], [6416] and [6418].

Logic 1 Expression [6411]

Selection of execution order of the logic expression for the Logic 1 function:

6411	L1	Expr
Default:		((1.2).3).4
((1.2).3).4	0	Default execution order, see explanation below.
(1.2).(3.4)	1	Alternative execution order, see explanation below.

- Parentheses () show the order in which the Logic 1 Inputs are combined, according to [6411].
- 1, 2, 3, and 4, represent the Logic 1 Input signals selected in menu [6412], [6414], [6416], and [6418].
- The dots stand for the Logic 1 Operators (&, +, or ^), whose values are selected in menus [6413], [6415], and [6417].

To build the Logic 1 expression using the default selection in menu [6411], the execution order is as follows:

1. Input 1 is combined with Input 2 using Operator 1.
2. Input 3 is combined with the expression (1.2), using Operator 2.
3. Input 4 is combined with the result of (1.2).3, using Operator 3.

The alternative execution order leads to:

1. Input 1 is combined with Input 2 using Operator 1.
2. Input 3 is combined with Input 4 using Operator 3.
3. Expression (1.2) is combined with expression (3.4), using Operator 2.

Example

Input 1 [6412]

Input 2 = F1, menu [6414]

Input 3 = T1Q, menu [6416]

Input 4 = NOT1, menu [631]

In case NOT1 is configured to CA2 the output of the NOT1 gate will be the inverse of CA2 i.e. !CA2.

Operator 1 = & (AND), set in menu [6413]

Operator 2 = + (OR), menu [6415]

Operator 3 = & (AND), menu [6417]

The following expression is created, using the menus above:

CA1&F1+T1Q&NOT1

With the default setting for L1 Expression this is representing:

((CA1&F1)+T1Q)&NOT1

Let's use the following values on the input signals as an example:

CA1=1 (active/high)

F1= 1 (active/high)

T1Q = 1 (active/high)

NOT1 = 0 (inactive/low)

With the respective values inserted the resulting logic expression is:

641	Orpm
Logic 1	
	((1&1)+1)&0
Sby A	Rem/Rem

which is equal to 0.

With the alternative execution order for the L1 Expression this is representing:

$$(CA1&F1)+(T1Q&NOT1)$$

With the above values inserted the resulting logic expression now becomes:

641	Orpm
Logic 1	
	(1&1) + (1&0)
Sby A	Rem/Rem

which is equal to 1.

Logic 1 Input 1 [6412]

In this menu the first input for the Logic 1 function is selected. The same selections are valid for [6414] L1 Input 2, [6416] L1 Input 3, and [6418] L1 Input 4. See chapter 12. page 129.

6412 L1 Input 1	
Default:	CA1
Selection:	Same as in menu DigOut 1 [541].

Logic 1 Operator 1 [6413]

In this menu the first operator for the Logic 1 function is selected.

6413 L1 Op 1		
Default:	&	
.	0	When . (dot) is selected, the Logic 1 expression is finished (when two or three expressions are tied together).
&	1	&=AND
+	2	+ =OR
^	3	^=EXOR

Logic 1 Input 2 [6414]

In this menu the second input for the Logic 1 function is selected.

6414 L1 Input 2	
Default:	NOT1
Selection:	Same as in menu DigOut 1 [541].

Logic 1 Operator 2 [6415]

In this menu the second operator for the Logic 1 function is selected.

6415 L1 Op 2	
Default:	&
Selection:	Same as in menu L1 Op 1 [6413].

Logic 1 Input 3 [6416]

In this menu the third input for the Logic 1 function is selected.

6416 L1 Input 3	
Default:	Run
Selection:	Same as in menu DigOut 1 [541].

Logic 1 Operator 3 [6417]

In this menu the third operator for the Logic 1 function is selected.

6417 L1 Op 3	
Default:	.
Selection:	Same as in menu L1 Op 1 [6413].

Logic 1 Input 4 [6418]

In this menu the fourth input for the Logic 1 function is selected.

6418 L1 Input 4	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Logic 1 Set Delay [6419]

The activation of the output signal for the Logic 1 function is delayed with the set value in this menu. Compare to chapter Fig. 51 page 83.

6419 L1 Set Dly	
Default:	0.0 s
Range:	0 - 36000.0 s

Logic 1 Reset Delay [641A]

The reset of the output signal for the Logic 1 function is delayed with the set value in this menu. Compare to fig. 51, page 83.

641A L1 Res Dly	
Default:	0.0 s
Range:	0 - 36000.0 s

Logic 1 Timer Value [641B]

The actual timer value for logic 1 is viewed in this menu.

641B L1 Tmr Val	
Default:	0.0 s
Range:	0 - 36000.0 s

Logic 2 - 4 [642] - [644]

Refer to the descriptions for Logic 1. For default values see chapter 12. page 129.

8.6.5 Timers [650]

The Timer functions can be used as a delay timer or as an interval with separate “on” and “off” times (alternate mode), or as a way to prolong a signal (on-time mode). The selected trigger signal starts the timer function, and the signal is converted according to the mode settings, resulting in the timer output signal (T1Q - T4Q). In “Delay” mode, the output signal T1Q becomes high if the set delay time is expired. See fig. 52.

In “Delay” mode, the activation of the timer output signal will be delayed in comparison to the trigger signal. The timer output signal is activated (high) when the set delay time has expired. See fig. 52. The timer output signal will however follow the trigger signal when this is deactivated (low) again.

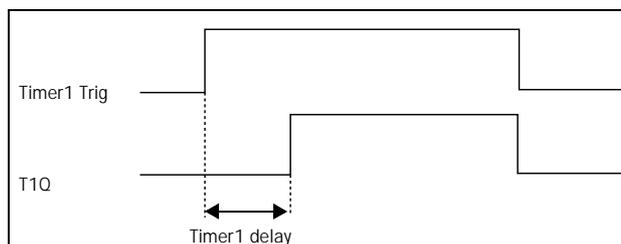


Fig. 52 Delay timer mode.

In alternate mode, the output signal T1Q will switch automatically from high to low etc. according to the set interval times “Timer1 T1” and “Timer 1 T2”. See fig. 53.

The output signal can be programmed to the digital or relay outputs used in logic functions [600] or as a virtual connection source [560].

NOTE: The actual timers are common for all parameter sets. If the actual set is changed, the timer functionality [641] to [645] will change according set settings but the timer value will stay unchanged. So initialization of the timer might differ for a set change compared to normal triggering of a timer.

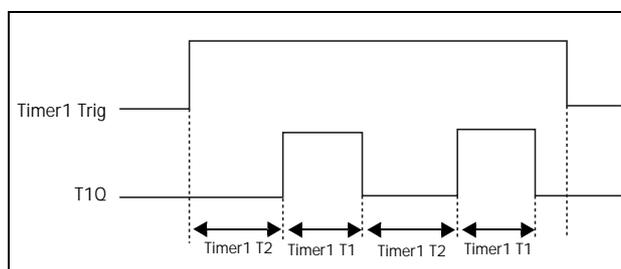


Fig. 53 Alternative timer mode

The function of the “On-time” mode is to extend an activated (high) timer output signal in comparison to the trigger signal. See Fig. 54.

- Output goes high when in signal goes high (positive edge triggered)
- Output stays high for configured time.
- If new positive edge is detected during configured on-time the elapsed time is reset.
- In case the in signal stays high longer than configured time output is kept high as long as in signal is active.

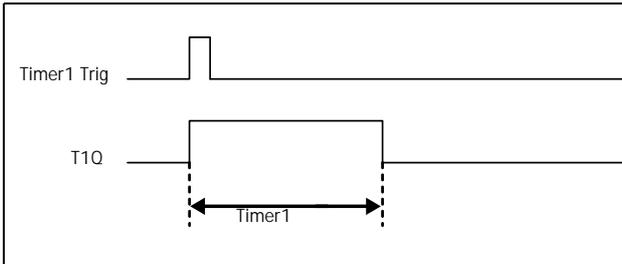


Fig. 54 On-time timer mode.

The timer output signals (T1Q - T4Q) can be programmed to the relay outputs used in logic functions [620], or be used as a virtual connection source [560].

NOTE: The actual timers are common for all parameter sets. If the actual parameter set is changed, the timer functionality will change according to the settings, but the timer value will stay unchanged. So initialisation of the timer might differ for a set change compared to normal triggering of a timer.

Timer1 [651]

Parameter group for Timer 1.

Timer 1 Trig [6511]

Selection of the Timer input trigger signal

Timer 1 can be activated by a high signal on a DigIn that is set to Timer 1 or via a virtual destination [560].

6511 Timer1 Trig	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Timer 1 Mode [6512]

Selection of mode of operation for Timer 1.

6512 Timer1 Mode		
Default:	Off	
Off	0	Timer is disabled
Delay	1	Output signal will be delayed in comparison to the trigger signal.
Alternate	2	Timer output will automatically keep on switching according to the independently programmable on and off times as long as it is triggered.
On-time	3	Timer output will extend the trigger signal according to configured on-time.

Timer 1 Delay [6513]

This menu is only visible when timer mode is set to delay.

This menu can only be edited as in alternative 2, see section 7.5 page 43.

Timer 1 delay sets the time that will be used by the first timer after it is activated.

6513 Timer1Delay	
Default:	0.0 s
Range:	0 - 36000.0 s

Timer 1 T1 [6514]

This menu is only visible when timer mode is set to Alternate or On-time.

Timer 1 T1 sets the on time in both modes.

6514 Timer1 T1	
Default:	0.0 s
Range:	0 - 36000.0 s

Timer 1 T2 [6515]

Timer 1 T2 sets the off time in the alternate mode.

6515 Timer1 T2	
Default:	0.0 s
Range:	0 - 36000.0 s

NOTE: "Timer 1 T1 [6514]" and "Timer 1 T2 [6515]" are only visible when Timer Mode is set to Alternate.

Timer 1 Actual Value [6516]

Timer 1 Value shows actual value of the timer.

6516 Timer1Value	
Default:	0.0 s
Range:	0 - 36000.0 s

Timer 2 - Timer 4 [652] - [654]

Refer to the description for Timer 1 [651].

8.6.6 Flip flops [660]

The flip-flop function is a memory circuit that can be used to store data concerning state. The output from a flip-flop is dependent not only on its current input, but also on its state at the moment this is received (hence previous input status also matters).

The set/reset flip-flop circuit has two input signals, SET and RESET, that control the state of an output signal, OUT.

When none of the input signals are active (i.e. both are =0), the flip-flop will keep its current value. Changes of the flip-flop state always occur on the rising edge of one of its inputs.

When only one of the input signals becomes active (=1), this will directly decide the status of the output signal.

Consequently if SET becomes active and RESET is inactive, the SET command is given to the output signal, OUT. This will result in a signal change from inactive to active (=1), if not already in an active state.

Conversely, if SET is inactive and RESET becomes active, the RESET command is given to the output signal, OUT, causing this to be deactivated (=0).

When both of the inputs signals becomes active the resulting operation depends on the configured Flip-flop priority mode as explained below.

Flip-flop priority mode

When both input signals becomes active simultaneously, i.e. both SET and RESET are =1, a priority function decides which signal will influence the output signal. There are three different priority settings available for the flip-flop function, selected in the menu for "Flip-flop Mode". Examples of the different priority settings are presented in fig. 55.

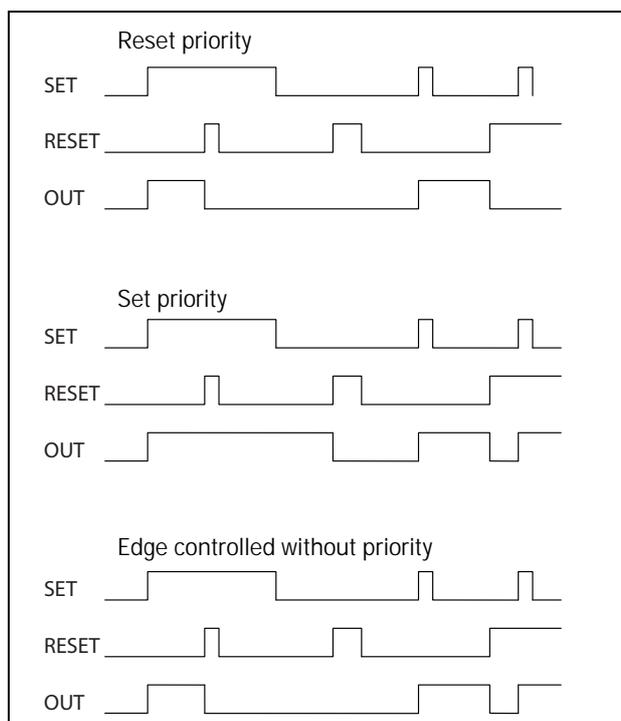


Fig. 55 Programmable flip-flop modes.

Reset priority

"Reset priority" means that if both input signals becomes active, it will be the RESET command that is obeyed, causing the output signal to become inactive (=0) on the rising edge of RESET, as can be seen in fig. 55 If RESET comes first OUT remain inactive when later SET signal becomes active. If SET comes first OUT will turn inactive upon the rising edge of RESET.

Set priority

For "Set priority" the determining input signal is SET. Should both input signals become active, this is resulting in an activated (=1) output signal on the rising edge of SET, as can be seen in fig. 55. If SET comes first OUT will remain active when later RESET signal becomes active. If RESET comes first OUT will turn active upon the rising edge of SET.

Edge controlled without priority

The third setting is "Edge controlled", for which no input signal has priority over the other. The output signal follows any of the two input signals (still providing they are at a positive edge). The most recent registered activity decides the output. See table 22.

Should both inputs become activated simultaneously, there will not be any change; the output signal will just keep its earlier status.

NOTE: The input signals are updated in intervals of 8 milliseconds, therefore the signal changes are considered simultaneous if the difference is less than 8 ms.

Table 22 Truth table for Edge control without priority.

SET	RESET	OUT
0	0	- (no change)
↗1	0/1	1 (set)
0/1	↗1	0 (reset)
↗1	↗1	No change

Flip flop 1 [661]

Function for SR flip-flop 1.

Flip flop 1 mode [6611]

Priority setting of input signals for flip-flop 1.

6611 F1 mode		
Default:		Reset
Reset	0	Reset priority.
Set	1	Set priority.
Edge	2	Edge controlled without priority.

Flip flop 1 set [6612]

Selection of SET input signal for flip-flop 1.

6612 F1 set	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Flip flop 1 reset [6613]

Selection of RESET input signals for flip-flop 1.

6613 F1 reset	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Flip flop 1 set delay [6614]

The SET input signal for flip-flop 1 is delayed with the set value in this menu.

6614 F1 Set Dly	
Default:	0.0 s
Selection:	0 - 36000.0 s

Flip flop 1 reset delay [6615]

The RESET input signal for flip-flop 1 is delayed with the set value in this menu.

6615 F1 Res Dly	
Default:	0.0 s
Selection:	0 - 36000.0 s

Flip flop 1 timer value [6616]

This menu shows the actual value of the flip flop 1 timer.

6616 F1 Tmr Val	
Default:	0.0 s
Selection:	0 - 36000.0 s

Flip flop 2 - 4 [662] - [664]

Refer to the description for Flip Flop 1[661].

8.6.7 Counters [670]

Counter functions for counting pulses and signalling on digital output when counter reaches specified high and low limit levels.

The counter is counting up on positive flanks on the triggered signal, the counter is cleared as long as the Reset signal is active.

The counter can be automatically decremented with specified decrement time, if no new trigger signal has occurred within the decrement time.

The counter value is clamped to the high limit value and the digital output function (CTR1 or CTR2) is active when counter value equals high limit value.

See fig. 56 for more information of the counters.

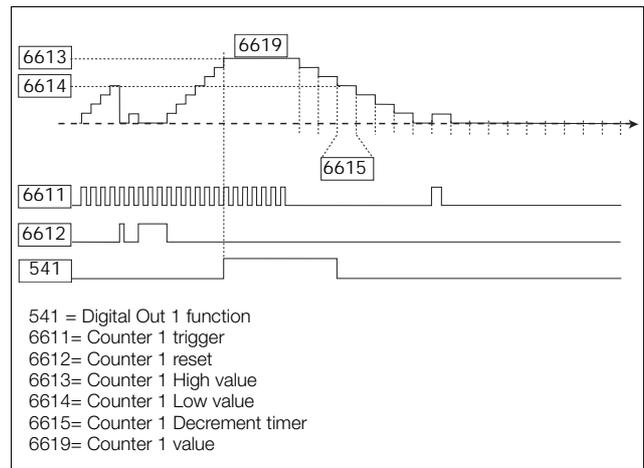


Fig. 56 Counters, operating principle.

Counter1 [671]

Counter 1 parameter group.

Counter 1 Trigger [6711]

Selection of the digital output signal used as trigger signal for counter 1. Counter 1 is incremented by 1 on every positive flank on the trigger signal.

NOTE: Maximum counting frequency is 8 Hz.

6711 C1 Trig	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Counter 1 Reset [6712]

Selection of the digital signal used as reset signal for counter 1. Counter 1 is cleared to 0 and held to 0 as long as reset input is active (high).

NOTE: Reset input has top priority.

6712 C1 Reset	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Counter 1 High value [6713]

Sets counter 1 high limit value. Counter 1 value is clamped to selected high limit value and the counter 1 output (CTR1) is active (high) when the counter value equals the high value.

NOTE: Value 0 means that counter output is always true (high).

6713 C1 High Val	
Default:	0
Range:	0 - 10000

Counter 1 Low value [6714]

Sets counter 1 low limit value. Counter 1 output (CTR1) is de-activated (low) when the counter value is equal or smaller than the low value.

NOTE: Counter high value has priority so if high and low values are equal then the counter output is de-activated when the value is smaller than the low value.

6714 C1 Low Val	
Default:	0
Range:	0 - 10000

Counter 1 Decrement timer [6715]

Sets counter 1 automatic decrement timer value. The counter 1 is decremented by 1 after elapsed decrement time and if no new trigger has happened within the decrement time. The decrement timer is reset to 0 at every counter 1 trig pulse.

6715 C1 DecTimer		
Default:		Off
Range:	Off, 1–3600 s (Off=0)	

Counter 1 Value [6719]

Parameter shows the actual value of counter 1.

NOTE: Counter 1 value is common for all parameter sets.

NOTE: The value is volatile and lost at power down.

6719 C1 Value	
Default:	0
Range:	0 - 10000

Counter2 [672]

Refer to description for Counter 1 [671].

Counter 2 Trigger [6721]

Function is identical to Counter 1 Trigger [6711].

6721 C2 Trig	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Counter 2 Reset [6722]

Function is identical to Counter 1 Reset [6712].

6722 C2 Reset	
Default:	Off
Selection:	Same as in menu DigOut 1 [541].

Counter 2 High value [6723]

Function is identical to Counter 1 High value [6713].

