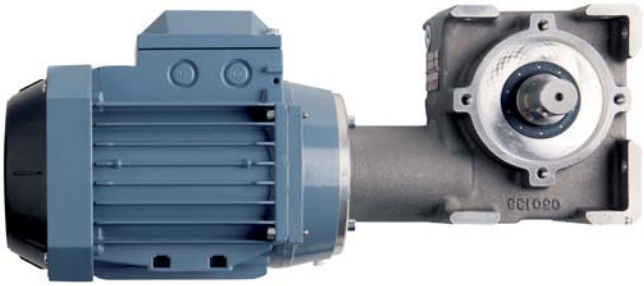
Emotron EMX-D
Drive system for rotary heat exchanger



Instruction manual

English

emotron®
DEDICATED DRIVE

Addendum valid for Emotron EMX-D

This addendum belongs to the instruction manual with document number:
01-5016-01r0 for Emotron EMX-D

Installation of the drive unit (motor plus reduction gear)

- Mount the drive unit.

Attached to the Gearbox you will find a ventilation plug and a brief "Installation and Maintenance instruction". Follow these instructions together with the following:

- On the gearbox there are three plugs.
  Before starting up, remove the plug in highest position, check the oil level and add oil if necessary.
  Use lubricant according to the type plate. Quantity of lubricant in the gearbox is 0,25 litre.

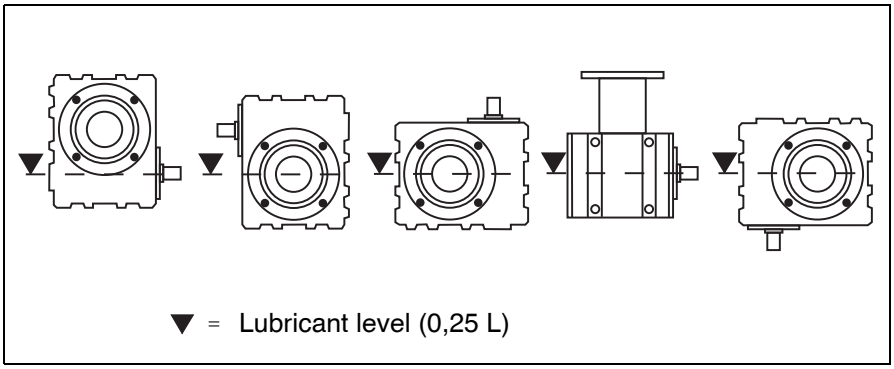


Fig. 1 Recommended oil level in the gearbox depending on shaft position.

- Now replace the plug you removed with the ventilation plug (the plug attached to the gearbox) and fasten it.

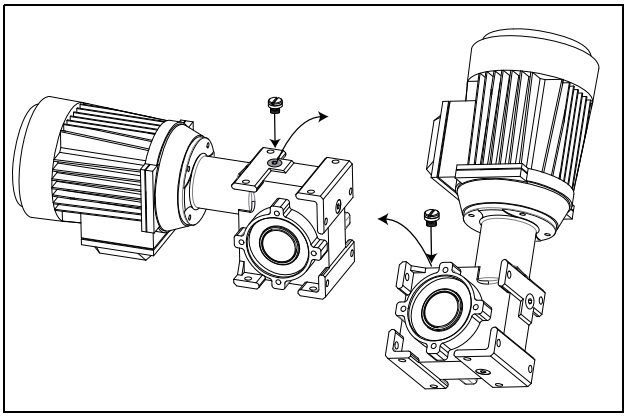


Fig. 2 Remove the plug in highest position and replace with the ventilation plug.

NOTE: It is important to replace the plug in highest position with the ventilation plug (included in delivery). This to prevent oil leakage at thermal changes.

Select language

As default, the language in the control panel display and menu system is set to English. One of the first things to do during commissioning is to select desired language in the system.
There are two ways to select language.

1. Follow the Instruction manual and select language according to chapter 7.3.1 Operation menu [210]
2. It is also possible to press the Toggle Key and you will come directly to menu “Language[211]”.

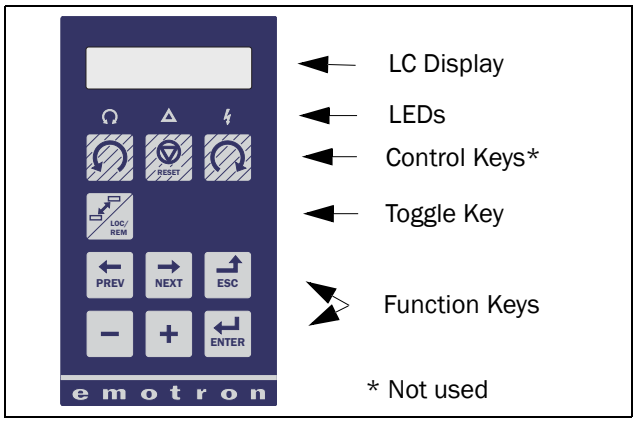


Fig. 3 Control panel

The Toggle and Loc/Rem Key

This key is a quick access to menu “Language [211]”. Press this key if you would like to change the language in menu system and Control panel display.

Language [211]

Select the language used in menu system and on the LCD display.

		211 Language Stp A English
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

- Press + or − key until desired Language is displayed.
- Save/Confirm the selected language by pressing ENTER key.

Emotron EMX-D

INSTRUCTION MANUAL - ENGLISH

Software version 4.2x

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Safety Instructions

Instruction manual

Read this instruction manual before installing and running the drive system.

Handling the drive system

Installation, commissioning, demounting, taking measurements, etc, of or on the drive system may only be carried out by personnel technically qualified for the task. The installation must be carried out in accordance with local standards.

Opening the control unit

WARNING: Always switch off the mains voltage before opening the control unit and wait at least 5 minutes to allow the buffer capacitors to discharge.

Always take adequate precautions before opening the control unit. Although the connections for the control signals and the switches are isolated from the mains voltage, do not touch the control board when the drive system drive system is switched on.

Precautions to be taken with a connected motor

If work must be carried out on a connected motor or on the driven machine, the mains voltage must always be disconnected from the drive system first. Wait at least 5 minutes before starting work.

Earthing

The controlunit must always be earthed via the mains safety earth connection.

EMC Regulations

In order to comply with the EMC Directive, it is absolutely necessary to follow the installation instructions. All installation descriptions in this manual follow the EMC Directive.

Voltage tests (Megger)

Do not carry out voltage tests (Megger) on the motor, before all the motor cables have been disconnected from the drive system.

Condensation

If the control unit is moved from a cold (storage) room to a room where it will be installed, condensation can occur. This can result in sensitive components becoming damp. Do not connect the mains voltage until all visible dampness has evaporated.

Incorrect connection

The control unit is not protected against incorrect connection of the mains voltage, and in particular against connection of the mains voltage to the motor outlets U, V and W. The control unit can be damaged in this way.

Transport

To avoid damage, keep the drive system in its original packaging during transport. This packaging is specially designed to absorb shocks during transport.

DC-link residual voltage

WARNING: After switching off the mains supply, dangerous voltage can still be present in the control unit. When opening the control unit for installing and/or commissioning activities wait at least 5 minutes. In case of malfunction a qualified technician should check the DC-link or wait for one hour before dismantling the control unit for repair.

Contents

1. Introduction

Emotron EMX-D is a speed-controlled drive system specially designed for driving rotary heat-exchangers. The system comprises an enclosed control unit and a motor unit with worm reduction gear, which are linked by two cables. The control unit is driven by a single-phase power supply, 230 VAC, 50/60 Hz.

NOTE: Read this instruction manual carefully before starting installation, connection or working with the drive system.

The following symbols can appear in this manual. 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 drive system.

WARNING: Failure to follow these instructions can result in serious injury to the user in addition to serious damage to the drive system.

Users

This instruction manual is intended for:

- installation engineers
- maintenance engineers
- operators
- service engineers

1.1 Delivery and unpacking

Check for any visible signs of damage. Inform your supplier immediately of any damage found. Do not install the drive system if damage is found.

1.2 Using of the instruction manual

Check that the software version number on the first page of this manual matches the software version in the control unit.

With help of the index and the contents it is easy to track individual functions and to find out how to use and set them.

1.3 Standards

The variable speed drives described in this instruction manual comply with the standards listed in Table 1. For the declarations of conformity and manufacturer's certificate, contact your supplier for more information or visit www.emotron.com.

1.3.1 Recommendations with respect to EMC

In order to fulfil the European EMC Directive 2004/108/EC regarding electromagnetic compatibility, the following precautions must be taken:

- The motor cable must be mounted as close to the heat exchanger housing as possible. If the cable is too long, the excess should be collected together in the form of, for example, a figure "8". The area enclosed by the cable should be as small as possible. Electrical tape or cable ties can be used to achieve this.

Fig. 1 Excess motor cable should be arranged such that the area enclosed is as small as possible

Special EMC couplings/glands are necessary. An EMC filter is built into all EMX-D units,

CAUTION: In order to comply fully with the standards stated in the Manufacturer's Declaration ANNEX IIB, the installation instructions detailed in this instruction manual must be followed to the letter.