6723 C2 High Val	
Default:	0
Range:	0 - 10000

Counter 2 Low value [6724]

Function is identical to Counter 1 Low value [6714].

6724 C2 Low Val	
Default:	0
Range:	0 - 10000

Counter 2 Decrement timer [6725]

Function is identical to Counter 1 Decrement timer [6715].

6725 C2 DecTimer	
Default:	Off
Range:	Off, 1–3600 s (Off=0)

Counter 2 Value [6729]

Parameter shows the actual value of counter 2.

NOTE: Counter 2 value is common for all parameter sets.

NOTE: The value is volatile and lost at power down.

6729 C2 Value	
Default:	0
Range:	0 - 10000

8.6.8 Clock Logic [680]

Group 670 if only available if the drive is equipped with a 4-line type Control panel (incl. RTC).

There are two Clock functions, Clock 1 and Clock 2. Each clock with separate settings for Time on, Time Off, Date on, Date Off and Weekday. These clocks can be used for activating/deactivating desired functions via Relay, digital output or Virtual I/O (For example creating start and stop commands).

Clock 1 [681]

The time, date and weekday for clock 1 are set in these submenus.

681 Clock 1	
-------------	--

Clock 1 Time On [6811]

Time when the clock 1 output signal (CLK1) is activated.

6811 Clk1TimeON	
Default:	00:00:00 (hh:mm:ss)
Range:	0:00:00–23:59:59

Clock 1 Time Off [6812]

Time when the clock 1 output signal (CLK1) is deactivated.

6812 Clk1TimeOff	
Default:	00:00:00 (hh:mm:ss)
Range:	0:00:00–23:59:59

Clock 1 Date On [6813]

Date when the clock 1 output signal (CLK1) is activated.

6813 Clk1DateOn	
Default:	2000-00-00
Range:	yyyy-mm-dd (year-month-day)

Clock 1 Date Off [6814]

Date when the clock output signal (CLK1) is deactivated. Note that if “Clk1DateOff” is set to an earlier date than “Clk1DateOn”, the result will be that the clock is not deactivated at the set date.

6814 Clk1DateOff	
Default:	2000-00-00
Range:	yyyy-mm-dd (year-month-day)

Clock 1 Weekday [6815]

Weekdays when the clock function is active. Having entered the editing mode, select or unselect the desired weekdays with the cursor using the PREV and NEXT keys on the control panel. Confirm by pressing ENTER. Exit the editing mode and the activated weekdays will be viewed in the menu display. The deactivated weekdays are replaced by a dash mark "-" (e.g. "MTWTF--").

6815 Clk1Weekday	
Default:	MTWTFSS (all activated)
Range:	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday.

NOTE: Please make sure that the correct time and date settings are done for the real time clock, menu group [930] "Clock".

Example 1:

The output CLK1 shall be active Mondays to Fridays on working hours, e.g. 08:00-17:00. This signal is used to start e.g. a fan with virtual I/O.

Menu	Text	Setting
6811	Clk1TimeOn	08:00
6812	Clk1TimeOff	17:00
6813	Clk1DateOn	2017-02-01 (date in the past)
6814	Clk1DateOff	2099-12-31 (Date in the future)
6815	Clk1Weekday	MTWTF--
561	VIO 1 Dest	Run FWD
562	VIO 1 Source	Clk1

Example 2:

The output CLK1 shall be active on weekends, all day.

Menu	Text	Setting
6811	Clk1TimeOn	0:00:00
6812	Clk1TimeOff	23:59:59
6813	Clk1DateOn	2017-02-01 (date in the past)
6814	Clk1DateOff	2099-12-31 (Date in the future)
6815	Clk1Weekday	-----SS
561	VIO 1 Dest	Run FWD
562	VIO 1 Source	Clk1

Clock 2 [682]

Refer to the description for Clock 1 [681].

8.7 View Operation/Status [700]

Menu with parameters for viewing all actual operational data, such as speed, torque, power, etc.

8.7.1 Operation [710]

Process Value [711]

The process value is showing the process actual value, depending on selection done in menu Process Source [321].

711 Process Val	
Unit	Depends on selected Pcess source [321] and Process Unit [322].
Resolution	Speed: 1 rpm, 4 digits Other units: 3 digits

Electrical Power [715]

Displays the actual electrical output power. Negative sign is used when the motor is generating electrical power to the drive unit.

715 E1 Power	
Unit:	kW
Resolution:	1 W

Current [716]

Displays the actual output current.

716 Current	
Unit:	A
Resolution:	0.1 A

Output Voltage [717]

Displays the actual output voltage.

717 Output volt	
Unit:	V
Resolution:	0.1 V

DC Link Voltage [719]

Displays the actual DC link voltage.

719 DC Voltage	
Unit:	V
Resolution:	0.1 V

IGBT Temperature [71A]

Displays the actual IGBT temperature, measured. The signal is generated by a sensor in the IGBT module.

71A IGBT Temp	
Unit:	°C
Resolution:	0.1°C

* The IGBT losses and temperature depend on the actual operation condition, i.e. output current and voltage, DC-voltage, switching frequency and cooling.

PT100_1_2_3 Temperature [71B]

Displays the actual PT100 temperature, for PT100 board 1.

71B PT100 1,2,3	
Unit:	°C
Resolution:	1°C

PT100_4_5_6 Temperature [71C]

Displays the actual PT100 temperature, for PT100 board 2.

71C PT100 4,5,6	
Unit:	°C
Resolution:	1°C

8.7.2 Status [720]

Frequency Inverter Status [721]

Indicates the overall status of the DCU.

721	0rpm
VSD Status	1/222/333/44
Sby	Rem/Rem

Fig. 57 The DCU status

Display position	Function	Status value
1	Parameter Set	A,B,C,D
222	Source of reference value	Rem (remote) Key (keyboard) Com (Serial comm.) Opt (option)
333	Source of Run/Stop command	Rem (remote) Key (keyboard) Com (Serial comm.) Opt (option)
44	Limit functions	- -No limit active VL (Voltage Limit) CL (Current Limit)

Example: "A/Key/Rem/TL"

This means:

A: Parameter Set A is active.

Key: Reference value comes from the keyboard (CP).

Rem: Run/Stop commands come from terminals 1-22.

Description of communication format.

Integer values and bits used.

Bit	Integer representation
1 - 0	Active Parameter set, where 0=A, 1=B, 2=C, 3=D
4 - 2	Source of Reference control value, where 0=Rem, 1=Key, 2=Com, 3=Option
7 - 5	Source of Run/Stop/Reset command, where 0=Rem, 1=Key, 2=Com, 3=Option
13 - 8	Active limit functions, where 0=No limit, 1=VL, 3=CL
14	Inverter is in warning (A warning condition is active)
15	Inverter is tripped (A Trip condition is active)

Example:

Previous example "A/Key/Rem/TL"

is interpreted "0/1/0/4"

In bit format this is presented as

Bit	Interpretation	Integer representation	
0 LSB	0	A(0)	Parameter set
1	0		
2	1	Key (1)	Source of control
3	0		
4	0		
5	0	Rem (0)	Source of command
6	0		
7	0		
8	1	CL (3)	Limit functions
9	1		
10	0		
11	0		
12	0		
13	0		
14	0		Warning condition
15 MSB	0		Trip condition

In the example above it is assumed that we have no trip or warning condition (the alarm LED on the control panel is off).

Warning [722]

Display the actual or last warning condition. A warning occurs if the DCU is close to a trip condition but still in operation. During a warning condition the red trip LED will start to blink as long as the warning is active.

722	0rpm
Warning	
Brake	17:15:38
Sby	Rem/Rem

The active warning message is displayed in menu [722]. If no warning is active the message "No Error" is displayed. The following warnings are possible:

Communication integer value	Warning message
0	No Error
2	PTC
5	ExtTrip1*
8	Comm error
9	PT100
12	Ext Mot Temp
13	LC Level
15	Option
16	Over temp
17	Over curr F
18	Over volt D
19	Over volt G
20	Over volt
21	Over speed
22	Under voltage
23	Power fault
24	Desat
25	DClk error
26	Int error
27	Ovolt m cut
28	Over voltage
29	STO Active
32	ExtTrip2*
33	AnIn<Offset
34	ExtTrip3*
35	ExtTrip4*

* Warning messages ExtTrip1 - ExtTrip4 are configurable in menu [430].

See also chapter 9, page 113.

Digital Input Status [723]

Indicates the status of the digital inputs. See fig. 58.

- 1 DigIn 1
- 2 DigIn 2
- 3 DigIn 3
- 4 DigIn 4
- 5 DigIn 5
- 6 DigIn 6
- 7 DigIn 7
- 8 DigIn 8

The positions one to eight (read from left to right) indicate the status of the associated input:

- 1 High
- 0 Low

The example in fig. 58 indicates that DigIn 1, DigIn 3 and DigIn 6 are active at this moment.

723	0rpm
DigIn Status	10100100
Sby	Rem/Rem

Fig. 58 Digital input status example

Digital Output Status [724]

Indicates the status of the digital outputs and relays. See fig. 59.

RE indicate the status of the relays on position:

- 1 Relay1
- 2 Relay2
- 3 Relay3

DO indicate the status of the digital outputs on position:

- 1 DigOut1
- 2 DigOut2

The status of the associated output is shown.

- 1 High
- 0 Low

The example in fig. 59 indicates that DigOut1 is active and Digital Out 2 is not active. Relay 1 is active, relay 2 and 3 are not active.

724	0rpm
DigOutStatus	RE 100 DO 10
Sby	Rem/Rem

Fig. 59 Digital output status example

Analogue Input Status [725]

Indicates the status of the analogue inputs 1 and 2.

725	0rpm
AnIn 1	2
0%	-2%
Sby	Rem/Rem

Fig. 60 Analogue input status

The first row indicates the analogue inputs.

- 1 AnIn 1
- 2 AnIn 2

Reading downwards from the first row to the second row the status of the belonging input is shown in %:

- 100% AnIn1 has a negative 100% input value
- 65% AnIn2 has a 65% input value

So the example in fig. 60 indicates that both the Analogue inputs are active.

NOTE: The shown percentages are absolute values based on the full range/scale of the in- or output; so related to either 0–10 V or 0–20 mA.

Analogue Input Status [726]

Indicates the status of the analogue inputs 3 and 4.

726	0rpm
AnIn 3	4
-100%	65%
Sby	Rem/Rem

Fig. 61 Analogue input status

Analogue Output Status [727]

Indicates the status of the analogue outputs. fig. 62. E.g. if 4-20 mA output is used, the value 20% equals to 4 mA.

727	0rpm
AnOut 1	2
-100%	65%
Sby	Rem/Rem

Fig. 62 Analogue output status

The first row indicates the Analogue outputs.

- 1 AnOut 1
- 2 AnOut 2

Reading downwards from the first row to the second row the status of the belonging output is shown in %:

-100%AnOut1 has a negative 100% output value
65%AnOut2 has a 65% output value

The example in fig. 62 indicates that both the Analogue outputs are active.

NOTE: The shown percentages are absolute values based on the full range/scale of the in- or output; so related to either 0–10 V or 0–20 mA.

I/O board Status [728] - [72A]

Indicates the status for the additional I/O on option boards 1 (B1), 2 (B2) and 3 (B3).

728	0rpm
IO Status B1	
	RE 000 DI100
sby	Rem/Rem

Area D Stat [72B]

These menus are not visible in the control panel display. Only used in EmoSoftCom PC-tool (optional) and can be read via fieldbus or serial communication.

Area D LSB [72B1]

Status bits 0 to 15.
See Chapter 7.2.1 page 37.

Area D MSB [72B2]

Status bits 16 and up.
See Chapter 7.2.1 page 37.

VIO Status [72C]

Shows the values of the 8 Virtual IO's in menu[560].

72C	0rpm
VIO Status	
	00000000
sby	Rem/Rem

Run Status [72D]

This menu indicates what is blocking the drive from starting to run.

72D Run Status		
Default:		OK
OK	0	Nothing blocks the motor from starting to run.
No Run cmd	1	Missing run command.
No Enable cmd	2	Missing enable command.
Sleep	3	Blocked by sleep.
Pump Blocked	4	Blocked by pump functionality.
Trip	5	Blocked by a trip.
STO	6	Blocked by STO.
Int Blocked	7	Blocked by internal condition (setup problem e.g. failed ID-run not reset).
PEBBs nok	8	Blocked by PEBBs (all PEBBs not ready).
DC-link nok	9	Blocked by DC-link (DC-voltage not ready).
PPU load/cpy	10	Blocked by PPU load or copy.
Opt search	11	Blocked by search for options (trying to establish communication with built-in option boards).
Opt blocked	12	Blocked by option software (functionality in a non-standard software is blocking run).

NOTE: The drive may be running even if blocked, e.g. due to commissioning or stopping.

8.7.3 Stored values [730]

The shown values are the actual values built up over time. Values are stored at power down and updated again at power up.

Run Time [731]

Displays the total time that the DCU has been in the Run Mode.

731 Run Time	
Unit:	hh:mm:ss (hours: minutes: seconds)
Range:	00: 00: 00–262143: 59: 59

Reset Run Time [7311]

Reset the run time counter. The stored information will be erased and a new registration period will start.

7311 Reset RunTm		
Default:	No	
No	0	
Yes	1	

NOTE: After reset the setting automatically reverts to “No”.

Mains time [732]

Displays the total time that the DCU has been connected to the mains supply. This timer cannot be reset.

732 Mains Time	
Unit:	hh:mm:ss (hours: minutes: seconds)
Range:	00: 00: 00–262143: 59: 59

Energy [733]

Displays the total energy consumption since the last energy reset [7331] took place.

733 Energy	
Unit:	Wh (shows Wh, kWh, MWh or GWh)
Range:	0.0–1GWh, Counter will restart at 0 after 1GWh

Reset Energy [7331]

Resets the energy counter. The stored information will be erased and a new registration period will start.

7331 Rst Energy		
Default:	No	
No	0	
Yes	1	

NOTE: After reset the setting automatically goes back to “No”.

8.8 View Trip Log [800]

Main menu with parameters for viewing all the logged trip data. In total the DCU saves the last nine trips in the trip memory. When a trip occurs the status menus are copied to the trip message log and here are nine trip message logs [810]–[890]. The trip memory refreshes on the FIFO principle (First In, First Out). When the tenth trip occurs the oldest trip will disappear. At every trip, the actual values of several parameter are stored and available for troubleshooting.

Trip message log with RTC [8x0]

Trip recorded with present Real Time Clock (RTC is mounted in 4-line control panel) are shown with actual time and date.

8x0 <Trip message>	
Unit:	yy:mm:dd hh:mm:ss (year:month:day hours:minutes:seconds)
Range:	00: 00: 00–262143: 59: 59

Trip Message log without RTC [8x0]

Trip recorded with no present RTC are shown with the time of the "Run Time [731]" counter at trip occurrence.

After reset of occurred trip, the trip message will disappear and menu [100] will be indicated.

8x0 <Trip message>	
Unit:	hh:mm:ss (hours:minutes:seconds)
Range:	00: 00: 00–262143: 59: 59

Trip message log [810]

When a trip occurs the menu will change to menu [810]. After resetting an alarm, the menu will change and show menu [100].

Below two examples of trip messages are shown.

Here the menu shows the date and the real time when the trip occurred.

810	0rpm
Over temp	
2020-01-15	17:15:38
Sby	Rem/Rem

Fig. 63

Here the menu shows the run time when the trip occurred.

810	0rpm
Over temp	
	1396:13:00
Sby	Rem/Rem

Fig. 64

Fig. 64 shows the third trip memory menu [810]: Over temperature trip occurred after 1396 hours and 13 minutes in Run time.

For Fieldbus integer value of trip message, see message table for Warning [722].

NOTE: Bits 0–5 used for trip message value. Bits 6–15 for internal use.

Trip message [811]–[81Q]

The information from the status menus are copied to the trip message log when a trip occurs.

Trip menu	Copied from	Description
811	711	Process Value
815	715	Electrical Power
816	716	Current
817	717	Output voltage
819	719	DC voltage
81A	71A	IGBT Temperature
81B	71B	PT100 1, 2, 3
81C	721	VSD Status
81D	723	Digital input status
81E	724	Digital output status
81F	725	Analogue input status 1-2
81G	726	Analogue input status 3-4
81H	727	Analogue output status 1-2
81I	728	I/O status option board 1
81J	729	I/O status option board 2
81K	72A	I/O status option board 3
81L	731	Run Time
81M	732	Mains Time
81N	733	Energy
81O	310	Set/View ref
81P	72C	VIO Status
81Q	71C	PT100 4, 5, 6

Trip Messages [820] - [890]

Same information as for menu [810].

All nine alarm lists contain the same type of data. For example DeviceNet parameter 31101 in alarm list 1 contains the same data information as 31151 in alarm list 2. See Menu List chapter 12. page 129.

Reset Trip Log [8A0]

Resets the content of the 9 trip memories.

8A0 Reset Trip L		
Default:		No
No	0	
Yes	1	

NOTE: After the reset the setting goes automatically back to "NO". The message "OK" is displayed for 2 sec.

8.9 System Data [900]

Main menu for viewing all the DCU system data.

8.9.1 VSD Data [920]

VSD Type [921]

Shows the DCU type according to the type number.

The options are indicated on the type plate of the DCU.

NOTE: If the control board is not configured, then type shown is DCU48-###-##.

921	
DCU2.1	
	DCU48-046-5X
Sby	

Fig. 65 Example of DCU type.

Examples

DCU48-046-5X DCU-series

- suited for DC voltages up to 760 Vdc
- rated output current of 69 Adc (LV-side)
- IP Class = IP54 and IP55 (2X = IP20/21)

Software [922]

Shows the software version number of the DCU.

Fig. 66 gives an example of the version number.

922	
Software	
	V 5.12 - 95.04
Sby	

Fig. 66 Example of software version

V 5.12= Software version

-95.04 = option version, is only visible and valid for special software, type OEM adapted software.

95 = (major) special software variant number

04= (minor) revision of this special software

Table 23 Information for Modbus and Profibus number, software version

Bit	Example	Description
7-0	32	Minor version
13-8	5	Major version
15-14		release 00: V, release version 01: P, pre-release version 10: β , Beta version 11: α , Alpha version

Table 24 Information for Modbus and Profibus number, option version

Bit	Example	Description
7-0	07	Minor option version
15-8	03	Major option version

NOTE: It is important that the software version displayed in menu [922] is the same software version number as the software version number written on the title page of this instruction manual. If not, the functionality as described in this manual may differ from the functionality of the DCU.

Build Information [9221]

Software version created, date and time.

9221	
Build Info	
200616145041	
Sby	
Default:	YYMMDDHHMMSS (YY=year, MM=month, DD=day, HH=hours, MM=minutes, SS=seconds)

Build ID [9222]

Software identification code.