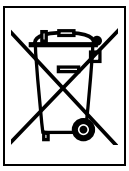
Table 1 Standards

Market	Standard	Description
European	Machine Directive	98/37/EEC
	EMC Directive	2004/108/EEC
	Low Voltage Directive	2006/95/EC
	WEEE Directive	2002/96/EC
All	EN 60204-1	Safety of machinery - Electrical equipment of machines Part 1: General requirements. **Machine Directive: Manufacturer's certificate acc. to Appendix IIB**
	EN(IEC)61800-3:2004	Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods. **EMC Directive: Declaration of Conformity and CE marking**
	EN(IEC)61800-5-1 Ed. 2.0	Adjustable speed electrical power drive systems Part 5-1. Safety requirements - Electrical, thermal and energy. **Low Voltage Directive: Declaration of Conformity and CE marking**
	IEC 60721-3-3	Classification of environmental conditions. Air quality chemical vapours, unit in operation. Chemical gases 3C1, Solid particles 3S2. Optional with coated boards Unit in operation. Chemical gases Class 3C2, Solid particles 3S2.
	UL508C	UL Safety standard for Power Conversion Equipment

1.4 Dismantling and scrapping

The enclosures of the drives are made from recyclable material as aluminium, iron and plastic. Each drive contains a number of components demanding special treatment, for example electrolytic capacitors. The circuit boards contain small amounts of tin and lead. Any local or national regulations in force for the disposal and recycling of these materials must be complied with.

1.4.1 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 or visit our home page www.emotron.com.

2. General description

Emotron EMX-D is a speed-controlled drive system specially designed for driving rotary heat-exchangers. The system comprises an enclosed control unit and a motor unit with worm reduction gear, which are linked by two cables. The control unit is driven by a single-phase power supply, 230 VAC, 50/60 Hz.

Emotron EMX-D has numerous built-in features making it ideal for this particular application:

- No initial trimming is required.
- Soft starting/soft stop.
- Electronic motor protection.
- The drive system is designed to suit most types of control signal.
- The control inputs are galvanically-isolated.
- The operational status of the system can be displayed.
- High efficiency.

Furthermore, the drive system has a built-in linearity function that gives a linear relationship between the control signal and the efficiency of the heat exchanger rather than having the speed of rotation proportional to the control signal. This provides good conditions for stable temperature control.

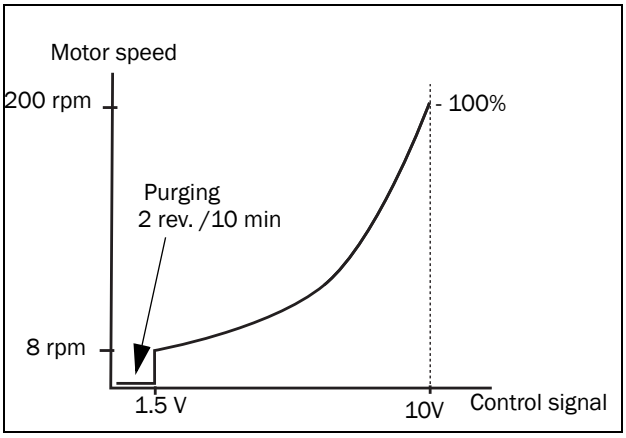


Fig. 2 Relation between control signal and motor speed - Normal conditions

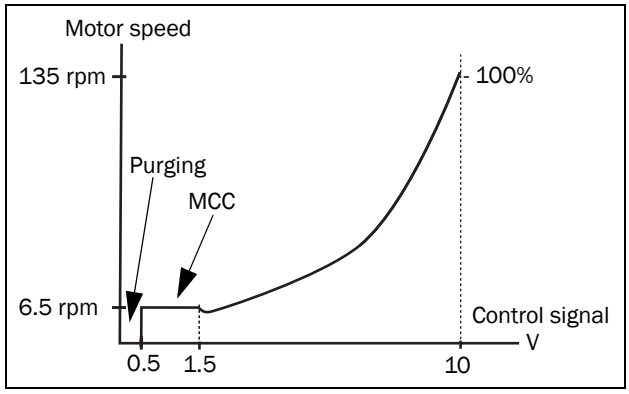


Fig. 3 Relation between control signal and motor speed when using special MCC parameters, see further in chapter 7.2.1 page 27.

2.1 Emotron EMX -D is available with different gearboxes

Order number	Name	Reduction	Gear rpm
01-5071-00	EMX-D Motor 10.3:1	10.3:1	8 - 200 rpm
01-5071-10	EMX-D Motor 10.3:1 with 60mm outgoing shaft		
01-5072-00	EMX-D Motor 15.5:1	15.5:1	5 - 135 rpm
01-5070-00	EMX-D Control unit		

2.2 Accessories

The following items can be ordered separately:

Order No	Description
01-5073-00	Cable glands kit
01-4995-00	3.1 m PTC cable 2 x 0.75 mm^2, screened
01-4995-10	2.9 m motor cable, 4 x 1.5 mm^2, screened
01-5074-00	Rotation sensor with magnet and screened cable.

2.3 Built-in functions

2.3.1 Automatic purging

If the control signal falls below 1, 5 V, the heat-exchanger will turn about 15° every 10 minutes. This low speed (average rotation speed) allows no heat transfer but ensures that the rotor is kept clean by purging.

2.3.2 Rotation monitor

The rotation monitor checks that the heat-exchanger rotor is actually rotating. A magnet mounted on the periphery of the rotor triggers a pulse sensor once every revolution.
If the drive belt fails, the heat-exchanger rotor will stop, the pulses will also stop and an alarm will be triggered. The motor rotates continuously irrespective of whether an alarm indicates it has stopped. The time to alarm is 10 minutes at minimal rotation speed (Purging) and 24 seconds at maximum rotation speed. The rotation monitor is out of function when the system is undergoing purging.
The magnet and impulse sensor are ordered separately.

2.3.3 Display of exact rotation speed

The exact rotation speed of the heat exchanger rotor is displayed as rpm when a rotation monitor is connected.

2.3.4 Alarm relay

A built-in relay triggers an alarm at:

- mains supply overvoltage
- mains supply undervoltage
- motor overload
- loss of signal from rotor magnet to rotation monitor, e.g., in the event of a snapped drive-belt.

2.3.5 Priority switch

On closing of the external potential-free input, the motor is rotated at the preset rpm (set in menu O14-Prio speed). This function has a higher priority than the control signals.

2.3.6 Analogue output

0-10 V or 0-20 mA in proportion to the speed of outgoing shaft.

2.3.7 Absolute humidity

The humidity sensor (Not included in Emotron delivery) is connected to an external transducer and controls the motor speed by means of control signal input.

2.3.8 Protection of control unit and motor

The control unit is equipped with monitoring for both mains supply over- and undervoltage. When the power supply increases or decreases outside preset thresholds the control unit and the motor stops. When the mains supply returns to normal the motor is restarted automatically.

The control unit incorporates electronic motor protection against overloading and a built in PTC protection. At overload the power supply to the motor is cut. It is no possible restart the drive system until the PTC is cooled down. This may take at least 1 minute.

3. Installation

3.1 Basic installation

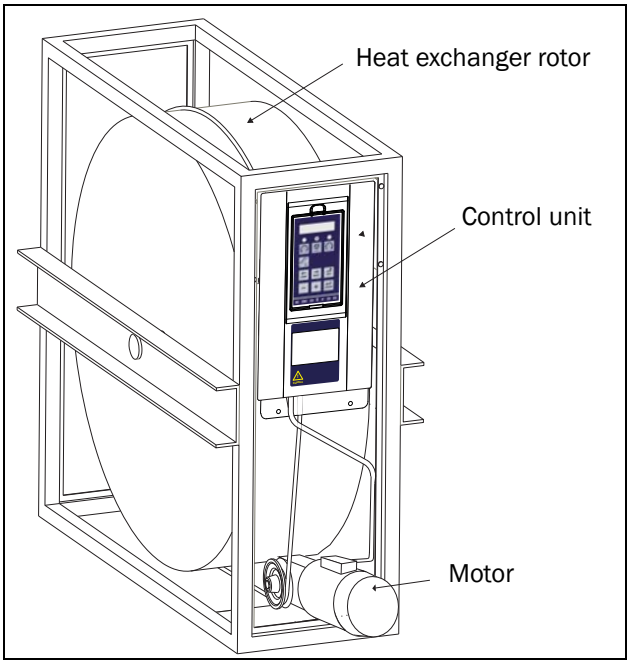


Fig. 4 Emotron motor and Control unit for rotary heat exchangers

The drive unit (motor plus reduction gear) is mounted on the bracket located in the heat-exchanger, and the control unit is mounted in a suitable position either in the heat-exchanger housing or, e.g., a control room. Vibration damping material such as rubber anti-vibration mountings should be inserted between the motor and the motor bracket.

Mounting scheme for control unit

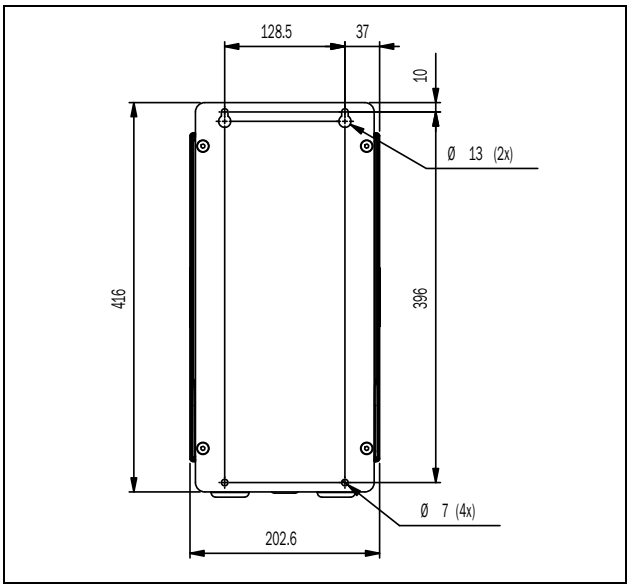


Fig. 5 Control unit mounting scheme

3.2 Mounting the rotation monitor

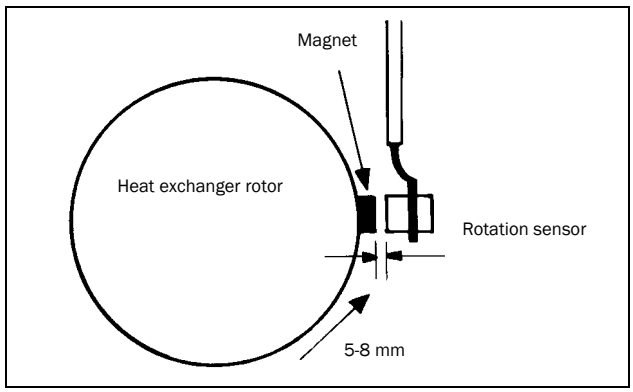


Fig. 6 Rotation monitor

The magnet for the rotation monitor is mounted tight on the periphery of the heat-exchanger. If the housing around the rotor is magnetic itself then the sensor magnet must be isolated from the housing. The rotation sensor is mounted to ensure that the magnet passes over it at a distance of 5-8 mm, see Fig. 6 .

3.3 Choice of pulley diameter

Table 2 Choice of pulleys for different diameters of heat exchanger and different gear ratio.

	Gear ratio 10.3:1		Gear ratio 15.5:1	
Rotor diameter mm	**Pulley, diameter mm**	**Rotor speed rpm**	**Pulley, diameter mm**	**Rotor speed rpm**
2500			100	5.4
3000			125	5.6
3200	150	9.4	125	5.3
3500	180	10.3	150	5.8
3800	180	9.5		
4200	200	9.5		
4600	224	9.7		
5000	250	10.0		
5500	250	9.1		

3.4 Cable connections

3.4.1 Mains cables

Dimension the mains cables according to local regulations. The cable must be able to carry the load current.

- To fulfil EMC purposes it is not necessary to use screened mains cables.
- Use heat-resistant cables, +60°C or higher.
- Dimension the cables and fuses in accordance with local regulations and the nominal current of the motor. See chapter 9. Page 39.
- The variable speed drives have an unpainted back side and is therefore suitable for mounting on an unpainted mounting plate.

Connect the mains cables according to Fig. 7 and Table 3.

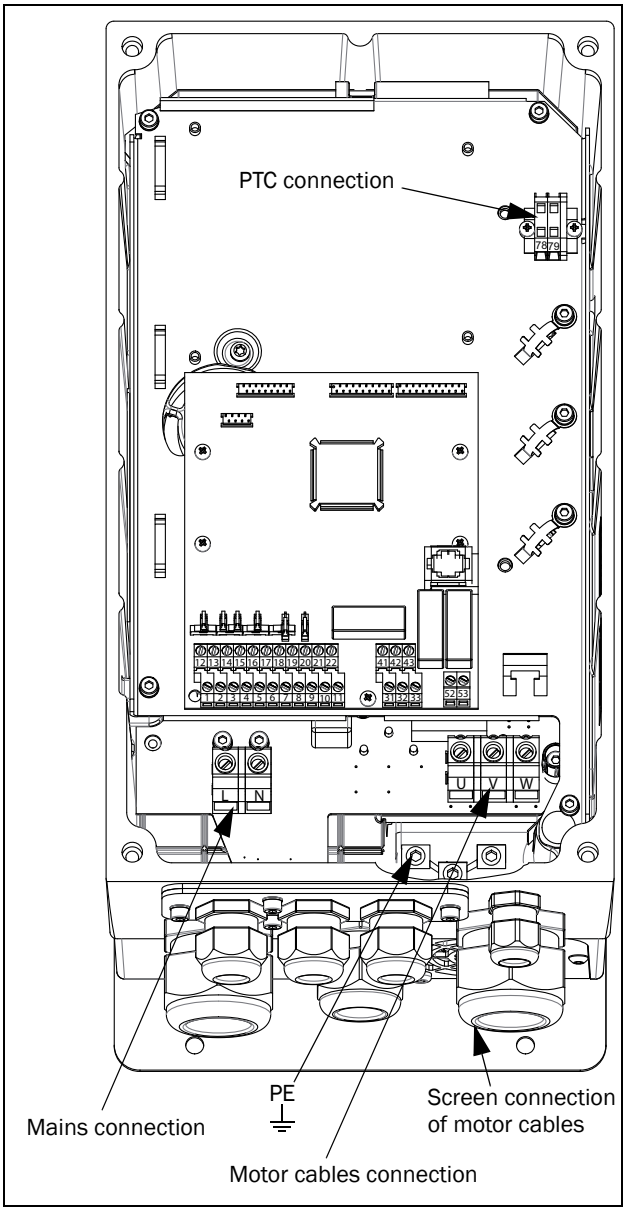


Fig. 7 Mains, motor and PTC connections to Control unit.

Table 3 Mains and motor connection

L,N PE	Mains supply, 1 -phase Safety earth (protected earth)
⏚ U, V, W	Motor earth Motor output, 3-phase

3.4.2 Motor cables

WARNING! Residual voltage remains in the system for 5 minutes after disconnection of mains voltage.

The following two cables must be connected between the motor unit and the control system.

- Motor cable: 4-core, 1.5 mm^2 screened.
- PTC cable: 2-core screened, min. 0.75 mm^2.

If cables are lengthened, ensure that the screening is spliced carefully.

An external fuse must always be provided. 10 AT.

A safety isolation switch should be installed between the power supply and the control unit. Note that when the power supply is isolated, an alarm will be triggered indicating a loss of power.

WARNING! Do not install a switch between the motor and the control unit.

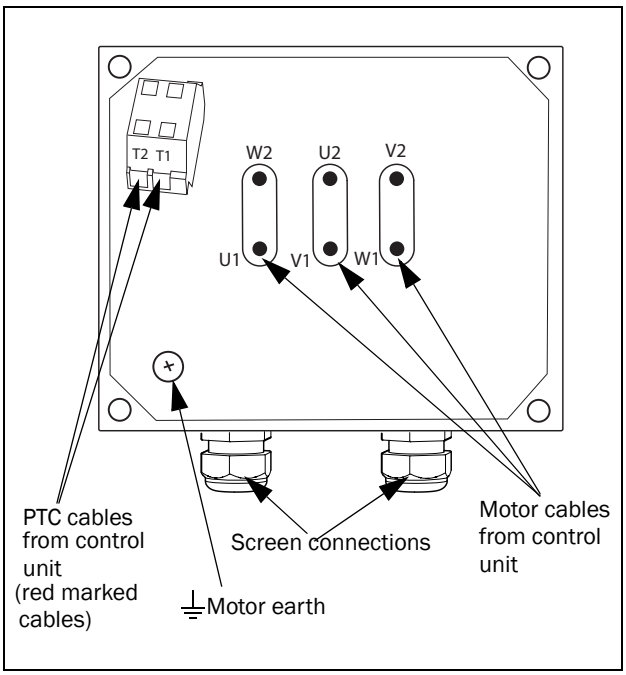


Fig. 8 Motor and PTC cables connection to motor, 3- phases and protective earth plus PTC cables, all screened.

Cable kit

The cables for linking the motor and control unit can be ordered separately as a kits consisting of:
Motor cable, 2.9 meter: 4 x 1.5 mm^2 screened and 3.1 meter PTC cable, 2 x 0.75 mm^2 screened with red marked cables.

3.4.3 EMC recommendations

To fulfil the requirements regarding Electromagnetic Compatibility (EMC) stipulated in the European directive 2004//EEC, it is essential to follow the instructions adhered to. EMX-D features an integral EMC filter.

The following should be observed for EMX-D:

- Screened cable must be used for the motor cable, the PTC cable the control cable and the cable to the rotation monitor. The shields shall be connected to the chassis/ earth with metal cable nipples.
- The mains cable and the alarm cable do not need to be screened.
- The screened motor cable must be placed against a metal support, such as the heat exchanger rotor housing. The shielding must be connected to the chassis of both the motor and the control unit. Metal cable nipples should be used.
- The control cables must be screened. The shielding must be connected to the chassis/earth using metal cable glands. The cable to the rotation monitor must also be screened.