9222	
Build ID	
BEE5529E	
Sby	

EmoLib ID [9223]

Software library identification code.

9223	
EmoLib ID	
9A12D134	
Sby	

Software configuration [9224]

Non-standard features are activated if the value is different from zero.

9224	
SW Config	
0	
Sby	
Default	0

Unit name [923]

Option to enter a name of the unit for service use or customer identity. The function enables the user to define a name with max 12 characters. Use the Prev and Next key to move the cursor to the required position. Then use the + and - keys to scroll in the character list. Confirm the character by moving the cursor to the next position by pressing the Next key. See section User-defined Unit [323].

Example

Create user name USER 15.

1. When in the menu [923] press Next to move the cursor to the right most position.
2. Press the + key until the character U is displayed.
3. Press Next.
4. Then press the + key until S is displayed and confirm with Next.
5. Repeat until you have entered USER15.

923	
Unit Name	
Sby	
Default:	0

When sending a unit name you send one character at a time starting at the right most position.

Hardware [924]

CB Key [9241]

Unique identifier of control board; 32 bit hex value.

9241 CB Key sby	00DBDA8B
Example:	00DBDA8B

CtrlPanel [925]

This menu and sub menus will be hidden if an older control panel is connected.

Control panel software version [9251]

Shows the software version number of the control panel.

Fig. 66 gives an example of the version number.

9251 CP SW ver sby	V 2.00
---	---------------

Fig. 67 Example of software version

V 2.00 = Software version

CP HW ver [9252]

Hardware version of connected control panel.

9252 CP HW ver sby	11
---	-----------

CP Build ID [9253]

32 bit hex value of build ID for control panel.

Fig. 68 gives an example of the version number.

9253 CP Build ID sby	64A26CE5
---	-----------------

Fig. 68 Example of control panel build ID.

8.9.2 Real Time clock

In the 4-line Control panel there is a built-in Real time clock. This means that actual date and time will be shown at e.g. a trip condition. There is a built-in capacitor to be able to keep the clock running if the power disappears.

In case of loss of power, the backup time for the Real time clock function is at least 60 days.

Actual date and time will be set from factory. However as the backup time is only around 60 days, it is recommended to set the Date and time during commissioning. Date and time is shown and can be set in following menus.

Clock [930]

This menu group displays actual time and date, read only. Time and date are factory set to CET (Central European mean time). Adjust if required in following sub-menus.

930 	1240rpm
Clock	
2021-01-01	12:34:40
Run 	Key/Key

Time [931]

Actual time, displayed as HH:MM:SS. Adjustable setting.

931	Time
Default:	00:00:00 (hh:mm:ss)

Date [932]

Actual date, displayed as YYYY-MM-DD. Adjustable setting.

932	Date
Default:	2000-00-00 (yy-mm-dd)

Weekday [933]

Display of actual weekday, read only.

933	Weekday
Default:	Monday
Monday	0
Tuesday	1
Wednesday	2
Thursday	3
Friday	4
Saturday	5
Sunday	6

8.9.3 Inspection [940]

Menu group of inspection interval feature.

Interval [941]

Service interval of drive (runtime in hours). After passing this interval, a warning message will flash on PPU. Its unit is hours and default value is 35 000 hours = 4 years. Its maximum value is 87 600 hours, which corresponds to 10 years.

941 Interval	
Default:	35 000 h
Selection:	Off, 1...87 600 h (Off=0)

Act.Counter [942]

This menu shows hours since last inspection. The menu is read only. When the Act.Counter reach the interval set in menu [941] Interval, a warning message "Inspection!" will blink in the PPU display text area F and warning led will blink. The warning message can be reset by menu [943] or by increasing the inspection interval in menu [941].

942 Act.Counter	
Default:	0 h
Range:	0... 2 000 000 000 h

Clear Cnt [943]

In this menu hours since last inspection (shown in menu [942] Act.Counter) can be reset. After resetting the value, it will revert to "No".

943 Clear Cnt		
Default:		No
No	0	
Yes	1	

8.9.4 Service cont [950]

This is a menu group for adding service contact information in the drive. It is accessible in normal login i.e. to all users. Editing of the texts is done according to the same principles as described for menu Unit name [923].

Company Name [951]

The menu enables to define a company name with maximum16 character alphanumeric entry.

951 Company Name	
Default:	Blank

Phone Number [952]

The menu enables to define a service center contact number with maximum10 digit numeric entry.

952 Phone Number	
Default:	Blank

Address Line 1 [953]

The menu enables to define a first line of a service center address with maximum16 character alphanumeric entry.

953 AddressLine1	
Default:	Blank

Address Line 2 [954]

The menu enables to define a second line of a service center address with maximum16 character alphanumeric entry.

954 AddressLine2	
Default:	Blank

Address Line 3 [955]

The menu enables to define a third line of a service center address with maximum16 character alphanumeric entry.

955 AddressLine3	
Default:	Blank

Email Name [956]

The menu enables to define an email name of a service center with maximum16 character alphanumeric entry.

956 Email Name	
Default:	Blank

Email Domain [957]

This menu enables to define domain name of a service center with maximum 16 character alphanumeric entry. The “@” symbol is fixed at the 16th position.

957	Email Domain
Default:	@cgglobal.com

8.10 DCDC option [O00]

8.10.1 LV Setup [O10]

Menus O1X specifies the DCU low-side setup and base data.

U (LV) Base [O11]

This is used as base for normalization.

O11	U (LV) Base
Default:	600V/1000V
Range:	0.0V.. Inv.U _{max}

NOTE: This menu is read-only.

I (LV) Base [O12]

This is used as base for normalization.

O12	I (LV) Base
Default:	1.5* Inv.I _{nom}
Range:	0.0A.... 1.5*Inv.I _{nom}

NOTE: This menu is read-only.

LV Connect [O13]

Setup control mode for Main and pre-charge contactors.

O13	LV Connect	
Default:	At Power On	
At Power On	0	Activate pre-charge and main contactors as soon as DC-link voltage is present.
At Run Cmd	1	Activate pre-charge and main contactors as soon as DC-link voltage is present and valid run command.
After U _{ramp}	2	Activate pre-charge and main contactors as soon as DC-link voltage is present, valid run command, and first start ramp of output voltage is finalized.

LV-filter L1 [O14]

Total inductance in DC-filter (without interleaving).

The individual inductances for interleaved control is three times larger.

O14 LV-filter L1	
Default:	Depends on DCU type and rating.
Range:	0.0 uH...6000 uH

NOTE: Used for internal I (LV) P gain scaling

LV-filter C1 [O15]

Total capacitance in DC-filter and DC-loads.

O15 LV-filter C1	
Default:	Depends on DCU type and rating.
Range:	0.0 mF...6000 mF

8.10.2 U (LV) Ctrl [O20]

Menus O2X specifies the DCU U (LV) output voltage control parameters.

U (LV) Ref [O21]

Output low-side DC voltage reference.

O21 U (LV) Ref	
Default:	300 V / 500 V
Range:	0.0 V...Inv.U _{max}

U (LV) Ramp [O22]

Output low-side DC voltage ramp time from 0V to 1000V.

O22 U (LV) Ramp	
Default:	1.00 s
Range:	0.00 s...10.0 s

U (LV) P Gain [O23]

Output low-side DC voltage, PI controller proportional gain.

O23 U (LV) P Gain	
Default:	0.10
Range:	0.01...30.0

U (LV) I Time [O24]

Output low-side DC voltage PI controller integrator time constant.

O24 U (LV) I Time	
Default:	0.20 s
Range:	0=Off, 0.01 s...10.0 s

U (LV) PI Max [O25]

Output low-side DC voltage PI controller limitation (positive and negative).

O25 U (LV) PI Max	
Default:	200 V
Range:	0.0V...Inv.U _{max}

U (LV) PI Margin [O26]

Maximum output low-side DC voltage margin from DCU DC-link voltage.

O26 U(LV) Margin	
Default:	5.0 %
Range:	0.0 %...20.0 %

U (LV) Droop [O27]

Output low-side DC voltage droop gain.

O27 U(LV) Droop	
Default:	0.0 %
Range:	0.0 %...20.0 %

U (LV) Mode [O2A]

Output low-side DC voltage control mode.

O2A U(LV) Mode		
Default:	Basic U	
Basic U	0	Basic voltage control mode
Cascaded U+I	1	Cascaded voltage control mode with an inner current control loop

NOTE: Selection "Basic U" corresponds to control mode in DCU 2.0.

I (LV) P Gain [O2B]

Output low-side DC voltage PI controller proportional gain in Cascaded U+I mode.

O2B U(LV) P Gain	
Default:	2.00
Range:	0.01...30.00

U+I (LV) Max [O2C]

Output low-side DC voltage PI controller limitation in Cascaded U+I mode (positive and negative).

O2C UU+I(LV) Max	
Default:	150 %
Range:	0 %...200 %

8.10.3 I (LV) Ctrl [O30]

Menus O3X specifies the DCU I (LV) output current control parameters.

I (LV) Ref [O31]

Output low-side DC voltage reference.

O31 I(LV) Ref	
Default:	0 %
Range:	-200 %...200 %

I (LV) Ramp [O32]

Output low-side DC current ramp time from 0 % to 100 %.

O32 I(LV) Ramp	
Default:	1.00 s
Range:	0.00 s...10.0 s

I (LV) P Gain [O33]

Output low-side DC current PI controller proportional gain.

O33 I(LV) P Gain	
Default:	0.10
Range:	0.01...1.00

I (LV) I Time [O34]

Output low-side DC current PI controller integrator time constant.

O34 I(LV) I Time	
Default:	0.10 s
Range:	0=Off, 0.01 s...10.0 s

I (LV) PI Max [O35]

Output low-side DC current PI controller limitation (positive and negative).

O35 I(LV) PI Max	
Default:	200 V
Range:	0.0 V...Inv.U _{max}

I (LV) Dampin [O3A]

Output current damping P-controller gain.

O3A I (LV) Dampin	
Default:	0.25
Range:	0.00...1.00

NOTE: Used for U (LV)-mode "Basic U".

8.10.4 U (HV) Ctrl [O40]

Menus O4X specifies the DCU U (HV) DC-link control parameters.

U (HV) Ref [O41]

High-side DC-link voltage reference.

O41 U (HV) Ref	
Default:	600 V / 1000 V
Range:	0.0 V...Inv.U _{max}

U (HV) Ramp [O42]

High-side DC-link voltage ramp time from 0 V to 1000 V.

O42 U (HV) Ramp	
Default:	1.00 s
Range:	0.00 s...10.0 s

U (HV) P Gain [O43]

High-side DC-link voltage PI controller proportional gain.

O43 U (HV) P Gain	
Default:	2.00
Range:	0.01...30.0

U (HV) I Time [O44]

High-side DC-link voltage PI controller integrator time constant.

O44 U (HV) I Time	
Default:	0.20 s
Range:	0=Off, 0.01 s...10.0 s

U (HV) PI Max [O45]

High-side DC-link voltage PI controller limitation (positive and negative).

O45 U (HV) PI Max	
Default:	150 %
Range:	0 %...200 %

U (HV) Margin [O46]

Minimum high-side DC-link voltage margin from DCU low-side DC voltage U (LV).

O46 U(HV) Margin	
Default:	10.0 %
Range:	0.0 %...20.0 %

U (HV) Droop [O47]

High-side DC-link voltage droop gain.

O47 U(HV) Droop	
Default:	0.0 %
Range:	0.0 %...20.0 %

8.10.5 LV Protectio [O60]

Menus O6X specifies the DCU low-side voltage and current operating ranges and trip levels.

U (LV) MaxLim [O61]

Maximum valid value for the low-side output DC-voltage.

O61 U(LV) MaxLim	
Default:	U (LV) Base
Range:	0.0 V...Inv.U _{max}

U (LV) MaxTrip [O62]

Over voltage trip limit for the low-side output DC-voltage.

O62 U(LV) MaxTrip	
Default:	U (LV) Base
Range:	0.0 V...Inv.U _{max}

U (LV) MaxTime [O63]

Over voltage trip delay time where 0.00 s means immediate trip (no delay).

O63 U(LV) MaxTime	
Default:	1.00 s
Range:	0.00 s...60.0 s

U (LV) MinLim [O64]

Minimum valid value for the low-side output DC-voltage.

O64 U(LV) MinLim	
Default:	0 V
Range:	0.0 V...Inv.U _{max}

U (LV) MinTrip [O65]

Under voltage trip limit for the low-side output DC-voltage.

O65 U(LV) MinTrip	
Default:	0 V
Range:	0.0 V...Inv.U _{max}

U (LV) MinTime [O66]

Under voltage trip delay time where 0.00 s means immediate trip (no delay).

O66 U(LV) MinTime	
Default:	1.00 s
Range:	0.00 s...60.0 s

I (LV) MaxLim [O67]

Maximum valid value for the low-side output DC-current.

O67 I(LV) MaxLim	
Default:	1.2* I (LV) Base
Range:	0.0A...1.5* I (LV) Base

I (LV) MaxTrip [O68]

Over current trip limit for the low-side output DC-current.

O68 I(LV) MaxTrip	
Default:	1.5* I (LV) Base
Range:	0.0 A...1.5* I (LV) Base

I (LV) MaxTime [O69]

Over current trip delay time where 0.00s means immediate trip (no delay).

O69 I(LV) MaxTime	
Default:	1.00 s
Range:	0.00 s...60.0 s

U (HV) MaxLim [O6A]

Maximum valid value for the high-side output DC-voltage.

O6A U(HV) MaxLim	
Default:	Inv.U _{max}
Range:	0.0 V...Inv.U _{cut}

U (HV) MaxTrip [O6B]

Over voltage trip limit for the high-side output DC-voltage.

O6B U(HV) MaxTrip	
Default:	Inv.U _{ovr}
Range:	0.0 V...Inv.U _{cut}

U (HV) MaxTime [O6C]

Over voltage trip delay time where 0.00 s means immediate trip (no delay).

O6C U(HV) MaxTime	
Default:	1.00 s
Range:	0.00 s...60.0 s

U (HV) MinLim [O6D]

Minimum valid value for the high-side output DC-voltage.

O6D U(HV) MinLim	
Default:	Inv.U _{min}
Range:	0.0 V...Inv.U _{max}

U (HV) MinTrip [O6E]

Under voltage trip limit for the high-side output DC-voltage.

O6E U(HV) MinTrip	
Default:	Inv.U _{min} -50V
Range:	0.0V...Inv.U _{max}

U (HV) MinTime [O6F]

Under voltage trip delay time where 0.00 s means immediate trip (no delay).

O6F U(HV) MinTime	
Default:	1.00 s
Range:	0.00 s...60.0 s

8.10.6 View Energy [O90]

Menus O9X provides read-out of the accumulated energies.

Energy Total [O91]

Total energy flow (positive = from DCU to DC-load).

O91 Energy Total	
Default:	0 Wh
Range:	0 Wh...1 GWh (restart)

Energy Out [O92]

Total output energy flow (from DCU to low-side DC-load).

O92 Energy Out	
Default:	0 Wh
Range:	0 Wh...1 GWh (restart)

Energy In [O93]

Total input energy flow (from low-side DC-source to DCU).

O93 Energy In	
Default:	0 Wh
Range:	0 Wh...1 GWh (restart)

Reset Energy [O94]

Resets all Energy counters (Total, Out and In).

O94 Reset Energy		
Default:	No	
No	0	
Yes	1	Resets all energy counters.

9. Troubleshooting, Diagnoses and Maintenance

9.1 Trips, warnings and limits

In order to protect the DCU the principal operating variables are continuously monitored by the system. If one of these variables exceeds the safety limit an error/warning message is displayed. In order to avoid any possibly dangerous situations, the inverter sets itself into a stop Mode called Trip and the cause of the trip is shown in the display.

Trips will always stop the DCU. Trips can be divided into normal and soft trips, depending on the setup Trip Type, see menu “[250] Autoreset”. Normal trips are default. For normal trips the DCU stops immediately, i.e. the motor coasts naturally to a standstill. For soft trips the DCU stops by ramping down the speed, i.e. the motor decelerates to a standstill.

“Trip”

- The DCU stops immediately.
- The Trip relay or output is active (if selected).
- The Trip LED is on.
- The accompanying trip message is displayed.
- The “TRP” status indication is displayed (area D of the display).
- After reset command, the trip message will disappear and menu [100] will be indicated.

Apart from the TRIP indicators there are two more indicators to show that the inverter is in an “abnormal” situation.

“Warning”

- The DCU is close to a trip limit.
- The Warning relay or output is active (if selected).
- The Trip LED is flashing.
- The accompanying warning message is displayed in window “[722] Warning”.
- One of the warning indications is displayed (area F of the display).

“Limits”

- The DCU is limiting torque and/or frequency to avoid a trip.
- The Limit relay or output is active (if selected).
- The Trip LED is flashing.
- One of the Limit status indications is displayed (area D of the display).

Table 25 List of trips and warnings

Trip/Warning messages	Selections	Trip	Warning indicators (Area D)
PTC	Trip/Off	Normal	
Motor PTC	On	Normal	
PT100	Trip/Off	Normal	
ExtTrip1	Via DigIn	Normal	
Ext Mot Temp	Via DigIn	Normal	
Comm error	Trip/Off/Warn/ Change PSet	Normal	
Over temp	On	Normal	OT
Over curr F	On	Normal	
Over volt D	On	Normal	
Over volt G	On	Normal	
Over volt	On	Normal	
Under voltage	On	Normal	LV
LC Level	Trip/Off/Warn Via DigIn	Normal	LCL
Desat ### *	On	Normal	
DCLink error	On	Normal	
Power Fault PF ##### *	On	Normal	
Ovolt m cut	On	Normal	
Over voltage	Warning		VL
STO Active	Warning		STO
OPTION	On	Normal	
Internal error		Normal	
ExtTrip2	Via DigIn	Normal	
AnIn<Offset	Off/Trip/Warn	Normal	
U (LV) Min Err	On	Normal	
U (LV) Max Err	On	Normal	
I (LV) Min Err	On	Normal	
I (LV) Max Err	On	Normal	
U (HV) Min Err	On	Normal	
U (HV) Max Err	On	Normal	
Sensor Error	On	Normal	

*) Refer to table table 26 regarding which Desat or Power Fault is triggered.