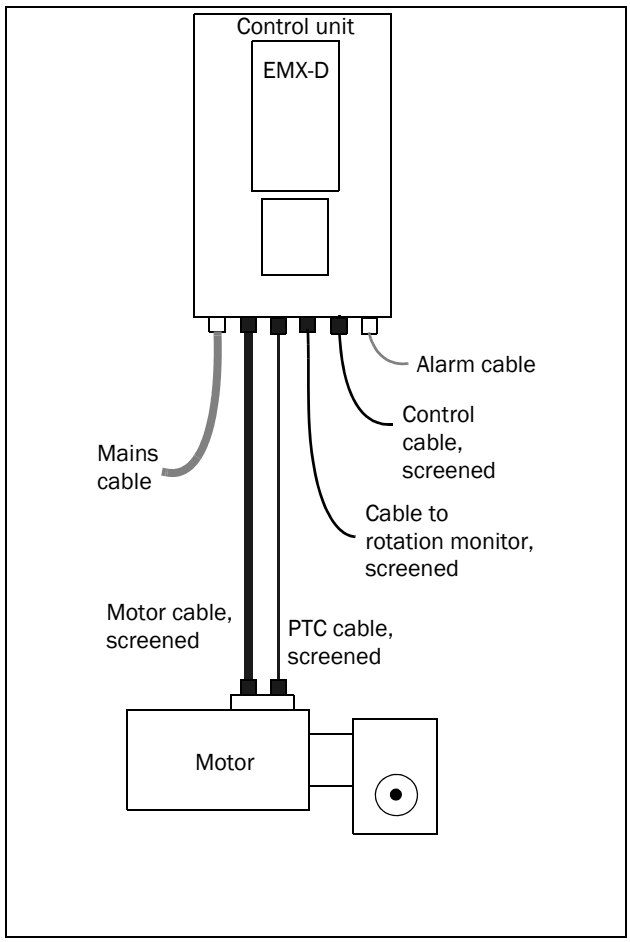


Fig. 9 EMC-adapted installation of EMX-D

4. Control Connections

4.1 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 5 minutes to allow the DC capacitors to discharge before connecting the control signals or changing position of any switches.

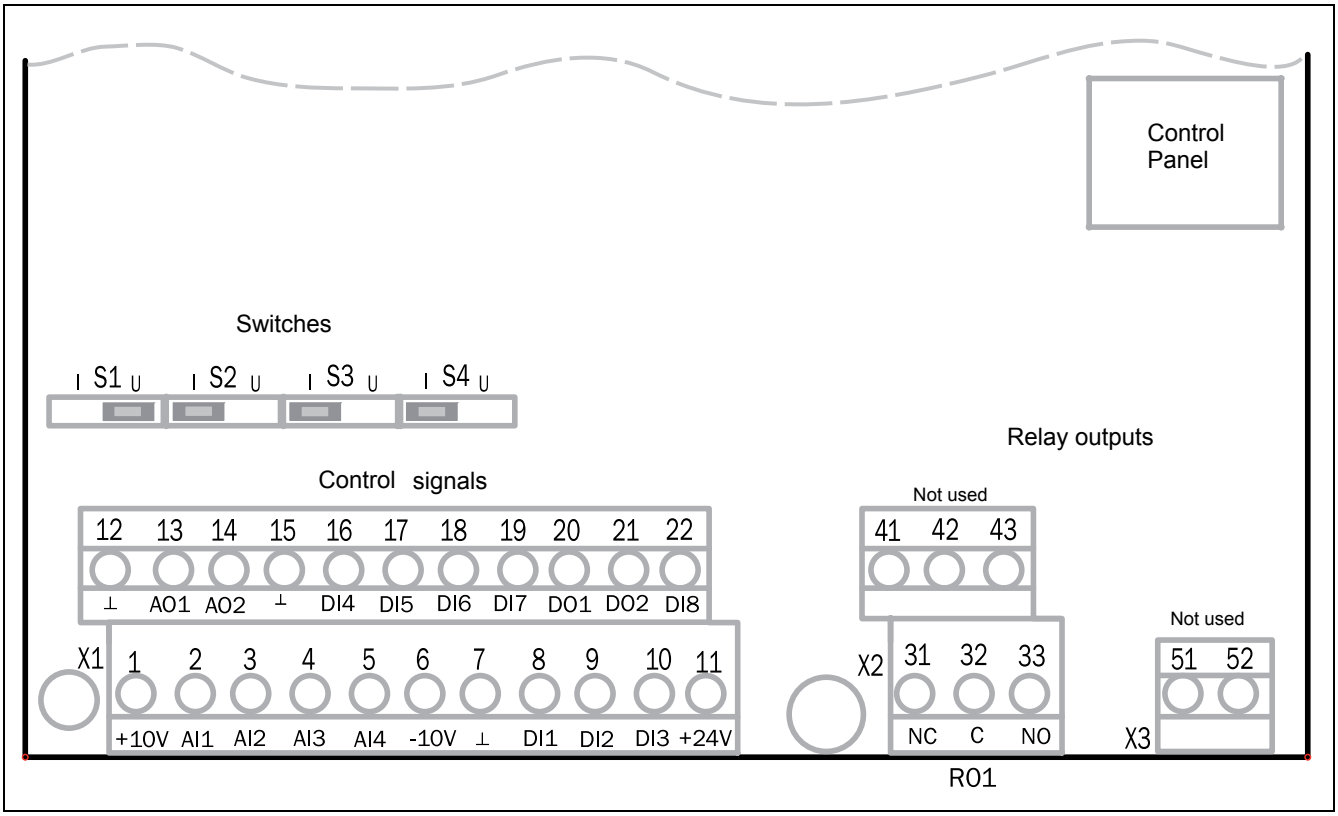


Fig. 10 Control board layout

4.2 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. For signal specifications refer to chapter 9. page 39.

NOTE: The maximum total combined current for outputs 11 is 100mA.

Table 4 Control signals

Terminal	Name	Function (Default)
Outputs		
1	+10 V	+10 VDC supply voltage
6	-10 V	-10 VDC supply voltage
7	Common	Control signal -
11	+24 V	+24 VDC supply voltage
12	Common	Signal ground
15	Common	Signal ground
Digital inputs		
8	DigIn 1	RunL (reverse)
9	DigIn 2	RunR (forward)
10	DigIn 3	Not used
16	DigIn 4	Rotation monitor
17	DigIn 5	Priority switch
18	DigIn 6	Max speed
19	DigIn 7	Not used
22	DigIn 8	Not used
Digital outputs		
20	DigOut 1	Not used
21	DigOut 2	Not used
Analogue inputs		
2	AnIn 1	Control signal +
3	AnIn 2	Not used
4	AnIn 3	Not used
5	AnIn 4	Not used
Analogue outputs		
13	AnOut 1	0 - 10V, in proportion to speed
14	AnOut 2	Not used
Relay outputs		
31	N/C 1	Relay 1 output Trip, active when the VSD is in a TRIP condition.
32	COM 1	
33	N/O 1	

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

4.3 Inputs configuration with the switches

The switch S1is used to set the input configuration for the analogue input AnIn1, as described in table 5. See Fig. 10 for the location of the switches.