Trip/Warning messages	Selections	Trip	Warning indicators (Area D)
PTC	Trip/Off	Normal	
Motor PTC	On	Normal	
PT100	Trip/Off	Normal	
ExtTrip1	Via DigIn	Normal	
Ext Mot Temp	Via DigIn	Normal	
Comm error	Trip/Off/Warn/ Change PSet	Normal	
Over temp	On	Normal	OT
Over curr F	On	Normal	
Over volt D	On	Normal	
Over volt G	On	Normal	
Over volt	On	Normal	
Under voltage	On	Normal	LV
LC Level	Trip/Off/Warn Via DigIn	Normal	LCL
Desat ### *	On	Normal	
DCLink error	On	Normal	
Power Fault PF ##### *	On	Normal	
Ovolt m cut	On	Normal	
Over voltage	Warning		VL
STO Active	Warning		STO
OPTION	On	Normal	
Internal error		Normal	
ExtTrip2	Via DigIn	Normal	
AnIn<Offset	Off/Trip/Warn	Normal	
U (LV) Min Err	On	Normal	
U (LV) Max Err	On	Normal	
I (LV) Min Err	On	Normal	
I (LV) Max Err	On	Normal	
U (HV) Min Err	On	Normal	
U (HV) Max Err	On	Normal	
Sensor Error	On	Normal	

9.2 Trip conditions, causes and remedial action

The table later on in this section must be seen as a basic aid to find the cause of a system failure and to how to solve any problems that arise. The DCU is mostly just a small part of a complete DCU system. Sometimes it is difficult to determine the cause of the failure, although the DCU gives a certain trip message it is not always easy to find the right cause of the failure. Good knowledge of the complete drive system is therefore necessary. Contact your supplier if you have any questions.

The DCU is designed in such a way that it tries to avoid trips by limiting torque, overvolt etc.

Failures occurring during commissioning or shortly after commissioning are most likely to be caused by incorrect settings or even bad connections.

Failures or problems occurring after a reasonable period of failure-free operation can be caused by changes in the system or in its environment (e.g. wear).

Failures that occur regularly for no obvious reasons are generally caused by Electro Magnetic Interference. Be sure that the installation fulfils the demands for installation stipulated in the EMC directives.

Sometimes the so-called "Trial and error" method is a quicker way to determine the cause of the failure. This can be done at any level, from changing settings and functions to disconnecting single control cables or replacing entire DCU.

The Trip Log can be useful for determining whether certain trips occur at certain moments. The Trip Log also records the time of the trip in relation to the run time counter.



WARNING!
If it is necessary to open the DCU or any part of the system (conduits, electrical panels, cabinets, etc.) to inspect or take measurements as suggested in this instruction manual, it is absolutely necessary to read and follow the safety instructions in the manual.

9.2.1 Technically qualified personnel

Installation, commissioning, demounting, making measurements, etc., of or at the DCU may only be carried out by personnel technically qualified for the task.

9.2.2 Opening the DCU



WARNING!
Always switch the mains voltage off if it is necessary to open the DCU and wait at least 7 minutes to allow the capacitors to discharge.



WARNING!
In case of malfunctioning always check the DC-link voltage, or wait one hour after the mains voltage has been switched off, before dismantling the DCU for repair.

The connections for the control signals and the switches are isolated from the mains voltage. Always take adequate precautions before opening the DCU.

9.2.3 Precautions to take with a connected motor

If work must be carried out on a connected motor or on the driven machine, the mains voltage must always first be disconnected from the DCU. Wait at least 7 minutes before continuing.

9.2.4 Autoreset Trip

If the maximum number of Trips during Autoreset has been reached, the trip message hour counter is marked with an "A".

810	0rpm
Ext trip	
A2020-05-05	14:25:02
Sby A	Rem/Rem

Fig. 69 Autoreset trip

Fig. 69 shows the 3rd trip memory menu [830]: Overvoltage G trip after the maximum Autoreset attempts took place after 345 hours, 45 minutes and 12 seconds of run time.

Table 26 Trip condition, their possible causes and remedial action

Trip condition	Possible Cause	Remedy
Ext trip 1	External input (DigIn 1-8) active: - active low function on the input. NOTE: Exact trip message is dependent on [431] ExtTrip1 Text.	- Check the equipment that initiates the external input - Check the programming of the digital inputs DigIn 1-8
Ext trip 2	External input (DigIn 1-8) active: - active low function on the input. NOTE: Exact trip message is dependent on [432] ExtTrip2 Text.	- Check the equipment that initiates the external input - Check the programming of the digital inputs DigIn 1-8
Ext trip 3	External input (DigIn 1-8) active: - active low function on the input. NOTE: Exact trip message is dependent on [433] ExtTrip3 Text.	- Check the equipment that initiates the external input - Check the programming of the digital inputs DigIn 1-8
Ext trip 4	External input (DigIn 1-8) active: - active low function on the input. NOTE: Exact trip message is dependent on [434] ExtTrip4 Text.	- Check the equipment that initiates the external input - Check the programming of the digital inputs DigIn 1-8
Ext Mot Temp	External input (DigIn 1-8) active: - active low function on the input.	- Check the equipment that initiates the external input - Check the programming of the digital inputs DigIn 1-8
Internal error	Internal alarm	Contact service
Comm error	Error on serial communication (option)	- Check cables and connection of the serial communication. - Check all settings with regard to the serial communication - Restart the equipment including the DCU
Over temp	Heatsink temperature too high: - Too high ambient temperature of the DCU - Insufficient cooling - Too high current - Blocked or stuffed fans	- Check the cooling of the DCU cabinet. - Check the functionality of the built-in fans. The fans must switch on automatically if the heatsink temperature gets too high. At power up the fans are briefly switched on. - Check DCU and DC load rating - Clean fans - Check / reduce switching frequency settings in [22E1].
Over curr F	Output current exceeds the peak DCU current: - Too high load - Excessive load change - Soft short-circuit between phases or phase to earth - Poor or loose cable connections	- Check the DC-filter and load. - Check on bad cable connections - Check on bad earth cable connection - Check on water or moisture in the DC-filter and cable connections.
Over volt D(eceleration)	Too high DC Link voltage	- Check the DC link supply
Over volt G(eneration)		
Over volt (Mains)	Too high DC Link voltage, due to too high supply voltage	- Check the DC link supply
O(ver) volt M(ains) cut		

Table 26 Trip condition, their possible causes and remedial action

Trip condition	Possible Cause	Remedy
Under voltage	Too low DC Link voltage: <ul style="list-style-type: none"> - Too low or no supply voltage - Mains voltage dip due to starting other major power consuming machines on the same line. 	<ul style="list-style-type: none"> - Make sure all three phases are properly connected and that the terminal screws are tightened. - Check that the mains supply voltage is within the limits of the DCU. - Try to use other mains supply lines if dip is caused by other machinery - Use the function low voltage override [421]
LC Level	Low liquid cooling level in external reservoir. External input (DigIn 1-8) active: <ul style="list-style-type: none"> - active low function on the input. NOTE: Only valid for DCU types with Liquid Cooling option.	<ul style="list-style-type: none"> - Check liquid cooling - Check the equipment and wiring that initiates the external input - Check the programming of the digital inputs DigIn 1-8
OPTION	If an Option specific trip occurs	Check the description of the specific option
Desat	Failure in output stage, <ul style="list-style-type: none"> - desaturation of IGBTs - Hard short circuit between phases or phase to earth - Earth fault 	<ul style="list-style-type: none"> - Check on bad cable connections - Check on bad earth cable connections - Check on water and moisture in the DC-filter and cable connections - For size H and up, check the cables from the PEBBs to the motor, that all are in correct order in parallel connection
Desat U+ *		
Desat U- *		
Desat V+ *		
Desat V- *		
Desat W+ *		
Desat W- *		
DC link error	DC link voltage ripple exceeds maximum level	<ul style="list-style-type: none"> - Make sure all three phases are properly connected and that the terminal screws are tightened. - Check that the mains supply voltage is within the limits of the DCU. - Try to use other mains supply lines if dip is caused by other machinery.
Power Fault	One of the PF (Power Fault) trips below has occurred, but could not be determined.	<ul style="list-style-type: none"> - Check the PF errors and try to determine the cause. The trip history can be helpful.
PF Fan Err *	Error in fan module	<ul style="list-style-type: none"> - Check for clogged air inlet filters in panel door and blocking material in fan module.
PF HCB Err*	Error in controlled rectifier module (HCB)	<ul style="list-style-type: none"> - Check mains supply voltage
PF Curr Err	Error in current balancing: <ul style="list-style-type: none"> - between different modules. - between two phases within one module. 	<ul style="list-style-type: none"> - Check motor. - Check fuses and line connections - Check the individual motor current leads with an clamp on amp meter.
PF Overvolt	Error in voltage balancing, overvoltage detected in one of the power modules (PEBB)	<ul style="list-style-type: none"> - Check motor. - Check fuses and line connections.
PF Comm Err *	Internal communication error	Contact service
PF Int Temp *	Internal temperature too high	Check internal fans
PF Temp Err *	Malfunction in temperature sensor	Contact service
PF DC Err *	DC-link error and mains supply fault	<ul style="list-style-type: none"> - Check mains supply voltage - Check fuses and line connections.
PF Sup Err *	Mains supply fault	<ul style="list-style-type: none"> - Check mains supply voltage - Check fuses and line connections.
PF PBUc*	Powerboard micro controller reset by watchdog.	
AnIn<Offset	An analogue input signal is below 75% of the configured minimum value.	<ul style="list-style-type: none"> - Check cables and connections of the analogue inputs. - Check the configured minimum values for the analogue inputs. - Disable AI Flt Mode in menu [51D].
ULV)Min Err	LV-side voltage has dropped below Minimum trip limit [O65].	<ul style="list-style-type: none"> - Check cables and wiring. - Check SVMB measurement circuitry.
U LV)Max Err	LV-side voltage has exceeded Maximum trip limit [O62].	<ul style="list-style-type: none"> - Check cables and wiring. - Check SVMB measurement circuitry.

Table 26 Trip condition, their possible causes and remedial action

Trip condition	Possible Cause	Remedy
I(LV)Min Err	LV-side current has exceeded (negatively) Maximum trip limit [O68].	- Check cables and wiring. - Check SVMB measurement circuitry.
I(LV)Max Err	LV-side current has exceeded (positively) Maximum trip limit [O68].	- Check cables and wiring. - Check SVMB measurement circuitry.
U(HV)Min Err	HV-side voltage has dropped below Minimum trip limit [O6E].	- Check cables and wiring. - Check SVMB measurement circuitry.
U(HV)Max Err	HV-side voltage has exceeded Maximum trip limit [O6B].	- Check cables and wiring. - Check SVMB measurement circuitry.
Sensor Error	Failure in SVMB circuitry.	- Check cables and wiring.

* = 2...15 Module number if parallel power units (size 430–3000 A)

** = If no size is mentioned in this column, the information is valid for all sizes.

9.3 Maintenance

The DCU is designed to require minimum of servicing and maintenance. There are however some things which must be inspected regularly in order to optimise product life time.

- Keep the DCU unit clean and cooling efficient (clean air inlets, heatsink profile, parts, components, etc)
- There is an internal fan that should be inspected and cleaned from dust if necessary.
- If DCU is built into cabinets, also check and clean the dust filters of the cabinets regularly.
- Check external wiring, connections and control signals.
- Check tightening of all terminal screws regularly, especially important are power and cable connections

Preventive maintenance can optimise the product life time and secure trouble free operation without interruptions.

For more information on maintenance, please contact your CG Drives & Automation service partner.

10. Options

10.1 Supply voltage measurement board (SVMB)

Part number	Description
01-5178-00	Supply voltage measurement board ver.1
01-5178-50	Supply voltage measurement board ver.1 with coated board.
01-6681-00	Supply voltage measurement board ver.2
01-6681-50	Supply voltage measurement board ver.2 with coated board.

The Voltage measurement board monitors the LV-side output voltage and provides feedback to the internal controllers of the DCU.

SVMB ver.2 is mandatory for DCU functionality.

10.2 Liquid cooling

DCU modules in frame sizes E - O and F69 - T69 are available in a liquid cooled version. These units are designed for connection to a liquid cooling system, normally a heat exchanger of liquid-liquid or liquid-air type. Heat exchanger is not part of the liquid cooling option.

Drive units with parallel power modules (frame size G - T69) are delivered with a dividing unit for connection of the cooling liquid. The drive units are equipped with rubber hoses with leak-proof quick couplings.

The Liquid cooling option is described in a separate manual.

10.3 I/O Board

Part number	Description
01-3876-01	I/O option board 2.0

Each I/O option board 2.0 provides three extra relay outputs and three extra isolated digital inputs (24V). The I/O Board works in combination with the Pump/Fan Control, but can also be used as a separate option. Maximum 3 I/O boards possible. This option is described in a separate manual.

10.4 PTC/PT100

Part number	Description
01-3876-08	PTC/PT100 2.0 option board

The PTC/PT100 2.0 option board for connecting motor thermistors and max 3 PT100 elements to the DCU is described in a separate manual.

10.5 EmoSoftCom

EmoSoftCom is an optional software that runs on a personal computer. It can also be used to load parameter settings from the DCU to the PC for backup and printing. Recording can be made in oscilloscope mode. Please contact CG Drives & Automation sales for further information.

10.6 Control panel

Control panel with a 4-line display.

Part number		Description
IP54	IP20/21	
01-6520-00	01-6521-00	4-line PPU (standard)
01-6520-10	01-6521-10	4-line PPU with Bluetooth (optional)



Fig. 70 Control panel with 4-line display.

The display is back lit and consists of 4 rows, each with space for 20 characters. The Control panel is equipped with real time clock function. This means that actual date and time will be shown at e.g. a trip condition.

There is also an optional Control panel with Bluetooth communication available for connection with cellphone or tablet.

10.7 External control panel kits (4-line)

10.7.1 Control panel kit, including blank panel

Part number	Description
01-6878-40	Control panel kit (size B)
01-6879-40	Control panel kit (size C)
01-6880-40	Control panel kit (size D and up)



Fig. 71 Control panel kit, including blank panel.

External control panel IP54 suitable for mounting on a cabinet door. This option is to be used in combination with a DCU module ordered with a built-in control panel.

10.7.2 Control panel kit, including control panel

Part number	Description
01-6878-00	Standard PPU (size B)
01-6878-10	PPU with Bluetooth (size B)
01-6879-00	Standard PPU (size C)
01-6879-10	PPU with Bluetooth (size C)
01-6880-00	Standard PPU (size D and up)
01-6880-10	PPU with Bluetooth (size D and up)



Fig. 72 Control panel kit, including control panel.

External control panel IP54 suitable for mounting on a panel door. This option is to be used in combination with a DCU module ordered with a blank control panel.

10.8 Communication options

Part number	Description	From DCU software version (see menu [922])
01-3876-05	Profibus DP	4.0
01-3876-06	DeviceNet	4.0
01-3876-09	Modbus/TCP, Industrial Ethernet	4.11
01-3876-10	EtherCAT, Industrial Ethernet	4.32
01-3876-11	Profinet IO, one port Industrial Ethernet	4.32
01-3876-12	Profinet IO, two port Industrial Ethernet	4.32
01-3876-13	EtherNet/IP, two port industrial EtherNet	4.36
01-3876-16	CANopen	4.42

For communication with the DCU there are several option boards for communication. There are different options for Fieldbus communication and one serial communication option with RS-232 or RS-485 interface which has galvanic isolation.

11. Technical data

11.1 Emotron DCU48 ratings 450-760 VDC

Table 27 DCU48

Model DCU48-	Normal duty 120% 1min/10min				Frame/PEBB IP20			LC-filter (LV) IP00		
	Idc (LV) (A)	Pdc (LV), Nom @ Udc (LV)= 300V (kW)	Pdc (LV), Max @ Udc (LV)= 500V (kW)	Idc (HV), Max @ Udc (HV)= 600V (A)	IGBT	Fuse (HV) aR 690V (A)	Cooling A=Air L=Liquid	L3dc (LV) (mH)	Cdc (LV) (mF)*	Fuse (LV) aR 690V (A)
031	46,5	14	23	37	C (31A)	80	A	3x10	0.75	80
046	69	21	34	57	C (46A)	100	A	3x6.6	1.125	100
074	111	33	55	92	D (74A)	160	A	3x4,05	2.25	160
109	164	49	82	137	E (109A)	250 ¹	A/LC	3x2.7	4	250
175	263	79	131	219	E (175A)	400 ¹	A/LC	3x1.7	6	400
250	375	113	187	312	F (250A)	630 ²	A/LC	3x1.2	8	630
365	548	164	274	456	H1 (365A)	800 ³	A/LC	3x0.8	12	800
500	750	225	375	625	H (2x250A)	630 ²	A/LC	2x3x1.2	2x8	2x630
730	1095	328	548	912	H2 (2x365A)	800 ³	A/LC	2x3x0.81	2x12	2x800
1095	1642	493	821	1368	H3 (3x365A)	800 ³	A/LC	3x3x0.81	3x12	3x800
1460	2190	657	1095	1824	H4 (4x365A)	800 ³	A/LC	4x3x0.81	4x12	4x800

11.2 Emotron DCU69 ratings 550-1120 VDC

Table 28 DCU69

Model DCU69-	Normal duty 120% 1min/10min				Frame/PEBB IP20			LC-filter (LV) IP00		
	Idc (LV) (A)	Pdc (LV), Nom @ Udc (LV)= 525V (kW)	Pdc (LV), Max @ Udc (LV)= 875V (kW)	Idc (HV), Max @ Udc (HV)= 1050V (A)	IGBT	Fuse (HV) aR 1000V (A)	Cooling A=Air L=Liquid	L3dc (LV) (mH)	Cdc (LV) (mF) *	Fuse (LV) aR 1000V (A)
025	37,5	20	33	31	C69 (25A)	80	A	3x21	0.55	80
058	87	46	76	72	D69 (85A)	160	A	3x9.0	1.1	160
109	164	86	143	137	F69 (109A)	250 ¹	A/LC	3x4.56	2.67	250
200	300	158	262	250	F69 (200A)	400 ²	A	3x2.5	4	400
250	375	197	328	312	F69 (200A)	630 ⁴	LC	3x2.0	5.33	630
400	600	315	525	500	H69 (2x200A)	400 ³	A/LC	2x3x2.5	2x4	2x400
500	750	394	656	625	H69 (2x200A)	630 ⁴	LC	2x3x2.0	2x5.33	2x630
750	1125	591	984	937	I69 (3x200A)	630 ⁴	LC	3x3x2.0	3x5x33	3x630
1000	1500	788	1312	1250	J69 (4x200A)	630 ⁴	LC	4x3x2.0	4x5.33	4x630

11.3 General electrical specifications

Table 29 General electrical specifications

General		
High side input DC-voltage (range)	DCU48 DCU69	450 - 760 V DC 550 - 1120 V DC
Low side DC-voltage (range)		15-85 % of high side DC-voltage
High side DC-voltage (accuracy)		<1 % of maximum high side DC-voltage range
Low side DC-voltage (accuracy)		<1 % of maximum high side DC-voltage range
Switching frequency		3 kHz (adjustable 3-6 kHz)
Control signal inputs: Analogue (differential)		
Analogue Voltage/current: Max. input voltage: Input impedance:		0-±10 V/0-20 mA via switch +30 V/30 mA 40 kohm (voltage) 252 ohm (current)
Resolution: Hardware accuracy: Non-linearity		11 bits + sign 1% type + 1 ½ LSB fsd 1½ LSB
Digital:		
Input voltage: Max. input voltage: Input impedance:		High: >9 VDC, Low: <4 VDC +30 VDC <3.3 VDC: 4.7 kohm ≥3.3 VDC: 3.6 kohm
Signal delay:		≤8 ms
Control signal outputs Analogue		
Output voltage/current: Max. output voltage: Short-circuit current (∞): Output impedance: Resolution: Maximum load impedance for current Hardware accuracy: Offset: Non-linearity:		0-10 V/0-20 mA via software setting +13 V @5 mA cont. +160 mA (voltage), +160 mA (current) 0 ohm (voltage) 10 bit 500 ohm 1.9% type fsd (voltage), 2.4% type fsd (current) 3 LSB 2 LSB
Digital		
Output voltage: Short circuit current(∞):		High: >20 VDC @50 mA, >23 VDC open Low: <1 VDC @50 mA 100 mA max (together with +24 VDC)
Relays		
Contacts		0.1 – 2 A/Umax 250 VAC or 42 VDC (30 VDC acc. to UL requirement) for general Purpose or Resistive use only .
RS-485 communication		
Differential voltage:		-7 V to 12 V
References		
+10VDC -10VDC +24VDC		+10 V _{DC} @10 mA Short-circuit current +30 mA max - 10 V _{DC} @10 mA +24 V _{DC} Short-circuit current +100 mA max (together with Digital Outputs)
Standby supply		
Standby supply input voltage for control unit.		24 VDC ±10% (max 1A consumption)

11.4 Operation at higher temperatures

Emotron DCU units are made for operation at maximum of 40 °C (104 °F) ambient temperature. However it is possible to use the DCU units at higher temperatures with some loss in performance, using derating.

Derating of output current with - 2,5% per degree Celsius to max +5 °C or -1,39% per degree Fahrenheit to max 9 °F.
Max temp = 45 °C (113 °F).

11.5 Environmental conditions

Table 30 Operation

Parameter	Normal operation
Nominal ambient temperature	0°C–40°C (32 °F - 104 °F)
Atmospheric pressure	86–106 kPa (12.5 - 15.4 PSI)
Relative humidity, non-condensing	0–90%
Contamination, according to IEC 60721-3-3	No electrically conductive dust allowed. Cooling air must be clean and free from corrosive materials. Chemical gases, class 3C2 (Coated boards 3C3). Solid particles, class 3S2.
Vibrations	According to IEC 60068-2-6, Sinusoidal vibrations: 10<f<57 Hz, 0.075 mm (0.00295 ft) 57<f<150 Hz, 1g (0.035 oz)
Altitude	0–1,000 m (0 - 3280 ft) DCU48 units, with derating 1%/100 m (328 ft) of rated current up to 4,000 m (13123 ft). DCU69 units, with derating 1%/100 m (328 ft) of rated current up to 2,000 m (6562 ft). Coated boards required for 2000 - 4000 m (6562 - 23123 ft)

Table 31 Storage

Parameter	Storage condition
Temperature	-20 to +60 °C (-4 to +140 °F)
Atmospheric pressure	86–106 kPa (12.5 - 15.4 PSI)
Relative humidity according to IEC 60721-3-1	Class 1K4, max. 95% and non condensing and no formation of ice.

11.6 Control signals

Table 32

Terminal X1	Name:	Function (Default):	Signal:	Type:
1	+10 V	+10 VDC Supply voltage	+10 V DC, max 10 mA	output
2	AnIn1	Process reference	0 -10 V DC or 0/4–20 mA bipolar: -10 - +10 V DC or -20 - +20 mA	analogue input
3	AnIn2		0 -10 V DC or 0/4–20 mA bipolar: -10 - +10 V DC or -20 - +20 mA	analogue input
4	AnIn3	U (LV)	0 -10 V DC or 0/4–20 mA bipolar: -10 - +10 V DC or -20 - +20 mA	analogue input
5	AnIn4		0 -10V DC or 0/4–20 mA bipolar: -10 - +10 V DC or -20 - +20 mA	analogue input
6	-10 V	-10VDC Supply voltage	-10 V DC, max 10 mA	output
7	Common	Signal ground	0V	output
8	DigIn 1	Off	0-8/24 V DC	digital input
9	DigIn 2	RunR	0-8/24 V DC	digital input
10	DigIn 3	Enable	0-8/24 V DC	digital input
11	+24 V	+24VDC Supply voltage	+24 V DC, 100 mA	output
12	Common	Signal ground	0 V	output
13	AnOut 1	Process Val	0 ±10 V DC or 0/4– +20 mA	analogue output
14	AnOut 2	Current	0 ±10 V DC or 0/4– +20 mA	analogue output
15	Common	Signal ground	0 V	output
16	DigIn 4	Off	0-8/24 V DC	digital input
17	DigIn 5	Off	0-8/24 V DC	digital input
18	DigIn 6	Off	0-8/24 V DC	digital input
19	DigIn 7	Off	0-8/24 V DC	digital input
20	DigOut 1	Output OK, Active when DCU is running and output voltage/current has been under control.	24 V _{DC} , 100 mA	digital output
21	DigOut 2	L2 (trip pulse of 1s)	24 V _{DC} , 100 mA	digital output
22	DigIn 8	RESET	0-8/24 VDC	digital input
A+		RS-485 transmit and receive signals	Isolated differential signals -7V to 12V	Communication
B-				
Terminal X2				
31	N/C 1	Relay 1 output Dedicated for Charge Relay contactor K2.	potential free change over 0.1 – 2 A/U _{max} 250 V AC or 42 V DC	relay output
32	COM 1			
33	N/O 1			
41	N/C 2	Relay 2 Output Output OK, Active when DCU is running and output voltage/current has been under control.	potential free change over 0.1 – 2 A/U _{max} 250 V AC or 42 V DC	relay output
42	COM 2			
43	N/O 2			
Terminal X3				
51	COM 3	Relay 3 Output, Dedicated for Main Contactor K1	potential free change over 0.1 – 2 A/U _{max} 250 V AC or 42 V DC	relay output
52	N/O 3			

Table 32

Terminal X11			
+	24 VDC \pm 10%	Input from 24 VDC \pm 10% double isolated transformer capable of supplying 1A continues current. Recommended fuse is 2A.	Input
-	0 V in		

12. Menu List

In the download area on our website, www.cgglobal.com or www.emotron.com, you find a communication information list and a list for noting parameter set information.

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
100	Start Window [100]								
110	1st Line	Process Val	43001	168/160	4BB9	19385	UInt	UInt	
120	2nd Line	Current	43002	168/161	4BBA	19386	UInt	UInt	
130	3rd Line	Output Volt	43003	168/162	4BBB	19387	UInt	UInt	
140	4th Line	VSD Status	43004	168/163	4BBC	19388	UInt	UInt	
150	5th Line	DC Voltage	43005	168/164	4BBD	19389	UInt	UInt	
160	6th Line	IGBT Temp	43006	168/165	4BBE	19390	UInt	UInt	
170	View mode	Always 100+	43007	168/166	4BBF	19391	UInt	UInt	
200	Main Setup [200]								
210	Operation [210]								
211	Language	English	43011	168/170	4BC3	19395	UInt	UInt	
214	Ref control	Option	43014	168/173	4BC6	19398	UInt	UInt	
215	Run/Stp Ctrl	Keybord	43015	168/174	4BC7	19399	UInt	UInt	
216	Reset Ctrl	Remote+Keyb	43016	168/175	4BC8	19400	UInt	UInt	
217	Local/Remote key function [217]								
2171	LocRefCtrl	Standard	43009	168/168	4BC1	19393	UInt	UInt	
2172	LocRunCtrl	Standard	43010	168/169	4BC2	19394	UInt	UInt	
218	Lock code?	0	43018	168/177	4BCA	19402	UInt, 1=1	UInt	
21A	Level/Edge	Level	43020	168/179	4BCC	19404	UInt	UInt	
21C	Supply Type	AC Supply	43382	170/31	4D36	19766	UInt	UInt	
22E	Motor PWM [22E]								
22E1	PWM Fswitch	3000Hz	43053	168/212	4BED	19437	UInt, 1=1Hz	UInt	
22E2	PWM Mode	Standard	43054	168/213	4BEE	19438	UInt	UInt	
22E3	PWM Random	Off	43055	168/214	4BEF	19439	UInt	UInt	
22E4	Udc filter	Off	43040	168/199	4BE0	19424	UInt	UInt	
230	Mot Protect								
234	Thermal Prot	Off	43064	168/223	4BF8	19448	UInt	UInt	
235	Motor Class	F 140 °C	43065	168/224	4BF9	19449	UInt	UInt	
236	PT100 Inputs	PT100 1+2+3	43066	168/225	4BFA	19450	UInt	UInt	
240	Parameter Set Handling [240]								
241	Select Set	A	43022	168/181	4BCE	19406	UInt	UInt	
242	Copy Set	A>B	43021	168/180	4BCD	19405	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
243	Default>Set	A	43023	168/182	4BCF	19407	UInt	UInt	
244	Copy to CP	No Copy	43024	168/183	4BD0	19408	UInt	UInt	
245	Load from CP	No Copy	43025	168/184	4BD1	19409	UInt	UInt	
246	ComFlt Set	Keep last	42653	167/67	4A5D	19037	UInt	UInt	
250	Trip Autoreset/Trip Conditions [250]								
251	No of Trips	0	43071	168/230	4BFF	19455	UInt, 1=1	UInt	
252	DriveProtect								
2521	Over temp	Off	43072	168/231	4C00	19456	Long, 1=1s	EInt	
2522	Over volt D	Off	43075	168/234	4C03	19459	Long, 1=1s	EInt	
2523	Over volt G	Off	43076	168/235	4C04	19460	Long, 1=1s	EInt	
2524	Over volt	Off	43077	168/236	4C05	19461	Long, 1=1s	EInt	
2525	Undervoltage	Off	43088	168/247	4C10	19472	Long, 1=1s	EInt	
2526	Over curr F	Off	43082	168/241	4C0A	19466	Long, 1=1s	EInt	
2527	Power Fault	Off	43087	168/246	4C0F	19471	Long, 1=1s	EInt	
2528	LC Level	Off	43099	169/3	4C1B	19483	Long, 1=1s	EInt	
253	MotorProtect								
2535	PT100	Off	43078	168/237	4C06	19462	Long, 1=1s	EInt	
2537	PTC	Off	43084	168/243	4C0C	19468	Long, 1=1s	EInt	
253A	Ext Mot Temp	Off	43097	169/1	4C19	19481	Long, 1=1s	EInt	
254	Comm & I/O								
2541	Com Error	Off	43089	168/248	4C11	19473	Long, 1=1s	EInt	
2543	AnIn<Offset	Off	43566	170/215	4DEE	19950	Long, 1=1s	EInt	
258	External								
2581	Ext Trip 1	Off	43080	168/239	4C08	19464	Long, 1=1s	EInt	
2583	Ext Trip 2	Off	43564	170/213	4DEC	19948	Long, 1=1s	EInt	
2585	Ext Trip 3	Off	43568	170/217	4DF0	19952	Long, 1=1s	EInt	
2587	Ext Trip 4	Off	43570	170/219	4DF2	19954	Long, 1=1s	EInt	
260	Serial Communication [260]								
261	Com Type	RS232/485	43031	168/190	4BD7	19415	UInt	UInt	
262	RS232/485								
2621	Baudrate	9600	43032	168/191	4BD8	19416	UInt	UInt	
2622	Address	1	43033	168/192	4BD9	19417	UInt, 1=1	UInt	
263	Fieldbus								
2631	Address	62	43034	168/193	4BDA	19418	UInt, 1=1	UInt	
2632	PrData Mode	Basic	43035	168/194	4BDB	19419	UInt	UInt	
2633	Read/Write	RW	43036	168/195	4BDC	19420	UInt	UInt	
2634	AddPrValues	0	43039	168/198	4BDF	19423	UInt, 1=1	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
2635	CANBaudrate	8	43030	168/189	4BD6	19414	UInt, 1=1	UInt	
264	Communication Fault [264]								
2641	ComFit Mode	Off	43037	168/196	4BDD	19421	UInt	UInt	
2642	ComFit Time	0,5s	43038	168/197	4BDE	19422	Long, 1=0.1s	EInt	
2643	485Fit Mode	Off	42979	168/138	4BA3	19363	UInt	UInt	
2644	485Fit Time	0,5s	42980	168/139	4BA4	19364	Long, 1=0.1s	EInt	
2645	KbdComFMode	Trip	42981	168/140	4BA5	19365	UInt	UInt	
2646	KbdComFTime	2s	42982	168/141	4BA6	19366	UInt, 1=0.1s	UInt	
2647	CPportFMode	Trip	42983	168/142	4BA7	19367	UInt	UInt	
2648	CPportFTime	10.0s	42984	168/143	4BA8	19368	UInt, 1=0.1s	UInt	
265	Ethernet [265]								
2651	IP Address	0.0.0.0	42701	167/115	4A8D	19085	UInt, 1=1	UInt	
			42702	167/116	4A8E	19086	UInt, 1=1	UInt	
			42703	167/117	4A8F	19087	UInt, 1=1	UInt	
			42704	167/118	4A90	19088	UInt, 1=1	UInt	
2652	MAC Address	000000000000	42705	167/119	4A91	19089	UInt, 1=1	UInt	
			42706	167/120	4A92	19090	UInt, 1=1	UInt	
			42707	167/121	4A93	19091	UInt, 1=1	UInt	
			42708	167/122	4A94	19092	UInt, 1=1	UInt	
			42709	167/123	4A95	19093	UInt, 1=1	UInt	
			42710	167/124	4A96	19094	UInt, 1=1	UInt	
2653	Subnet Mask	0.0.0.0	42711	167/125	4A97	19095	UInt, 1=1	UInt	
			42712	167/126	4A98	19096	UInt, 1=1	UInt	
			42713	167/127	4A99	19097	UInt, 1=1	UInt	
			42714	167/128	4A9A	19098	UInt, 1=1	UInt	
2654	Gateway	0.0.0.0	42715	167/129	4A9B	19099	UInt, 1=1	UInt	
			42716	167/130	4A9C	19100	UInt, 1=1	UInt	
			42717	167/131	4A9D	19101	UInt, 1=1	UInt	
			42718	167/132	4A9E	19102	UInt, 1=1	UInt	
2655	DHCP	Off	42719	167/133	4A9F	19103	UInt	UInt	
266	Fieldbus Signals [266]	0							
2661	FB S1/Wr1	0	42801	167/215	4AF1	19185	UInt, 1=1	UInt	
2662	FB S2/Wr2	0	42802	167/216	4AF2	19186	UInt, 1=1	UInt	
2663	FB S3/Wr3	0	42803	167/217	4AF3	19187	UInt, 1=1	UInt	
2664	FB S4/Wr4	0	42804	167/218	4AF4	19188	UInt, 1=1	UInt	
2665	FB S5/Wr5	0	42805	167/219	4AF5	19189	UInt, 1=1	UInt	
2666	FB S6/Wr6	0	42806	167/220	4AF6	19190	UInt, 1=1	UInt	
2667	FB S7/Wr7	0	42807	167/221	4AF7	19191	UInt, 1=1	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
2668	FB S8/Wr8	0	42808	167/222	4AF8	19192	UInt, 1=1	UInt	
2669	FB S9/Rd1	0	42809	167/223	4AF9	19193	UInt, 1=1	UInt	
266A	FB S10/Rd2	0	42810	167/224	4AFA	19194	UInt, 1=1	UInt	
266B	FB S11/Rd3	0	42811	167/225	4AFB	19195	UInt, 1=1	UInt	
266C	FB S12/Rd4	0	42812	167/226	4AFC	19196	UInt, 1=1	UInt	
266D	FB S13/Rd5	0	42813	167/227	4AFD	19197	UInt, 1=1	UInt	
266E	FB S14/Rd6	0	42814	167/228	4AFE	19198	UInt, 1=1	UInt	
266F	FB S15/Rd7	0	42815	167/229	4AFF	19199	UInt, 1=1	UInt	
266G	FB S16/Rd8	0	42816	167/230	4B00	19200	UInt, 1=1	UInt	
269	FB Status								
270	Wireless [270]								
271	WirelessMode	Off	40200	157/164	40C8	16584	UInt	UInt	
272	WiFi Options [272]								
2721	WiFi Mode	AccessPoint	40201	157/165	40C9	16585	UInt	UInt	
2722	Channel	5	40202	157/166	40CA	16586	UInt, 1=1	UInt	
2723	Encryption	WPA-2	40203	157/167	40CB	16587	UInt	UInt	
2724	DHCP	Static	40204	157/168	40CC	16588	UInt	UInt	
2725	SSID	Emotron_<5 random digits>	40215	157/179	40D7	16699	UInt	UInt	
2726	Password	12345678	40235	157/199	40EB	16619	UInt	UInt	
2727	IP Address	192.168.1.1	40255	157/219	40FF	16639	UInt, 1=1	UInt	
			40256	157/220	4100	16640	UInt, 1=1	UInt	
			40257	157/221	4101	16641	UInt, 1=1	UInt	
			40258	157/222	4102	16642	UInt, 1=1	UInt	
2728	Subnet Mask	255.255.255.0	40259	157/223	4103	16643	UInt, 1=1	UInt	
			40260	157/224	4104	16644	UInt, 1=1	UInt	
			40261	157/225	4105	16645	UInt, 1=1	UInt	
			40262	157/226	4106	16646	UInt, 1=1	UInt	
2729	Gateway	192.168.1.1	40263	157/227	4107	16647	UInt, 1=1	UInt	
			40264	157/228	4108	16648	UInt, 1=1	UInt	
			40265	157/229	4109	16649	UInt, 1=1	UInt	
			40266	157/230	410A	16650	UInt, 1=1	UInt	
272A	WiFi Status	OK	30054	117/218	2036	54	UInt	UInt	
273	Bluetooth (BLE) options [273]								
2731	BluetoothID	0.0.0.0	42620	167/34	4A3C	19004	UInt, 1=1	UInt	
2732	Pairing Key	123456	40267	157/231	410B	16651	UInt, 1=1	UInt	
274	Security [274]								
2741	Sec. Mode	Open	40273	157/237	4111	16657	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
2742	Password	Empty string							Not accessible via communication. Edit using PPU.
300	Process and Application Parameters [300]								
310	Set/View ref		42991	168/150	4BAF	19375	Long, 1=0.001	EInt	
320	Process Settings [320]								
321	Proc Source	LV Mode	43302	169/206	4CE6	19686	UInt	UInt	
360	Preset References [360]								
361	Motor Pot	Non volatile	43131	169/35	4C3B	19515	UInt	UInt	
362	Preset Ref 1	0	43132	169/36	4C3C	19516	Long, 1=0.001	EInt	
363	Preset Ref 2	250	43133	169/37	4C3D	19517	Long, 1=0.001	EInt	
364	Preset Ref 3	500	43134	169/38	4C3E	19518	Long, 1=0.001	EInt	
365	Preset Ref 4	750	43135	169/39	4C3F	19519	Long, 1=0.001	EInt	
366	Preset Ref 5	1000	43136	169/40	4C40	19520	Long, 1=0.001	EInt	
367	Preset Ref 6	1250	43137	169/41	4C41	19521	Long, 1=0.001	EInt	
368	Preset Ref 7	1500	43138	169/42	4C42	19522	Long, 1=0.001	EInt	
369	Key Ref Mode	Normal	43139	169/43	4C43	19523	UInt	UInt	
400	Load Monitor and Process Protection [400]								
430	Trip Text								
431	ExtTrip1Text	Ext Trip 1	42457	166/126	4999	18841	UInt	UInt	
			42458	166/127	499A	18842	UInt	UInt	
			42459	166/128	499B	18843	UInt	UInt	
			42460	166/129	499C	18844	UInt	UInt	
			42461	166/130	499D	18845	UInt	UInt	
			42462	166/131	499E	18846	UInt	UInt	
			42463	166/132	499F	18847	UInt	UInt	
			42464	166/133	49A0	18848	UInt	UInt	
			42465	166/134	49A1	18849	UInt	UInt	
			42466	166/135	49A2	18850	UInt	UInt	
			42467	166/136	49A3	18851	UInt	UInt	
42468	166/137	49A4	18852	UInt	UInt				