Table 5 Switch settings

Input	Signal type	Switch
AnIn1	Voltage (default)	S1 
	Current	S1 

4.4 Connection example

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

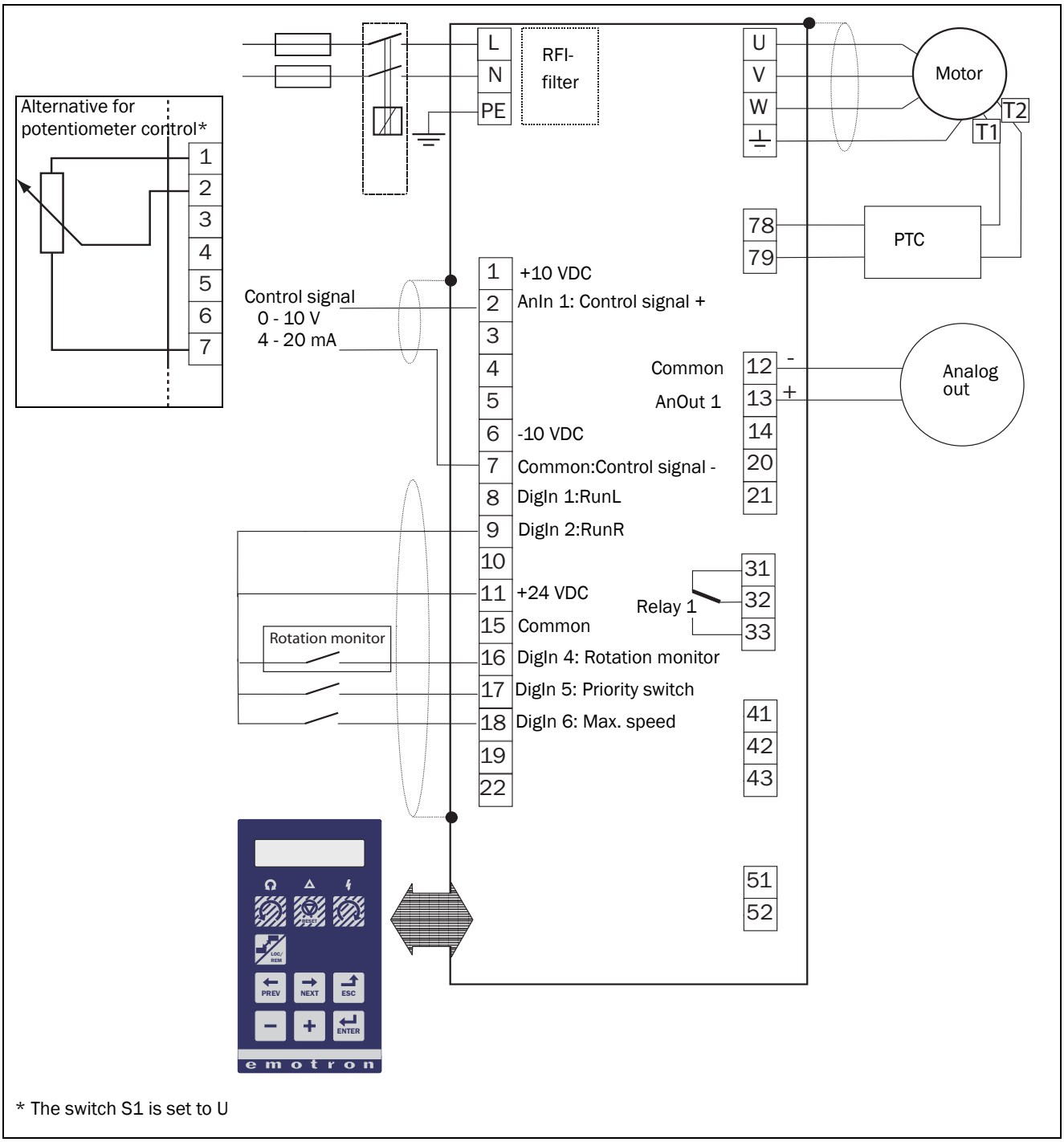


Fig. 11 Connection example

4.4.1 Cables

The standard control signal connections are suitable for stranded flexible wire up to 1.5 mm^2 and for solid wire up to 2.5 mm^2.

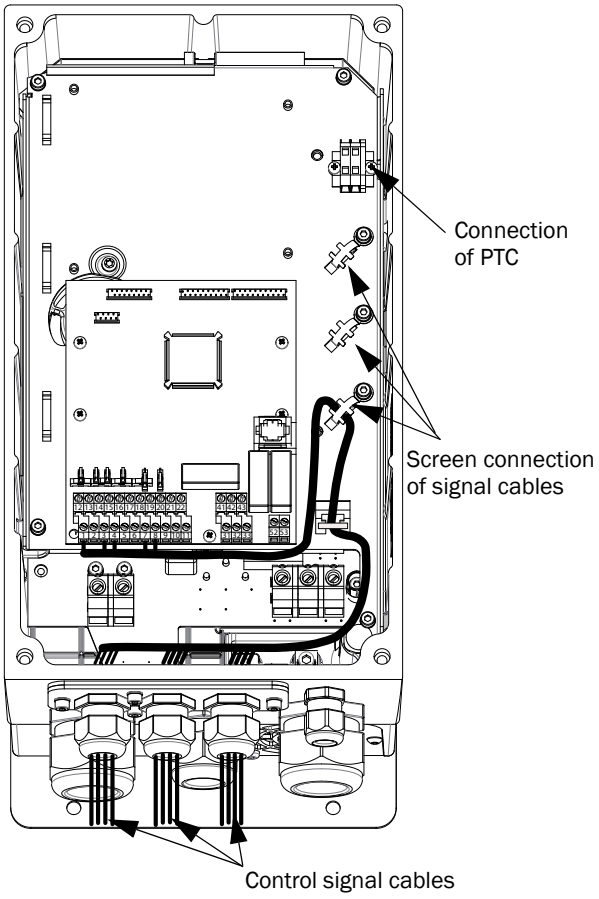


Fig. 12 Connecting the control signals and PTC

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.

4.4.2 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, a control signal may be connected directly to the variable speed drive.

We can distinguish between the following types of control signals:

Analogue inputs

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

Analogue outputs

Voltage or current signals, (0-10 V) which change slowly in value or only occasionally. In general, these are 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.

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
Analogue	Rigid cable: 0.14-2.5 mm^2 Flexible cable: 0.14-1.5 mm^2	0.5 Nm	Screened
Digital			Screened
Relay			Not screened

4.4.3 Screening

For all signal cables the best results are obtained if the screening is connected to both ends: the VSD side and at the source.

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.

4.4.4 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 kΩ). It is therefore strongly advised to use current control signals if the cables are longer than a few metres.

4.4.5 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.

4.4.6 Manual control using 10 kΩ potentiometer

The drive system can easily be controlled manually with the help of a 10 kΩ potentiometer which is connected in the following manner:

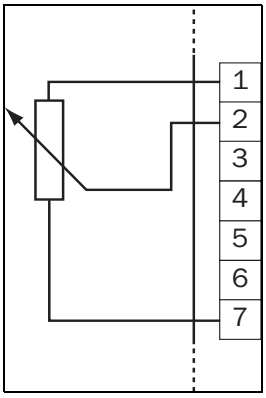


Fig. 13 10 kΩ potentiometer

4.4.7 Switching off

When it is desired to switch off the heat exchanger, for example at night, this can be done using a relay connected in series with the control signal. This relay interrupts the signal to control signal terminal number 2. In this way, no alarm about interruption of power supply is given. The control signal can of course also be reduced to its minimum value, in order to achieve the same result. If the control signal is low or absent the drive system switches to purging mode.

5. Getting Started

This chapter is a step by step guide showing you the quickest way to get the motor shaft turning.

First there is general information of how to connect mains, motor and control cables. The next section describes how to use the function keys on the control panel. The subsequent examples how to program/set and run the VSD and motor.

5.1 Connect the mains and motor cables

Dimension the mains and motor cables according to local regulations. The cable must be able to carry the VSD load current.
Connect mains cables and motor cables according to chapter § 3.4.1Mains cables, page 10, § 3.4.2Motor cables, page 10.

5.2 Remote control

In this example external signals are used to control the VSD/motor.

5.2.1 Connect control cables and set direction of rotation

Here you will make up the minimum wiring for starting. In this example (Fig. 14) the motor/VSD will run with right rotation (clockwise).

To comply with the EMC standard, use screened control cables with plaited flexible wire up to 1.5 mm^2 or solid wire up to 2.5 mm^2.

1. Connect a reference value between terminals 7 (Common) and 2 (AnIn 1) as in Fig. 14.

From factory there is a jumper between terminal 11(+24 VDC) and 9 (DigIn2, RUNR) to set the motor to run right (clockwise).

2. For remote control, remove the jumper and connect an external start button between terminal 11 and 9 as in Fig. 14. If you would like the motor to run left, use terminal 11 and 8 instead.

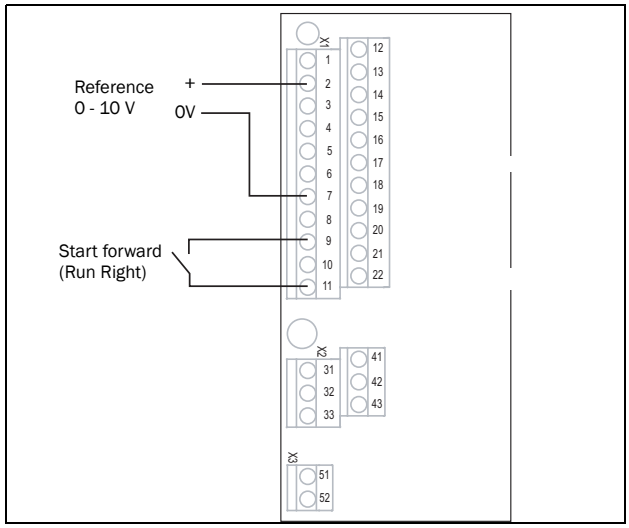


Fig. 14 Wiring

5.2.2 Switch on the mains

Mount the front cover on the VSD. Once the mains is switched on, the internal fan in the VSD will run for 5 seconds.

5.2.3 Run the drive system

Now the installation is finished, and you can press the external start button to start the motor.

When the motor is running the main connections are OK.

5.3 Using the function keys

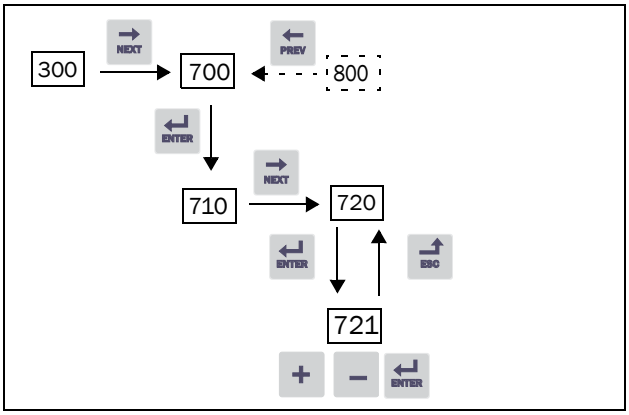


Fig. 15 Example of menu navigation when checking VSD status

ENTER	step to lower menu level or confirm changed setting
ESC	step to higher menu level or ignore changed setting
NEXT	step to next menu on the same level
PREV	step to previous menu on the same level
+	increase value or change selection
–	decrease value or change selection

6. Operation via the Control Panel

This chapter describes how to use the control panel.

6.1 General

The control panel displays the status of the VSD and is used to set all the parameters.

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

6.2 The control panel

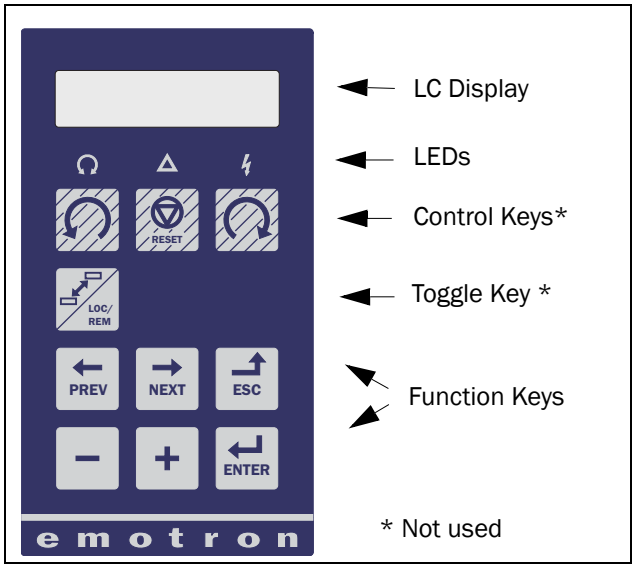


Fig. 16 Control panel

6.2.1 The display

The display is back lit and consists of 2 rows, each with space for 16 characters. The display is divided into seven areas.

The different areas in the display are described below:

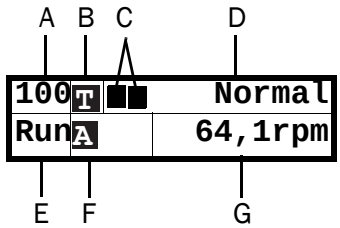


Fig. 17 The display

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

Area B Indicates if the menu is in the toggle loop.

Area C Rotation monitor Indicators, flashing each time rotation sensor is activated.

Area D: Shows the heading of the active menu.

Area E: Shows the status of the VSD (3 digits). The following status indications are possible:

- Acc : Acceleration
- Dec : Deceleration
- Run : Motor runs
- Trp : Tripped
- Stp : Motor is stopped
- VL : Operating at Voltage limit
- SL : Operating at Speed limit
- CL : Operating at Current limit
- TL : Operating at Torque limit
- OT : Operating at Temperature Limit
- LV : Operating at Low Voltage

Area F: Shows A.

Area G: This area shows the value for active parameter and rotation alarm or ---- if no signal from rotation sensor.

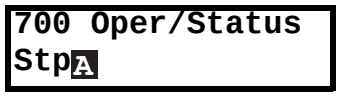


Fig. 18 Example 1st level menu

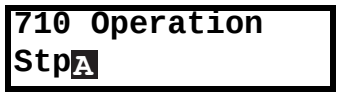


Fig. 19 Example 2nd level menu

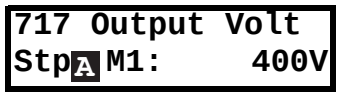


Fig. 20 Example 3d level menu

6.2.2 LED indicators

The symbols on the control panel have the following functions:

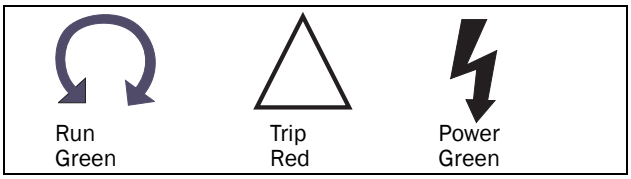


Fig. 21 LED indications

Table 6 LED indication

Symbol	Function		
	ON	flashing	OFF
POWER (green)	Power on	----------	Power off
TRIP (red)	VSD tripped	Warning/Limit	No trip
RUN (green)	On during 1 second indicating pulse from Rotation monitor.	1 Hz = Purge 2 Hz = Normal Motor speed	Motor stopped

6.2.3 Function keys

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

Table 7 Function keys

ENTER	ENTER key:	- step to a lower menu level - confirm a changed setting
ESC	ESCAPE key:	- step to a higher menu level - ignore a changed setting, without confirming
PREV	PREVIOUS key:	- step to a previous menu within the same level - go to more significant digit in edit mode
NEXT	NEXT key:	- step to a next menu within the same level - go to less significant digit in edit mode
−	- key:	- decrease a value - change a selection
+	+ key:	- increase a value - change a selection

Fig. 22 Menu structure

6.3 The menu structure

The menu structure consists of 3 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.

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

For instance, a menu can have one selectable menu (View Reference Value [310]), or it can have 10 selectable menus (menu Operation [710]).

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

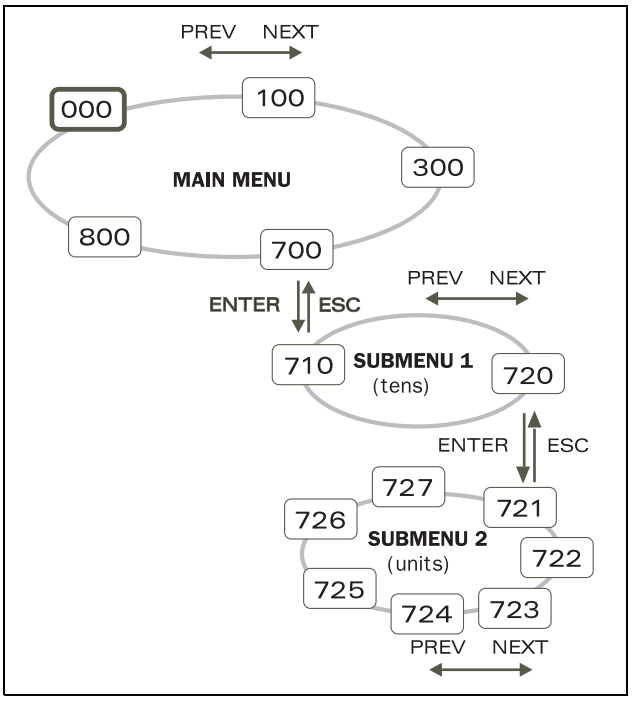


Fig. 23 Menu structure

6.3.1 The main menu

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

100 Normal view

Displayed at power-up. This menu displays the actual process status. If Rotation monitor is connected, actual speed of the heat exchanger rotor is displayed.

300 View reference speed

Displays Reference Speed.

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.

000 EMX-D Options

Settings for the operation are changed in these menus.

6.4 Programming during operation

Most of the parameters can be changed during operation without stopping the VSD. Parameters that cannot 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.

6.5 Editing values in a menu

Most values in the second row in a menu can be changed in two different ways.

```
013   MotMaxSpeed
Stp           200
```

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. Press Enter to confirm the value.

```
015   Purge Time
Stp           2.00s
```

Flashing

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 blink. 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 200 s to 30 s.

Example: When you press Next the 4 will blink.

```
015   Purge Time
StpA          4.00s
```

Flashing

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

6.6 Programming example

Following examples shows how to program and make changes in the settings and values.

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 or Next keys to proceed and to go to other menus.