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
432	ExtTrip2Text	Ext Trip 2	42469	166/138	49A5	18853	UInt	UInt	
			42470	166/139	49A6	18854	UInt	UInt	
			42471	166/140	49A7	18855	UInt	UInt	
			42472	166/141	49A8	18856	UInt	UInt	
			42473	166/142	49A9	18857	UInt	UInt	
			42474	166/143	49AA	18858	UInt	UInt	
			42475	166/144	49AB	18859	UInt	UInt	
			42476	166/145	49AC	18860	UInt	UInt	
			42477	166/146	49AD	18861	UInt	UInt	
			42478	166/147	49AE	18862	UInt	UInt	
			42479	166/148	49AF	18863	UInt	UInt	
433	ExtTrip3Text	Ext Trip 3	42480	166/149	49B0	18864	UInt	UInt	
			42481	166/150	49B1	18865	UInt	UInt	
			42482	166/151	49B2	18866	UInt	UInt	
			42483	166/152	49B3	18867	UInt	UInt	
			42484	166/153	49B4	18868	UInt	UInt	
			42485	166/154	49B5	18869	UInt	UInt	
			42486	166/155	49B6	18870	UInt	UInt	
			42487	166/156	49B7	18871	UInt	UInt	
			42488	166/157	49B8	18872	UInt	UInt	
			42489	166/158	49B9	18873	UInt	UInt	
			42490	166/159	49BA	18874	UInt	UInt	
434	ExtTrip4Text	Ext Trip 4	42491	166/160	49BB	18875	UInt	UInt	
			42492	166/161	49BC	18876	UInt	UInt	
			42493	166/162	49BD	18877	UInt	UInt	
			42494	166/163	49BE	18878	UInt	UInt	
			42495	166/164	49BF	18879	UInt	UInt	
			42496	166/165	49C0	18880	UInt	UInt	
			42497	166/166	49C1	18881	UInt	UInt	
			42498	166/167	49C2	18882	UInt	UInt	
			42499	166/168	49C3	18883	UInt	UInt	
			42500	166/169	49C4	18884	UInt	UInt	
			42501	166/170	49C5	18885	UInt	UInt	
500	I/Os and Virtual Connections [500]		42502	166/171	49C6	18886	UInt	UInt	
			42503	166/172	49C7	18887	UInt	UInt	
			42504	166/173	49C8	18888	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
510	Analogue Inputs [510]								
511	AnIn1 Fc	Process Ref	43201	169/105	4C81	19585	UInt	UInt	
512	AnIn1 Setup	4-20mA	43202	169/106	4C82	19586	UInt	UInt	
513	AnIn1 Advan								
5131	AnIn1 Min	4mA	43203	169/107	4C83	19587	Long, 1=0.01	EInt	
5132	AnIn1 Max	20mA	43204	169/108	4C84	19588	Long, 1=0.01	EInt	
5133	AnIn1 Bipol	20mA	43205	169/109	4C85	19589	Long, 1=0.01	EInt	
5134	AnIn1 FcMin	Min	43206	169/110	4C86	19590	UInt	UInt	
5135	AnIn1 VaMin	0	43541	170/190	4DD5	19925	Long, 1=0.001	EInt	
5136	AnIn1 FcMax	Max	43207	169/111	4C87	19591	UInt	UInt	
5137	AnIn1 VaMax	0	43551	170/200	4DDF	19935	Long, 1=0.001	EInt	
5138	AnIn1 Oper	Add +	43208	169/112	4C88	19592	UInt	UInt	
5139	AnIn1 Filt	0.1s	43209	169/113	4C89	19593	Long, 1=0.001s	EInt	
513A	AnIn1 Enabl	On	43210	169/114	4C8A	19594	UInt	UInt	
514	AnIn2 Fc	Off	43211	169/115	4C8B	19595	UInt	UInt	
515	AnIn2 Setup	4-20mA	43212	169/116	4C8C	19596	UInt	UInt	
516	AnIn2 Advan								
5161	AnIn2 Min	4mA	43213	169/117	4C8D	19597	Long, 1=0.01	EInt	
5162	AnIn2 Max	20mA	43214	169/118	4C8E	19598	Long, 1=0.01	EInt	
5163	AnIn2 Bipol	20mA	43215	169/119	4C8F	19599	Long, 1=0.01	EInt	
5164	AnIn2 FcMin	Min	43216	169/120	4C90	19600	UInt	UInt	
5165	AnIn2 VaMin	0	43542	170/191	4DD6	19926	Long, 1=0.001	EInt	
5166	AnIn2 FcMax	Max	43217	169/121	4C91	19601	UInt	UInt	
5167	AnIn2 VaMax	0	43552	170/201	4DE0	19936	Long, 1=0.001	EInt	
5168	AnIn2 Oper	Add +	43218	169/122	4C92	19602	UInt	UInt	
5169	AnIn2 Filt	0,1s	43219	169/123	4C93	19603	Long, 1=0.001s	EInt	
516A	AnIn2 Enabl	On	43220	169/124	4C94	19604	UInt	UInt	
517	AnIn3 Fc	U (LV)	43221	169/125	4C95	19605	UInt	UInt	
518	AnIn3 Setup	4-20mA	43222	169/126	4C96	19606	UInt	UInt	
519	AnIn3 Advan								
5191	AnIn3 Min	4mA	43223	169/127	4C97	19607	Long, 1=0.01	EInt	
5192	AnIn3 Max	20mA	43224	169/128	4C98	19608	Long, 1=0.01	EInt	
5193	AnIn3 Bipol	20mA	43225	169/129	4C99	19609	Long, 1=0.01	EInt	
5194	AnIn3 FcMin	Min	43226	169/130	4C9A	19610	UInt	UInt	
5195	AnIn3 VaMin	0	43543	170/192	4DD7	19927	Long, 1=0.001	EInt	
5196	AnIn3 FcMax	Max	43227	169/131	4C9B	19611	UInt	UInt	
5197	AnIn3 VaMax	0	43553	170/202	4DE1	19937	Long, 1=0.001	EInt	
5198	AnIn3 Oper	Add +	43228	169/132	4C9C	19612	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
5199	AnIn3 Filt	0,1s	43229	169/133	4C9D	19613	Long, 1=0.001s	EInt	
519A	AnIn3 Enabl	On	43230	169/134	4C9E	19614	UInt	UInt	
51A	AnIn4 Fc	Off	43231	169/135	4C9F	19615	UInt	UInt	
51B	AnIn4 Setup	4-20mA	43232	169/136	4CA0	19616	UInt	UInt	
51C	AnIn4 Advan								
51C1	AnIn4 Min	4mA	43233	169/137	4CA1	19617	Long, 1=0.01	EInt	
51C2	AnIn4 Max	20mA	43234	169/138	4CA2	19618	Long, 1=0.01	EInt	
51C3	AnIn4 Bipol	20mA	43235	169/139	4CA3	19619	Long, 1=0.01	EInt	
51C4	AnIn4 FcMin	Min	43236	169/140	4CA4	19620	UInt	UInt	
51C5	AnIn4 VaMin	0	43544	170/193	4DD8	19928	Long, 1=0.001	EInt	
51C6	AnIn4 FcMax	Max	43237	169/141	4CA5	19621	UInt	UInt	
51C7	AnIn4 VaMax	0	43554	170/203	4DE2	19938	Long, 1=0.001	EInt	
51C8	AnIn4 Oper	Add +	43238	169/142	4CA6	19622	UInt	UInt	
51C9	AnIn4 Filt	0,1s	43239	169/143	4CA7	19623	Long, 1=0.001s	EInt	
51CA	AnIn4 Enabl	On	43240	169/144	4CA8	19624	UInt	UInt	
51D	AI Fit Mode	Off	42859	168/18	4B2B	19243	UInt	UInt	
520	Digital Inputs [520]								
521	DigIn 1	Off	43241	169/145	4CA9	19625	UInt	UInt	
522	DigIn 2	RunR	43242	169/146	4CAA	19626	UInt	UInt	
523	DigIn 3	Enable	43243	169/147	4CAB	19627	UInt	UInt	
524	DigIn 4	Off	43244	169/148	4CAC	19628	UInt	UInt	
525	DigIn 5	Off	43245	169/149	4CAD	19629	UInt	UInt	
526	DigIn 6	Off	43246	169/150	4CAE	19630	UInt	UInt	
527	DigIn 7	Off	43247	169/151	4CAF	19631	UInt	UInt	
528	DigIn 8	Reset	43248	169/152	4CB0	19632	UInt	UInt	
529	B1 DigIn 1	Off	43501	170/150	4DAD	19885	UInt	UInt	
52A	B1 DigIn 2	Off	43502	170/151	4DAE	19886	UInt	UInt	
52B	B1 DigIn 3	Off	43503	170/152	4DAF	19887	UInt	UInt	
52C	B2 DigIn 1	Off	43504	170/153	4DB0	19888	UInt	UInt	
52D	B2 DigIn 2	Off	43505	170/154	4DB1	19889	UInt	UInt	
52E	B2 DigIn 3	Off	43506	170/155	4DB2	19890	UInt	UInt	
52F	B3 DigIn 1	Off	43507	170/156	4DB3	19891	UInt	UInt	
52G	B3 DigIn 2	Off	43508	170/157	4DB4	19892	UInt	UInt	
52H	B3 DigIn 3	Off	43509	170/158	4DB5	19893	UInt	UInt	
530	Analogue Outputs [530]								
531	AnOut1 Fc	Process Val	43251	169/155	4CB3	19635	UInt	UInt	
532	AnOut1 Setup	4-20mA	43252	169/156	4CB4	19636	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
533	AnOut 1 Advan								
5331	AnOut 1 Min	4mA	43253	169/157	4CB5	19637	Long, 1=0.01	Elnt	
5332	AnOut 1 Max	20mA	43254	169/158	4CB6	19638	Long, 1=0.01	Elnt	
5333	AnOut1Bipol	20mA	43255	169/159	4CB7	19639	Long, 1=0.01	Elnt	
5334	AnOut1FCMin	Min	43256	169/160	4CB8	19640	UlnT	UlnT	
5335	AnOut1VaMin	0	43545	170/194	4DD9	19929	Long, 1=0.001	Elnt	
5336	AnOut1FCMax	Max	43257	169/161	4CB9	19641	UlnT	UlnT	
5337	AnOut1VaMax	0	43555	170/204	4DE3	19939	Long, 1=0.001	Elnt	
534	AnOut2 Fc	Current	43261	169/165	4CBD	19645	UlnT	UlnT	
535	AnOut2 Setup	4-20mA	43262	169/166	4CBE	19646	UlnT	UlnT	
536	AnOut2 Advan								
5361	AnOut2 Min	4mA	43263	169/167	4CBF	19647	Long, 1=0.01	Elnt	
5362	AnOut2 Max	20mA	43264	169/168	4CC0	19648	Long, 1=0.01	Elnt	
5363	AnOut2Bipol	20mA	43265	169/169	4CC1	19649	Long, 1=0.01	Elnt	
5364	AnOut2FcMin	Min	43266	169/170	4CC2	19650	UlnT	UlnT	
5365	AnOut2VaMin	0	43546	170/195	4DDA	19930	Long, 1=0.001	Elnt	
5366	AnOut2FcMax	Max	43267	169/171	4CC3	19651	UlnT	UlnT	
5367	AnOut2VaMax	0	43556	170/205	4DE4	19940	Long, 1=0.001	Elnt	
540	Digital Outputs [540]								
541	DigOut 1	Output OK	43271	169/175	4CC7	19655	UlnT	UlnT	
542	DigOut2	L2	43272	169/176	4CC8	19656	UlnT	UlnT	
550	Relays [550]								
551	Relay 1	Charge Relay	43273	169/177	4CC9	19657	UlnT	UlnT	
552	Relay 2	Output OK	43274	169/178	4CCA	19658	UlnT	UlnT	
553	Relay 3	Main Relay	43275	169/179	4CCB	19659	UlnT	UlnT	
554	B1 Relay 1	Off	43511	170/160	4DB7	19895	UlnT	UlnT	
555	B1 Relay 2	Off	43512	170/161	4DB8	19896	UlnT	UlnT	
556	B1 Relay 3	Off	43513	170/162	4DB9	19897	UlnT	UlnT	
557	B2 Relay 1	Off	43514	170/163	4DBA	19898	UlnT	UlnT	
558	B2 Relay 2	Off	43515	170/164	4DBB	19899	UlnT	UlnT	
559	B2 Relay 3	Off	43516	170/165	4DBC	19900	UlnT	UlnT	
55A	B3 Relay 1	Off	43517	170/166	4DBD	19901	UlnT	UlnT	
55B	B3 Relay 2	Off	43518	170/167	4DBE	19902	UlnT	UlnT	
55C	B3 Relay 3	Off	43519	170/168	4DBF	19903	UlnT	UlnT	
55D	Relay Advan								
55D1	Relay1 Mode	N.O	43276	169/180	4CCC	19660	UlnT	UlnT	
55D2	Relay2 Mode	N.O	43277	169/181	4CCD	19661	UlnT	UlnT	
55D3	Relay3 Mode	N.O	43278	169/182	4CCE	19662	UlnT	UlnT	
55D4	B1R1 Mode	N.O	43521	170/170	4DC1	19905	UlnT	UlnT	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
55D5	B1R2 Mode	N.O	43522	170/171	4DC2	19906	UInt	UInt	
55D6	B1R3 Mode	N.O	43523	170/172	4DC3	19907	UInt	UInt	
560	Virtual Connections [560]								
561	VIO 1 Dest	Off	43281	169/185	4CD1	19665	UInt	UInt	
562	VIO 1 Source	Off	43282	169/186	4CD2	19666	UInt	UInt	
563	VIO 2 Dest	Off	43283	169/187	4CD3	19667	UInt	UInt	
564	VIO 2 Source	Off	43284	169/188	4CD4	19668	UInt	UInt	
565	VIO 3 Dest	Off	43285	169/189	4CD5	19669	UInt	UInt	
566	VIO 3 Source	Off	43286	169/190	4CD6	19670	UInt	UInt	
567	VIO 4 Dest	Off	43287	169/191	4CD7	19671	UInt	UInt	
568	VIO 4 Source	Off	43288	169/192	4CD8	19672	UInt	UInt	
569	VIO 5 Dest	Off	43289	169/193	4CD9	19673	UInt	UInt	
56A	VIO 5 Source	Off	43290	169/194	4CDA	19674	UInt	UInt	
56B	VIO 6 Dest	Off	43291	169/195	4CDB	19675	UInt	UInt	
56C	VIO 6 Source	Off	43292	169/196	4CDC	19676	UInt	UInt	
56D	VIO 7 Dest	Off	43293	169/197	4CDD	19677	UInt	UInt	
56E	VIO 7 Source	Off	43294	169/198	4CDE	19678	UInt	UInt	
56F	VIO 8 Dest	Off	43295	169/199	4CDF	19679	UInt	UInt	
56G	VIO 8 Source	STO Active	43296	169/200	4CE0	19680	UInt	UInt	
600	Logical Functions and Timers [600]								
610	Comparators [610]								
611	Setup Analogue Comparator 1 [611]								
6111	CA1 Value	Speed	43400	170/49	4D48	19784	UInt	UInt	
6112	CA1 LevelHI	300rpm	43401	170/50	4D49	19785	Long, 1=0.001	EInt	
6113	CA1 LevelLO	200rpm	43402	170/51	4D4A	19786	Long, 1=0.001	EInt	
6114	CA1 Type	Hysteresis	43403	170/52	4D4B	19787	UInt	UInt	
6115	CA1 Polar	Unipolar	43404	170/53	4D4C	19788	UInt	UInt	
6116	CA1 Set Dly	0s	43405	170/54	4D4D	19789	Long, 1=1s	EInt	
6117	CA1 Res Dly	0s	43406	170/55	4D4E	19790	Long, 1=1s	EInt	
6118	CA1 Tmr Val	0s	43407	170/56	4D4F	19791	Long, 1=1s	EInt	
612	CA2 Setup [612]								
6121	CA2 Value	Torque	43408	170/57	4D50	19792	UInt	UInt	
6122	CA2 LevelHI	20	43409	170/58	4D51	19793	Long, 1=0.001	EInt	
6123	CA2 LevelLO	10	43410	170/59	4D52	19794	Long, 1=0.001	EInt	
6124	CA2 Type	Hysteresis	43411	170/60	4D53	19795	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
6125	CA2 Polar	Unipolar	43412	170/61	4D54	19796	UInt	UInt	
6126	CA2 Set Dly	0s	43413	170/62	4D55	19797	Long, 1=1s	Elnt	
6127	CA2 Res Dly	0s	43414	170/63	4D56	19798	Long, 1=1s	Elnt	
6128	CA2 Tmr Val	0s	43415	170/64	4D57	19799	Long, 1=1s	Elnt	
613	CA3 Setup [613]								
6131	CA3 Value	Process Val	43416	170/65	4D58	19800	UInt	UInt	
6132	CA3 LevelHI	300	43417	170/66	4D59	19801	Long, 1=0.001	Elnt	
6133	CA3 LevelLO	200	43418	170/67	4D5A	19802	Long, 1=0.001	Elnt	
6134	CA3 Type	Hysteresis	43419	170/68	4D5B	19803	UInt	UInt	
6135	CA3 Polar	Unipolar	43420	170/69	4D5C	19804	UInt	UInt	
6136	CA3 Set Dly	0s	43421	170/70	4D5D	19805	Long, 1=1s	Elnt	
6137	CA3 Res Dly	0s	43422	170/71	4D5E	19806	Long, 1=1s	Elnt	
6138	CA3 Tmr Val	0s	43423	170/72	4D5F	19807	Long, 1=1s	Elnt	
614	CA4 Setup [614]								
6141	CA4 Value	Process Err	43424	170/73	4D60	19808	UInt	UInt	
6142	CA4 LevelHI	100	43425	170/74	4D61	19809	Long, 1=0.001	Elnt	
6143	CA4 LevelLO	-100	43426	170/75	4D62	19810	Long, 1=0.001	Elnt	
6144	CA4 Type	Window	43427	170/76	4D63	19811	UInt	UInt	
6145	CA4 Polar	Bipolar	43428	170/77	4D64	19812	UInt	UInt	
6146	CA4 Set Dly	0s	43429	170/78	4D65	19813	Long, 1=1s	Elnt	
6147	CA4 Res Dly	0s	43430	170/79	4D66	19814	Long, 1=1s	Elnt	
6148	CA4 Tmr Val	0s	43431	170/80	4D67	19815	Long, 1=1s	Elnt	
620	Analogue Multiplexer [620]								
621	AnMux1								
6211	AnMux1 InA	AnIn1	43432	170/81	4D68	19816	UInt	UInt	
6212	AnMux1 InB	AnIn2	43433	170/82	4D69	19817	UInt	UInt	
6213	AnMux1 Op	Off	43434	170/83	4D6A	19818	UInt	UInt	
622	AnMux2								
6221	AnMux2 InA	AnIn1	43435	170/84	4D6B	19819	UInt	UInt	
6222	AnMux2 InB	AnIn2	43436	170/85	4D6C	19820	UInt	UInt	
6223	AnMux2 Op	Off	43437	170/86	4D6D	19821	UInt	UInt	
630	Not Gate [630]								
631	NOT1 Input	CA2	43438	170/87	4D6E	19822	UInt	UInt	
632	NOT2 Input	Off	43439	170/88	4D6F	19823	UInt	UInt	
633	NOT3 Input	Off	43440	170/89	4D70	19824	UInt	UInt	
634	NOT4 Input	Off	43441	170/90	4D71	19825	UInt	UInt	
635	NOT5 Input	Off	43442	170/91	4D72	19826	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
636	NOT6 Input	Off	43443	170/92	4D73	19827	UInt	UInt	
637	NOT7 Input	Off	43444	170/93	4D74	19828	UInt	UInt	
638	NOT8 Input	Off	43445	170/94	4D75	19829	UInt	UInt	
640	Logic output [640]								
641	Logic Output 1 [641]		31093	121/237	2445	1093	UInt, 1=1	UInt	
6411	L1 Expr	((1.2).3).4	43450	170/99	4D7A	19834	UInt	UInt	
6412	L1 Input 1	CA1	43451	170/100	4D7B	19835	UInt	UInt	
6413	L1 Op 1	&	43452	170/101	4D7C	19836	UInt	UInt	
6414	L1 Input 2	NOT1	43453	170/102	4D7D	19837	UInt	UInt	
6415	L1 Op 2	&	43454	170/103	4D7E	19838	UInt	UInt	
6416	L1 Input 3	Run	43455	170/104	4D7F	19839	UInt	UInt	
6417	L1 Op 3	.	43456	170/105	4D80	19840	UInt	UInt	
6418	L1 Input 4	Off	43457	170/106	4D81	19841	UInt	UInt	
6419	L1 Set Dly	0s	43458	170/107	4D82	19842	Long, 1=1s	EInt	
641A	L1 Res Dly	0s	43459	170/108	4D83	19843	Long, 1=1s	EInt	
641B	L1 Tmr Val	0s	43460	170/109	4D84	19844	Long, 1=1s	EInt	
642	Logic 2		31094	121/238	2446	1094	UInt, 1=1	UInt	
6421	L2 Expr	((1.2).3).4	43461	170/110	4D85	19845	UInt	UInt	
6422	L2 Input 1	CA1	43462	170/111	4D86	19846	UInt	UInt	
6423	L2 Op 1	&	43463	170/112	4D87	19847	UInt	UInt	
6424	L2 Input 2	NOT1	43464	170/113	4D88	19848	UInt	UInt	
6425	L2 Op 2	&	43465	170/114	4D89	19849	UInt	UInt	
6426	L2 Input 3	Run	43466	170/115	4D8A	19850	UInt	UInt	
6427	L2 Op 3	.	43467	170/116	4D8B	19851	UInt	UInt	
6428	L2 Input 4	Off	43468	170/117	4D8C	19852	UInt	UInt	
6429	L2 Set Dly	0s	43469	170/118	4D8D	19853	Long, 1=1s	EInt	
642A	L2 Res Dly	0s	43470	170/119	4D8E	19854	Long, 1=1s	EInt	
642B	L2 Tmr Val	0s	43471	170/120	4D8F	19855	Long, 1=1s	EInt	
643	Logic 3		31095	121/239	2447	1095	UInt, 1=1	UInt	
6431	L3 Expr	((1.2).3).4	43472	170/121	4D90	19856	UInt	UInt	
6432	L3 Input 1	CA1	43473	170/122	4D91	19857	UInt	UInt	
6433	L3 Op 1	&	43474	170/123	4D92	19858	UInt	UInt	
6434	L3 Input 2	NOT1	43475	170/124	4D93	19859	UInt	UInt	
6435	L3 Op 2	&	43476	170/125	4D94	19860	UInt	UInt	
6436	L3 Input 3	Run	43477	170/126	4D95	19861	UInt	UInt	
6437	L3 Op 3	.	43478	170/127	4D96	19862	UInt	UInt	
6438	L3 Input 4	Off	43479	170/128	4D97	19863	UInt	UInt	
6439	L3 Set Dly	0s	43480	170/129	4D98	19864	Long, 1=1s	EInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
643A	L3 Res Dly	0s	43481	170/130	4D99	19865	Long, 1=1s	EInt	
643B	L3 Tmr Val	0s	43482	170/131	4D9A	19866	Long, 1=1s	EInt	
644	Logic 4		31096	121/240	2448	1096	UInt, 1=1	UInt	
6441	L4 Expr	((1.2).3).4	43483	170/132	4D9B	19867	UInt	UInt	
6442	L4 Input 1	CA1	43484	170/133	4D9C	19868	UInt	UInt	
6443	L4 Op 1	&	43485	170/134	4D9D	19869	UInt	UInt	
6444	L4 Input 2	NOT1	43486	170/135	4D9E	19870	UInt	UInt	
6445	L4 Op 2	&	43487	170/136	4D9F	19871	UInt	UInt	
6446	L4 Input 3	Run	43488	170/137	4DA0	19872	UInt	UInt	
6447	L4 Op 3	.	43489	170/138	4DA1	19873	UInt	UInt	
6448	L4 Input 4	Off	43490	170/139	4DA2	19874	UInt	UInt	
6449	L4 Set Dly	0s	43491	170/140	4DA3	19875	Long, 1=1s	EInt	
644A	L4 Res Dly	0s	43492	170/141	4DA4	19876	Long, 1=1s	EInt	
644B	L4 Tmr Val	0s	43493	170/142	4DA5	19877	Long, 1=1s	EInt	
650	Timers [650]								
651	Timer1								
6511	Timer1 Trig	Off	43600	170/249	4E10	19984	UInt	UInt	
6512	Timer1 Mode	Off	43601	170/250	4E11	19985	UInt	UInt	
6513	Timer1Delay	0s	43602	170/251	4E12	19986	Long, 1=1s	EInt	
6514	Timer1 T1	0s	43603	170/252	4E13	19987	Long, 1=1s	EInt	
6515	Timer1 T2	0s	43604	170/253	4E14	19988	Long, 1=1s	EInt	
6516	Timer1Value	0s	43605	170/254	4E15	19989	Long, 1=1s	EInt	
652	Timer2								
6521	Timer2 Trig	Off	43606	171/0	4E16	19990	UInt	UInt	
6522	Timer2 Mode	Off	43607	171/1	4E17	19991	UInt	UInt	
6523	Timer2Delay	0s	43608	171/2	4E18	19992	Long, 1=1s	EInt	
6524	Timer2 T1	0s	43609	171/3	4E19	19993	Long, 1=1s	EInt	
6525	Timer2 T2	0s	43610	171/4	4E1A	19994	Long, 1=1s	EInt	
6526	Timer2Value	0s	43611	171/5	4E1B	19995	Long, 1=1s	EInt	
653	Timer3								
6531	Timer3 Trig	Off	43612	171/6	4E1C	19996	UInt	UInt	
6532	Timer3 Mode	Off	43613	171/7	4E1D	19997	UInt	UInt	
6533	Timer3Delay	0s	43614	171/8	4E1E	19998	Long, 1=1s	EInt	
6534	Timer3 T1	0s	43615	171/9	4E1F	19999	Long, 1=1s	EInt	
6535	Timer3 T2	0s	43616	171/10	4E20	20000	Long, 1=1s	EInt	
6536	Timer3Value	0s	43617	171/11	4E21	20001	Long, 1=1s	EInt	
654	Timer4								
6541	Timer4 Trig	Off	43618	171/12	4E22	20002	UInt	UInt	
6542	Timer4 Mode	Off	43619	171/13	4E23	20003	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
6543	Timer4Delay	0s	43620	171/14	4E24	20004	Long, 1=1s	EInt	
6544	Timer4 T1	0s	43621	171/15	4E25	20005	Long, 1=1s	EInt	
6545	Timer4 T2	0s	43622	171/16	4E26	20006	Long, 1=1s	EInt	
6546	Timer4Value	0s	43623	171/17	4E27	20007	Long, 1=1s	EInt	
660	Flip flops [660]								
661	Flip flop 1								
6611	F1 mode	Reset	43630	171/24	4E2E	20014	UInt	UInt	
6612	F1 set	Off	43631	171/25	4E2F	20015	UInt	UInt	
6613	F1 reset	Off	43632	171/26	4E30	20016	UInt	UInt	
6614	F1 set Dly	0s	43633	171/27	4E31	20017	Long, 1=1s	EInt	
6615	F1 res Dly	0s	43634	171/28	4E32	20018	Long, 1=1s	EInt	
6616	F1 Tmr Val	0s	43635	171/29	4E33	20019	Long, 1=1s	EInt	
662	Flip flop 2								
6621	F2 mode	Reset	43636	171/30	4E34	20020	UInt	UInt	
6622	F2 set	Off	43637	171/31	4E35	20021	UInt	UInt	
6623	F2 reset	Off	43638	171/32	4E36	20022	UInt	UInt	
6624	F2 Set Dly	0s	43639	171/33	4E37	20023	Long, 1=1s	EInt	
6625	F2 Res Dly	0s	43640	171/34	4E38	20024	Long, 1=1s	EInt	
6626	F2 Tmr Val	0s	43641	171/35	4E39	20025	Long, 1=1s	EInt	
663	Flip flop 3								
6631	F3 mode	Reset	43642	171/36	4E3A	20026	UInt	UInt	
6632	F3 set	Off	43643	171/37	4E3B	20027	UInt	UInt	
6633	F3 reset	Off	43644	171/38	4E3C	20028	Long	EInt	
6634	F3 Set Dly	0s	43645	171/39	4E3D	20029	Long, 1=1s	EInt	
6635	F3 Res Dly	0s	43646	171/40	4E3E	20030	Long, 1=1s	EInt	
6636	F3 Tmr Val	0s	43647	171/41	4E3F	20031	Long, 1=1s	EInt	
664	Flip flop 4								
6641	F4 mode	Reset	43648	171/42	4E40	20032	UInt	UInt	
6642	F4 set	Off	43649	171/43	4E41	20033	UInt	UInt	
6643	F4 reset	Off	43650	171/44	4E42	20034	UInt	UInt	
6644	F4 Set Dly	0s	43651	171/45	4E43	20035	Long, 1=1s	EInt	
6645	F4 Res Dly	0s	43652	171/46	4E44	20036	Long, 1=1s	EInt	
6646	F4 Tmr Val	0s	43653	171/47	4E45	20037	Long, 1=1s	EInt	
670	Counters [670]								
671	Counter1								
6711	C1 Trig	Off	43654	171/48	4E46	20038	UInt	UInt	
6712	C1 Reset	Off	43655	171/49	4E47	20039	UInt	UInt	
6713	C1 High Val	0	43656	171/50	4E48	20040	Long, 1=1	EInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
6714	C1 Low Val	0	43657	171/51	4E49	20041	Long, 1=1	EInt	
6715	C1 DecTimer	Off	43658	171/52	4E4A	20042	Long, 1=1s	EInt	
6719	C1 Value	0	43659	171/53	4E4B	20043	UInt, 1=1	UInt	
672	Counter2								
6721	C2 Trig	Off	43660	171/54	4E4C	20044	UInt	UInt	
6722	C2 Reset	Off	43661	171/55	4E4D	20045	UInt	UInt	
6723	C2 High Val	0	43662	171/56	4E4E	20046	Long, 1=1	EInt	
6724	C2 High Val	0	43663	171/57	4E4F	20047	Long, 1=1	EInt	
6725	C2 DecTimer	Off	43664	171/58	4E50	20048	Long, 1=1s	EInt	
6729	C2 Value	0	43665	171/59	4E51	20049	UInt, 1=1	UInt	
680	Clock Logic [680]								
681	Clock 1								
6811	Clk1TimeON	00:00:00	43670	171/64	4E56	20054	Long, 1=1h	EInt	
			43671	171/65	4E57	20055	Long, 1=1m	EInt	
			43672	171/66	4E58	20056	Long, 1=1s	EInt	
6812	Clk1TimeOff	00:00:00	43673	171/67	4E59	20057	Long, 1=1h	EInt	
			43674	171/68	4E5A	20058	Long, 1=1m	EInt	
			43675	171/69	4E5B	20059	Long, 1=1s	EInt	
6813	Clk1DateOn	2000-00-00	43676	171/70	4E5C	20060	Long, 1=1y	EInt	
			43677	171/71	4E5D	20061	Long, 1=1m	EInt	
			43678	171/72	4E5E	20062	Long, 1=1d	EInt	
6814	Clk1DateOff	2000-00-00	43679	171/73	4E5F	20063	Long, 1=1y	EInt	
			43680	171/74	4E60	20064	Long, 1=1m	EInt	
			43681	171/75	4E61	20065	Long, 1=1d	EInt	
6815	Clk1Weekday	MTWTFSS	43682	171/76	4E62	20066	UInt, 1=1	UInt	
682	Clock 2								
6821	Clk2TimeON	00:00:00	43684	171/78	4E64	20068	Long, 1=1h	EInt	
			43685	171/79	4E65	20069	Long, 1=1m	EInt	
			43686	171/80	4E66	20070	Long, 1=1s	EInt	
6822	Clk2TimeOff	00:00:00	43687	171/81	4E67	20071	Long, 1=1h	EInt	
			43688	171/82	4E68	20072	Long, 1=1m	EInt	
			43689	171/83	4E69	20073	Long, 1=1s	EInt	
6823	Clk2DateOn	2000-00-00	43690	171/84	4E6A	20074	Long, 1=1y	EInt	
			43691	171/85	4E6B	20075	Long, 1=1m	EInt	
			43692	171/86	4E6C	20076	Long, 1=1d	EInt	
6824	Clk2DateOff	2000-00-00	43693	171/87	4E6D	20077	Long, 1=1y	EInt	
			43694	171/88	4E6E	20078	Long, 1=1m	EInt	
			43695	171/89	4E6F	20079	Long, 1=1d	EInt	
6825	Clk2Weekday	MTWTFSS	43696	171/90	4E70	20080	UInt, 1=1	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
700	View Operation/ Status [700]								
710	Operation [710]								
711	Process Val		31001	121/145	23E9	1001	Long, 1=0.001	EInt	
715	El Power		31006	121/150	23EE	1006	Long, 1=1W	EInt	
716	Current		31007	121/151	23EF	1007	Long, 1=0.1A	EInt	
717	Output Volt		31008	121/152	23F0	1008	Long, 1=0.1V	EInt	
719	DC Voltage		31010	121/154	23F2	1010	Long, 1=0.1V	EInt	
71A	IGBT Temp		31011	121/155	23F3	1011	Long, 1=0.1 °C	EInt	
71B	PT100 1,2,3		31012	121/156	23F4	1012	Long, 1=1 °C	EInt	
			31013	121/157	23F5	1013	Long, 1=1 °C	EInt	
			31014	121/158	23F6	1014	Long, 1=1 °C	EInt	
71C	PT100 4,5,6		31097	121/241	2449	1097	Long, 1=1 °C	EInt	
			31098	121/242	244A	1098	Long, 1=1 °C	EInt	
			31099	121/243	244B	1099	Long, 1=1 °C	EInt	
720	Status [720]								
721	VSD Status		31015	121/159	23F7	1015	UInt	UInt	
722	Warning		31016	121/160	23F8	1016	UInt	UInt	
723	DigIn Status		31017	121/161	23F9	1017	UInt, 1=1	UInt	
724	DigOutStatus		31018	121/162	23FA	1018	UInt, 1=1	UInt	
725	AnIn 1 2		31019	121/163	23FB	1019	Long, 1=1%	EInt	
			31020	121/164	23FC	1020	Long, 1=1%	EInt	
726	AnIn 3 4		31021	121/165	23FD	1021	Long, 1=1%	EInt	
			31022	121/166	23FE	1022	Long, 1=1%	EInt	
727	AnOut 1 2		31023	121/167	23FF	1023	Long, 1=1%	EInt	
			31024	121/168	2400	1024	Long, 1=1%	EInt	
728	IO Status B1		31025	121/169	2401	1025	UInt, 1=1	UInt	
729	IO Status B2		31026	121/170	2402	1026	UInt, 1=1	UInt	
72A	IO Status B3		31027	121/171	2403	1027	UInt, 1=1	UInt	
72B	Area D Stat								
			30053						Area D bit shown by the PPU. Not available as a menu.
72B1	Area D LSB		30180	118/89	20B4	180	UInt, 1=1	UInt	
72B2	Area D MSB		30182	118/91	20B6	182	UInt, 1=1	UInt	
72C	VIO Status		30181	118/90	20B5	181	UInt, 1=1	UInt	
72D	Run Status	0	31036	121/180	20C	1036	UInt	UInt	
730	Stored values [730]								