Example 1

Shut off the rotation sensor

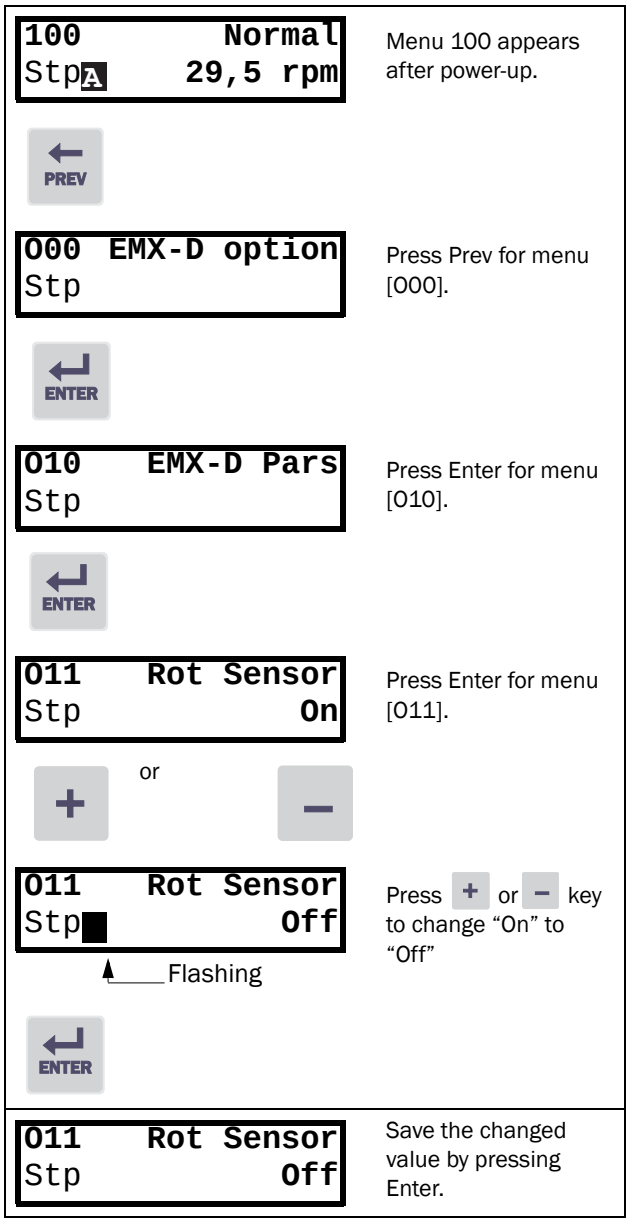


Fig. 24 Programming example 1 Turn off Rotation sensor

Example 2

Change purge time

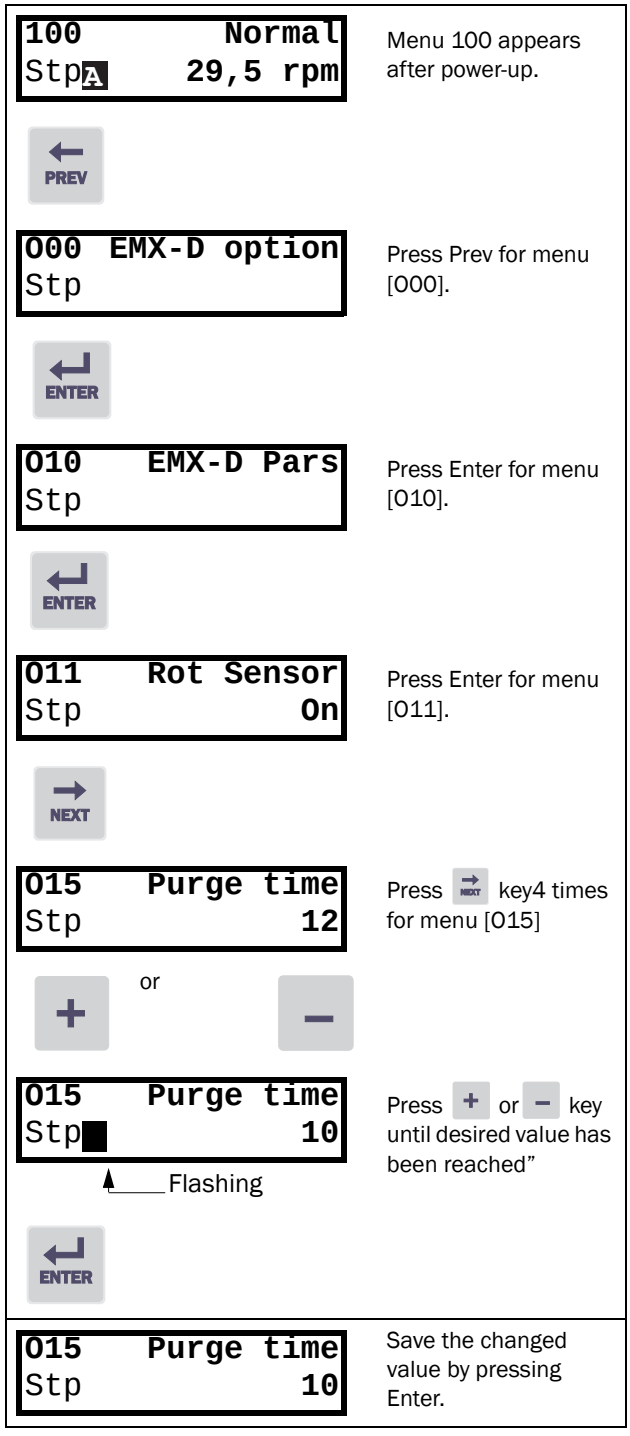


Fig. 25 Programming example 2, Change purge time.

Example 3

Change Hold torque from Off to On

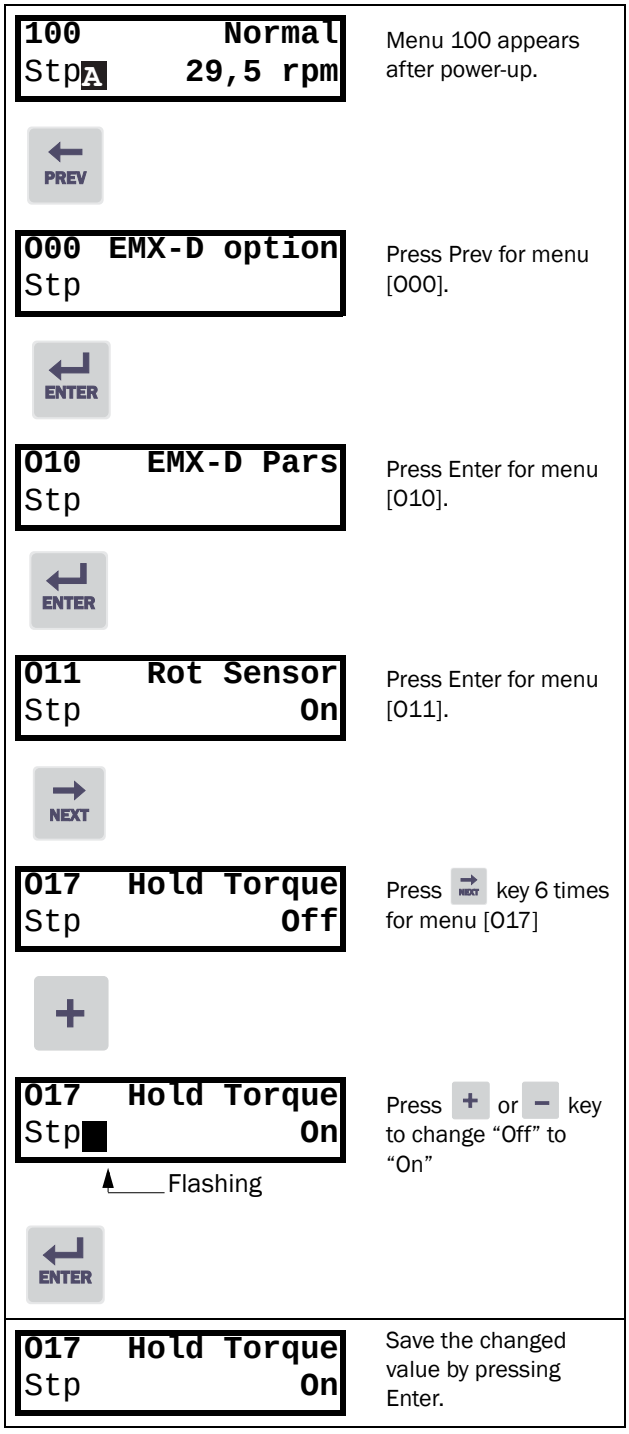


Fig. 26 Programming example 3, Turn on the Hold torque.

Example 4

Use of humidity rotor if installed.

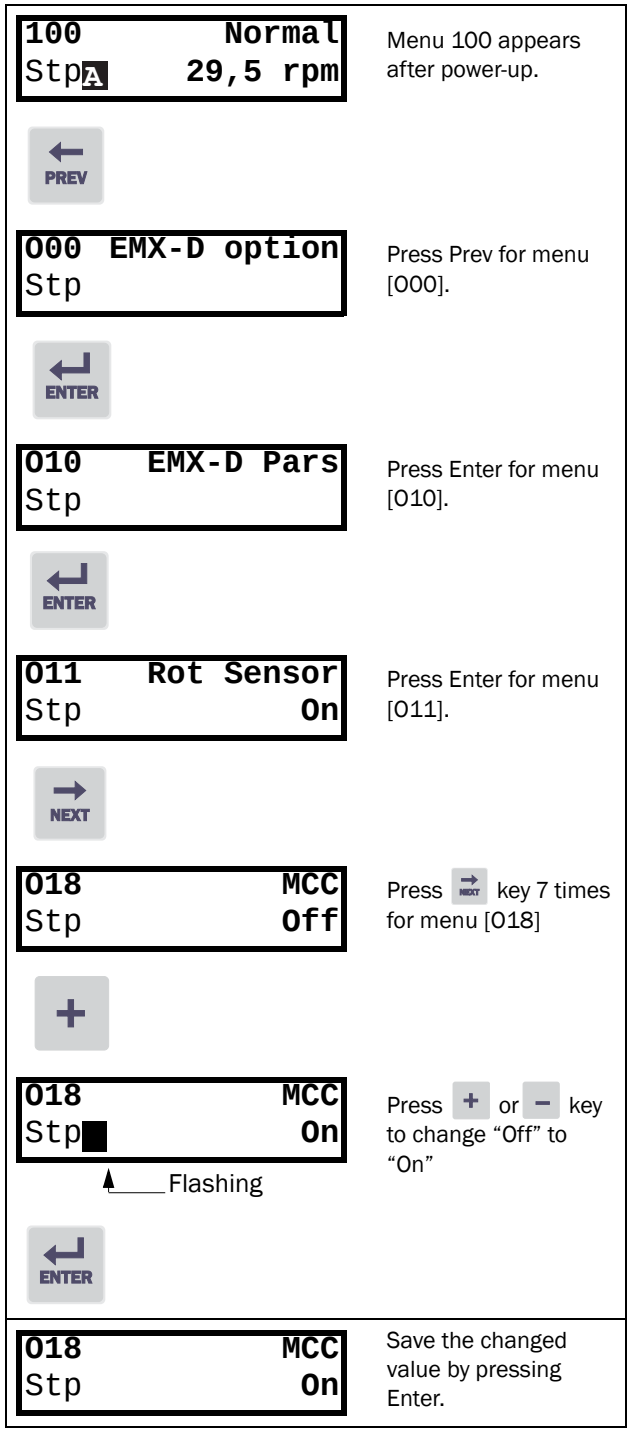


Fig. 27 Programming example 4, Use of humidity rotor.