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
731	Run Time		31028	121/172	2404	1028	Long, 1=1h	EInt	
			31029	121/173	2405	1029	Long, 1=1m	EInt	
			31030	121/174	2406	1030	Long, 1=1s	EInt	
7311	Reset RunTm	No	7	0/6	2007	7	UInt	UInt	
732	Mains Time	hh:mm:ss	31031	121/175	2407	1031	Long, 1=1h	EInt	
			31032	121/176	2408	1032	Long, 1=1m	EInt	
			31033	121/177	2409	1033	Long, 1=1s	EInt	
733	Energy	Wh	31034	121/178	240A	1034	Long, 1=1Wh	EInt	
7331	Rst Energy	No	6	0/5	2006	6	UInt	UInt	
800	View Trip Log [800]								
810	Trip message log [810]		31101	121/245	244D	1101	UInt, 1=1	UInt	
811	Process Val		31102	121/246	244E	1102	Long, 1=0.001	EInt	
815	EI Power		31107	121/251	2453	1107	Long, 1=1W	EInt	
816	Current		31108	121/252	2454	1108	Long, 1=0.1A	EInt	
817	Output volt		31109	121/253	2455	1109	Long, 1=0.1V	EInt	
819	DC Voltage		31111	122/0	2457	1111	Long, 1=0.1V	EInt	
81A	IGBT Temp		31112	122/1	2458	1112	Long, 1=0.1°C	EInt	
81B	PT100 1,2,3		31113	122/2	2459	1113	Long, 1=1°C	EInt	
			31114	122/3	245A	1114	Long, 1=1°C	EInt	
			31115	122/4	245B	1115	Long, 1=1°C	EInt	
81C	VSD Status		31116	122/5	245C	1116	UInt	UInt	
81D	DigIn Status		31117	122/6	245D	1117	UInt, 1=1	UInt	
81E	DigOutStatus		31118	122/7	245E	1118	UInt, 1=1	UInt	
81F	AnIn 1 2		31119	122/8	245F	1119	Long, 1=1%	EInt	
			31120	122/9	2460	1120	Long, 1=1%	EInt	
81G	AnIn 3 4		31121	122/10	2461	1121	Long, 1=1%	EInt	
			31122	122/11	2462	1122	Long, 1=1%	EInt	
81H	AnOut1 2		31123	122/12	2463	1123	Long, 1=1%	EInt	
			31124	122/13	2464	1124	Long, 1=1%	EInt	
81I	IO Status B1		31125	122/14	2465	1125	UInt, 1=1	UInt	
81J	IO Status B2		31126	122/15	2466	1126	UInt, 1=1	UInt	
81K	IO Status B3		31127	122/16	2467	1127	UInt, 1=1	UInt	
81L	Run Time		31128	122/17	2468	1128	Long, 1=1h	EInt	
			31129	122/18	2469	1129	Long, 1=1m	EInt	
			31130	122/19	246A	1130	Long, 1=1s	EInt	
81M	Mains Time		31131	122/20	246B	1131	Long, 1=1h	EInt	
			31132	122/21	246C	1132	Long, 1=1m	EInt	
			31133	122/22	246D	1133	Long, 1=1s	EInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
81N	Energy		31147	122/36	247B	1147	Long, 1=1Wh	EInt	
81O	Set/View ref		31135	122/24	246F	1135	Long, 1=0.001	EInt	
81P	VIO Status		31136	122/25	2470	1136	UInt, 1=1	UInt	
81Q	PT100 4,5,6		31137	122/26	2471	1137	Long, 1=1°C	EInt	
			31138	122/27	2472	1138	Long, 1=1°C	EInt	
			31139	122/28	2473	1139	Long, 1=1°C	EInt	
82O	Trip Message (Log 2)		31151 to 31189	122/40 to 122/78	247F to 24A5	1151 to 1189			
83O	Trip Message (Log 3)		31201 to 31239	122/90 to 122/128	24B1 to 24D7	1201 to 1239			
84O	Trip Message (Log 4)		31251 to 31289	122/140 to 122/178	24E3 to 2509	1251 to 1289			
85O	Trip Message (Log 5)		31301 to 31339	122/190 to 122/228	2515 to 253B	1301 to 1339			
86O	Trip Message (Log 6)		31351 to 31389	122/240 to 123/23	2547 to 256D	1351 to 1389			
87O	Trip Message (Log 7)		31401 to 31439	123/35 to 123/73	2579 to 259F	1401 to 1439			
88O	Trip Message (Log 8)		31451 to 31489	123/85 to 123/123	25AB to 25D1	1451 to 1489			
89O	Trip Message (Log 9)		31501 to 31539	123/135 to 123/173	25DD to 2603	1501 to 1539			
8AO	Reset Trip L	No	8	0/7	2008	8	UInt	UInt	
90O	System Data [900]								
92O	VSD Data [920]								
921	VSD Type		31037	121/181	240D	1037	UInt, 1=1	UInt	
922	Software		31038	121/182	240E	1038	UInt	UInt	
			31039	121/183	240F	1039	UInt	UInt	
9221	Build Info	YYMMDDHHMM SS	31040	121/184	2410	1040	UInt	UInt	
			31041	121/185	2411	1041	UInt	UInt	
			31042	121/186	2412	1042	UInt	UInt	
			31043	121/187	2413	1043	UInt	UInt	
			31044	121/188	2414	1044	UInt	UInt	
			31045	121/189	2415	1045	UInt	UInt	
9222	Build ID								Read value using PPU or EmoSoftCom.
9223	EmoLib ID								Read value using PPU or EmoSoftCom.
9224	SW Config	0	31050	121/194	241A	1050	UInt, 1=1	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
923	Unit Name	0	42301	165/225	48FD	18685	UInt	UInt	
			42302	165/226	48FE	18686	UInt	UInt	
			42303	165/227	48FF	18687	UInt	UInt	
			42304	165/228	4900	18688	UInt	UInt	
			42305	165/229	4901	18689	UInt	UInt	
			42306	165/230	4902	18690	UInt	UInt	
			42307	165/231	4903	18691	UInt	UInt	
			42308	165/232	4904	18692	UInt	UInt	
			42309	165/233	4905	18693	UInt	UInt	
			42310	165/234	4906	18694	UInt	UInt	
			42311	165/235	4907	18695	UInt	UInt	
			42312	165/236	4908	18696	UInt	UInt	
924	Hardware								
9241	CB Key		39900	156/119	20D2	210	UInt	UInt	
925	CtrlPanel								
9251	CP SW ver		39901	156/120	46AD	9901	UInt	UInt	
9252	CP HW ver		39902	156/121	46AE	9902	UInt, 1=1	UInt	
9253	CP Build ID		30220	118/129	20DC	220	UInt	UInt	
930	Clock [930]								
931	Time	00:00:00	42601	167/15	4A29	18985	Long, 1=1h	EInt	
			42602	167/16	4A2A	18986	Long, 1=1m	EInt	
			42603	167/17	4A2B	18987	Long, 1=1s	EInt	
932	Date	2000-00-00	42604	167/18	4A2C	18988	Long, 1=1y	EInt	
			42605	167/19	4A2D	18989	Long, 1=1m	EInt	
			42606	167/20	4A2E	18990	Long, 1=1d	EInt	
933	Weekday	Monday	42607	167/21	4A2F	18991	Long	EInt	
940	Inspection								
941	Interval	35 000h	42651	167/65	4A5B	19035	Long, 1=1h	EInt	
942	Act.Counter	0h	42652	167/66	4A5C	19036	Long, 1=1h	EInt	
943	Clear Cnt	No	10	0/9	200A	10	UInt	UInt	
950	Service Cont								

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
951	Company Name	Blank	42351	166/20	492F	18735	UInt	UInt	
			42352	166/21	4930	18736	UInt	UInt	
			42353	166/22	4931	18737	UInt	UInt	
			42354	166/23	4932	18738	UInt	UInt	
			42355	166/24	4933	18739	UInt	UInt	
			42356	166/25	4934	18740	UInt	UInt	
			42357	166/26	4935	18741	UInt	UInt	
			42358	166/27	4936	18742	UInt	UInt	
			42359	166/28	4937	18743	UInt	UInt	
			42360	166/29	4938	18744	UInt	UInt	
			42361	166/30	4930	18745	UInt	UInt	
			42362	166/31	493A	18746	UInt	UInt	
			42363	166/32	493B	18747	UInt	UInt	
			42364	166/33	493C	18748	UInt	UInt	
			42365	166/34	493D	18749	UInt	UInt	
			42366	166/34	493E	18750	UInt	UInt	
952	Phone Number	Blank	42367	166/36	493F	18751	UInt	UInt	
			42368	166/37	493F	18751	UInt	UInt	
			42369	166/38	4940	18752	UInt	UInt	
			42370	166/39	4941	18753	UInt	UInt	
			42371	166/40	4942	18754	UInt	UInt	
			42372	166/41	4943	18755	UInt	UInt	
			42373	166/42	4944	18756	UInt	UInt	
			42374	166/43	4945	18757	UInt	UInt	
			42375	166/44	4946	18758	UInt	UInt	
			42376	166/45	4947	18759	UInt	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
953	AddressLine1	Blank	42377	166/46	4949	18761	UInt	UInt	
			42378	166/47	494A	18762	UInt	UInt	
			42379	166/48	494B	18763	UInt	UInt	
			42380	166/49	494C	18764	UInt	UInt	
			42381	166/50	494D	18765	UInt	UInt	
			42382	166/51	494E	18766	UInt	UInt	
			42383	166/52	494F	18767	UInt	UInt	
			42384	166/53	4950	18768	UInt	UInt	
			42385	166/54	4951	18769	UInt	UInt	
			42386	166/55	4952	18770	UInt	UInt	
			42387	166/56	4953	18771	UInt	UInt	
			42388	166/57	4954	18772	UInt	UInt	
			42389	166/58	4955	18773	UInt	UInt	
			42390	166/59	4956	18774	UInt	UInt	
42391	166/60	4957	18775	UInt	UInt				
42392	166/61	4958	18776	UInt	UInt				
954	AddressLine2	Blank	42393	166/62	4959	18777	UInt	UInt	
			42394	166/63	495A	18778	UInt	UInt	
			42395	166/64	495B	18779	UInt	UInt	
			42396	166/65	495C	18780	UInt	UInt	
			42397	166/66	495D	18781	UInt	UInt	
			42398	166/67	495E	18782	UInt	UInt	
			42399	166/68	495F	18783	UInt	UInt	
			42400	166/69	4960	18784	UInt	UInt	
			42401	166/70	4961	18785	UInt	UInt	
			42402	166/71	4962	18786	UInt	UInt	
			42403	166/72	4963	18787	UInt	UInt	
			42404	166/73	4964	18788	UInt	UInt	
42405	166/74	4965	18789	UInt	UInt				
42406	166/75	4966	18790	UInt	UInt				
42407	166/76	4967	18791	UInt	UInt				
42408	166/77	4968	18792	UInt	UInt				

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
955	AddressLine3	Blank	42409	166/78	4969	18793	UInt	UInt	
			42410	166/79	496A	18794	UInt	UInt	
			42411	166/80	496B	18795	UInt	UInt	
			42412	166/81	496C	18796	UInt	UInt	
			42413	166/82	496D	18797	UInt	UInt	
			42414	166/83	496E	18798	UInt	UInt	
			42415	166/84	496F	18799	UInt	UInt	
			42416	166/85	4970	18800	UInt	UInt	
			42417	166/86	4971	18801	UInt	UInt	
			42418	166/87	4972	18802	UInt	UInt	
			42419	166/88	4973	18803	UInt	UInt	
			42420	166/89	4974	18804	UInt	UInt	
			42421	166/90	4975	18805	UInt	UInt	
			42422	166/91	4976	18806	UInt	UInt	
42423	166/92	4977	18807	UInt	UInt				
42424	166/93	4978	18808	UInt	UInt				
956	Email Name	Blank	42425	166/94	4979	18809	UInt	UInt	
			42426	166/95	497A	18810	UInt	UInt	
			42427	166/96	497B	18811	UInt	UInt	
			42428	166/97	497C	18812	UInt	UInt	
			42429	166/98	497D	18813	UInt	UInt	
			42430	166/99	497E	18814	UInt	UInt	
			42431	166/100	497F	18815	UInt	UInt	
			42432	166/101	4980	18816	UInt	UInt	
			42433	166/102	4981	18817	UInt	UInt	
			42434	166/103	4982	18818	UInt	UInt	
			42435	166/104	4983	18819	UInt	UInt	
			42436	166/105	4984	18820	UInt	UInt	
			42437	166/106	4985	18821	UInt	UInt	
			42438	166/107	4986	18822	UInt	UInt	
42439	166/108	4987	18823	UInt	UInt				
42440	166/109	4988	18824	UInt	UInt				

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
957	Email Domain	@cgglobal.com	42441	166/110	4989	18825	UInt	UInt	
			42442	166/111	498A	18826	UInt	UInt	
			42443	166/112	498B	18827	UInt	UInt	
			42444	166/113	498C	18828	UInt	UInt	
			42445	166/114	498D	18829	UInt	UInt	
			42446	166/115	498E	18830	UInt	UInt	
			42447	166/116	498F	18831	UInt	UInt	
			42448	166/117	4990	18832	UInt	UInt	
			42449	166/118	4991	18833	UInt	UInt	
			42450	166/119	4992	18834	UInt	UInt	
			42451	166/120	4993	18835	UInt	UInt	
			42452	166/121	4994	18836	UInt	UInt	
			42453	166/122	4995	18837	UInt	UInt	
			42454	166/123	4996	18838	UInt	UInt	
			42455	166/124	4997	18839	UInt	UInt	
42456	166/125	4998	18840	UInt	UInt				
000	DCDC option								
010	LV Setup								
011	U (LV) Base	600V/1000V	48001	188/60		24385	UInt, 1=0.1V	UInt	
012	I (LV) Base	1.5*Inv.Inom	48002	188/61		24386	UInt, 1=0.1A	UInt	
013	LV Connect	Power On	48003	188/62		24387	UInt	UInt	
014	LV-filter L1	Dependent on DCU type and rating.	48004	188/63		24388	UInt, 1=0.1uH	UInt	
015	LV-filter C1	Dependent on DCU type and rating.	48005	188/64		24389	UInt, 1=0.1mF	UInt	
020	U (LV) Ctrl								
021	U (LV) Ref	300 V / 500 V	48011	188/70		24395	UInt, 1=0.1V	UInt	
022	U (LV) Ramp	1.00 s	48012	188/71		24396	UInt, 1=0.01s	UInt	
023	U (LV) P Gain	0.10	48013	188/72		24397	UInt, 1=0.01	UInt	
024	U (LV) I Time	0.20 s	48014	188/73		24398	UInt, 1=0.01s	UInt	
025	U (LV) PI Max	200 V	48015	188/74		24399	UInt, 1=0.1V	UInt	
026	U (LV) Margin	5.0 %	48016	188/75		24400	UInt, 1=0.1%	UInt	
027	U (LV) Droop	0.0 %	48017	188/76		24401	UInt, 1=0.1%	UInt	
02A	U (LV) Mode	Basic U	48018	188/77		24402	UInt	UInt	
02B	I (LV) P Gain	2.00	48019	188/78		24403	UInt, 1=0.01	UInt	
02C	U+I (LV) Max	150 %	48020	188/79		24404	UInt, 1=1%	UInt	
030	I (LV) Ctrl								
031	I (LV) Ref	0 %	48031	188/90		24415	Int, 1=1%	Int	
032	I (LV) Ramp	1.00 s	48032	188/91		24416	UInt, 1=0.01s	UInt	

Menu Parameters		Default settings	Modbus Instance/ Device Net No.	Profibus slot/index	EtherCAT index (HEX)	Profinet index	Fieldbus format	Modbus format	Notes
033	I (LV) P Gain	0.10	48033	188/92		24417	UInt, 1=0.01	UInt	
034	I (LV) I Time	0.10 s	48034	188/93		24418	UInt, 1=0.01s	UInt	
035	I (LV) PI Max	200 V	48035	188/94		24419	UInt, 1=0.1V	UInt	
03A	I (LV) Dampin	0.25	48040	188/99		24424	UInt, 1=0.01	UInt	
040	U (HV) Ctrl								
041	U (HV) Ref	600 V / 1000 V	48041	188/100		24425	UInt, 1=0.1V	UInt	
042	U (HV) Ramp	1.00 s	48042	188/101		24426	UInt, 1=0.01s	UInt	
043	U (HV) P Gain	2.00	48043	188/102		24427	UInt, 1=0.01	UInt	
044	U (HV) I Time	0.20 s	48044	188/103		24428	UInt, 1=0.01s	UInt	
045	U (HV) PI Max	150 %	48045	188/104		24429	UInt, 1=1%	UInt	
046	U (HV) Margin	10.0 %	48046	188/105		24430	UInt, 1=0.1%	UInt	
047	U (HV) Droop	0.0 %	48047	188/106		24431	UInt, 1=0.1%	UInt	
060	LV Protectio								
061	U (LV) MaxLim	U (LV) Base	48071	188/130		24455	UInt, 1=0.1V	UInt	
062	U (LV) MaxTrip	U (LV) Base	48072	188/131		24456	UInt, 1=0.1V	UInt	
063	U (LV) MaxTime	1.00 s	48073	188/132		24457	UInt, 1=0.01s	UInt	
064	U (LV) MinLim	0 V	48074	188/133		24458	UInt, 1=0.1V	UInt	
065	U (LV) MinTrip	0 V	48075	188/134		24459	UInt, 1=0.1V	UInt	
066	U (LV) MinTime	1.00 s	48076	188/135		24460	UInt, 1=0.01s	UInt	
067	U (LV) MaxLim	1.2*I (LV) Base	48077	188/136		24461	UInt, 1=0.1A	UInt	
068	U (LV) MaxTrip	1.5*I (LV) Base	48078	188/137		24462	UInt, 1=0.1A	UInt	
069	U (LV) MaxTime	1.00 s	48079	188/138		24463	UInt, 1=0.01s	UInt	
06A	U (HV) MaxLim	Inv.U _{max}	48080	188/139		24464	UInt, 1=0.1V	UInt	
06B	U (HV) MaxTrip	Inv.U _{ovr}	48081	188/140		24465	UInt, 1=0.1V	UInt	
06C	U (HV) MaxTime	1.00 s	48082	188/141		24466	UInt, 1=0.01s	UInt	
06D	U (HV) MinLim	Inv.U _{min}	48083	188/142		24467	UInt, 1=0.1V	UInt	
06E	U (HV) MinTrip	Inv.U _{min} -50 V	48084	188/143		24468	UInt, 1=0.1V	UInt	
06F	U (HV) MinTime	1.00 s	48085	188/144		24469	UInt, 1=0.01s	UInt	
090	View Energy								
091	Energy Total	0 Wh	31034	121/178		1034	Long, 1=1Wh	EInt	
092	Energy Out	0 Wh	48089	188/148		24473	Long, 1=1Wh	EInt	
093	Energy In	0 Wh	48095	188/154		24479	Long, 1=1Wh	EInt	
094	Reset Energy	No	48099	188/158		24483	UInt	UInt	

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