7. Functional Description

This chapter describes the menus and parameters in the software. You will find a short description of each function and information about default values, ranges, etc.

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

Description of table layout

Menu no. Menu name Status Selected value	
Default:	
Selection or range	Description

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 8 shows the resolutions for 3 significant digits.

Table 8

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

7.1 Normal View [100]

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. As default it displays the actual process status. If rotation monitor is connected, actual speed of the heat exchanger rotor is displayed.

7.2 EMX-D Options[000]

This menu contains special features for the rotating heat exchanger application.

7.2.1 EMX-D Pars[010]

Selections and settings of the different parameters for the process.

Rotation Monitor [011]

In this menu, set if you have rotation monitor connected or not.

011 Rot Sensor Stp A On	
Default:	On
On	Rotation monitor connected
Off	No rotation monitor connected

Gearbox ratio [012]

This menu is used to specify which gearbox that is used. Normally this value does not need to be changed. To be sure, identify by means of information plate on the gearbox which gearbox you have and select the correct gear ratio. If MCC is chosen (menu O18) the ratio will automatically change from 10.3 to 15.5.

012 Gbox ratio Stp A 10.3	
Default:	10.3
10.3	Gear box 10.3 :1
15.5	Gear box 15.5 :1

Maximum motor speed [013]

Set max. speed on outgoing shaft (Motor speed)

013 Mot Max Speed Stp A 200rpm	
Default:	200 rpm
Range	0 - 200 rpm
Resolution	0.01

Mot Prio ref [014]

Here you can set desired speed on outgoing shaft, to shift to when terminal 17 and 11 is shorted.

	014 Mot Prio ref Stp**A** **200rpm**
Default:	200.00 rpm
Range	0-200rpm
Resolution	0.01 rpm

Purge time [015]

This function is used to set desired purge time. This means that the rotor will rotate during set time (Purge time) every 10 minutes.

	015 Purge time Stp**A** **12s**
Default:	12 s
Range	0 - 30s
Resolution	0.001s

Purge speed [016]

Here you can set desired speed of outgoing shaft during purge.

	016 Purge speed Stp**A** **10rpm**
Default:	10 rpm
Range	0 - 200 rpm
Resolution	0.01 rpm

Hold torque [017]

When the control signal is low and you do not want heat recovery, it can happen that the fans makes the heat exchanger wheel rotate. To avoid this you can apply a hold torque keeping the rotor standing still with electronic braking.

	017 Hold torque Stp**A** **off**
Default:	Off
Off	No hold torque
On	Hold torque on

MCC [018]

Special menu for humidity rotors (if installed), not used for normal application. In this mode there is special transfer function. (Fig. 3, page 7).

		018 MCC Stp**A** **Off**
Default:		Off
Off	0	Normal operation
On	1	Change menu 012, 13, 14,15 and 16

By setting MCC to “On” following values will be changed:

Menu	Setting
Gearbox ratio [012]	15.5
Maximum motor speed [013]	135 rpm
Mot Prio ref [014]	135 rpm
Purge time [015]	12 s
Purge speed [016]	6,75 rpm

MCC time [019]

Time for stand still. Default value should normally not be changed. Default value (0.0s) means continuous MCC mode.

	019 MCC time Stp**A** **0.0 s**
Default:	0.0 s
Range	0.0 - 30s
Resolution	0.001 s

MCC speed [01A]

In this menu you can adjust the MCC speed.

	01A MCC speed Stp**A** **6.5 rpm**
Default:	6.5 rpm
Range	0 - 200 rpm
Resolution	0.01 rpm

Slip compensation [01B]

In this menu you can chose to use slip compensation or not. Normally this should always be on.

	
Default:	On
On	Slip compensation
Off	No slip compensation

7.3 Main Setup [200]

The Main Setup menu contains the basic settings to get the VSD operational.

7.3.1 Operation [210]

Language [211]

Select the language used on the LC Display.

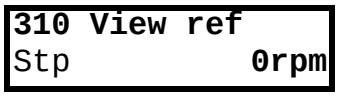
		
Default:		English
English	0	English selected
Svenska	1	Swedish selected
Nederlands	2	Dutch selected
Deutsch	3	German selected
Français	4	French selected
Español	5	Spanish selected
Русский	6	Russian selected
Italiano	7	Italian selected
Česky	8	Czech selected

7.4 View reference [300]

Shows active reference value.

7.4.1 View Reference speed [310]

In this menu [310] the value of the active reference signal is displayed.

	
Default:	0 rpm

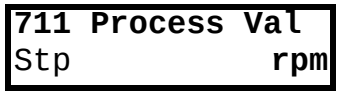
7.5 View Operation/Status [700]

Menu with parameters for viewing all actual operational data, such as speed, torque, power, etc.

7.5.1 Operation [710]

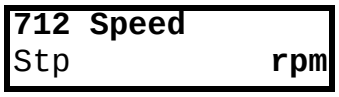
Process Value [711]

The process value is a display function showing actual speed of the outgoing shaft.

	
Unit	rpm
Resolution	0.01 rpm

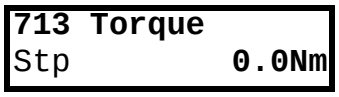
Speed [712]

Displays the actual motor speed.

	
Unit:	rpm
Resolution:	0.01 rpm

Torque [713]

Displays the actual outgoing shaft torque.

	
Unit:	Nm
Resolution:	0,1 Nm

Shaft power [714]

Displays the actual shaft power.

	
Unit:	W
Resolution:	1W

Electrical Power [715]

Displays the actual electrical output power.

715 El Power Stp kW	
Unit:	kW
Resolution:	1 W

Current [716]

Displays the actual output current.

716 Current Stp A	
Unit:	A
Resolution:	0.1 A

Output Voltage [717]

Displays the actual output voltage.

717 Output Volt Stp V	
Unit:	V
Resolution:	0,1 V

Frequency [718]

Displays the actual output frequency.

718 Frequency Stp Hz	
Unit:	Hz
Resolution:	0.1 Hz

DC Link Voltage [719]

Displays the actual DC link voltage.

719 DC Voltage Stp V	
Unit:	V
Resolution:	1 V

Heat sink Temperature [71A]

Displays the actual heat sink temperature.

71A Heat sink Tmp Stp °C	
Unit:	°C
Resolution:	0.1°C

7.5.2 Status [720]

VSD Status [721]

Indicates the overall status of the variable speed drive.

```
721 VSD Status
Stp A/Rem/Rem/44
```

Fig. 28 VSD status

Display position	Status	Value
1	Parameter Set	A
222	Source of reference value	-Rem (remote)
333	Source of Run/ Stop/Reset command	-Rem (remote)
44	Limit functions	-TL (Torque Limit) -SL (Speed Limit) -CL (Current Limit) -VL (Voltage Limit) - - - -No limit active

Example: “A/Rem/Rem/TL”

This means:

A: Parameter Set A is active.

Rem: Reference value comes from terminals 1-22.

Rem: Run/Stop commands come from terminals 1-22.

TL: Torque Limit active.

Warning [722]

Display the actual or last warning condition. A warning occurs if the VSD 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       Warnings
Stp       warn.msg
```

The active warning message is displayed in menu [722].

If no warning is active the message “No Error” is displayed.

You can find a list of all warnings in Table 9, page 35.

Digital Input Status [723]

Indicates the status of the digital inputs. See Fig. 29.

1 DigIn 1
2 DigIn 2
4 DigIn 4
5 DigIn 5
6 DigIn 6
7 DigIn 7

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. 29 indicates that DigIn 1, DigIn 3 and DigIn 6 are active at this moment.

```
723 DigIn Status
Stp      1010 010
```

Fig. 29 Digital input status example

Digital Output Status [724]

Indicates the status of the digital outputs and relays. See Fig. 30.

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. 30 indicates that DigOut1 is active and Digital Out 2 is not active. Relay 1 is active, relay 2 and 3 are not active.

```
724 DigOutStatus
Stp  RE 100 DO 10
```

Fig. 30 Digital output status example

Analogue Input Status 1 - 2 [725]

Indicates status of the analogue inputs 1-2.

```
725 AnIn 1       2
Stp 65%         0%
```

Fig. 31 Analogue input status 1-2

So the example in Fig. 31 indicates that the Analogue input1 is active.

NOTE: The shown percentages are absolute values based on the full range/scale of the in- our output; so related to either 0–10 V or 0–20 mA.

Analogue Input Status 3-4 [726]

Indicates status of the analogue inputs 3-4. These inputs are normally not used.

```
726 AnIn 3       4
Stp 0%          0%
```

Fig. 32 Analogue input status 3-4

Analogue Output Status 1-2 [727]

Indicates status of the analogue outputs Fig. 33. E.g. if 0-20 mA output is used, the value 20% equals to 4 mA.

```
727 AnOut 1      2
Stp 20%         0%
```

Fig. 33 Analogue output status 1

NOTE: The shown percentages are absolute values based on the full range/scale of the in- our output; so related to either 0–10 V or 0–20 mA.

7.5.3 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 VSD has been in Run Mode.

	731 Run Time Stp h:m:s
Unit:	h: m: s (hours: minutes: seconds)
Range:	0h: 0m: 0s–65535h: 59m: 59s

Mains time [732]

Displays the total time that the VSD has been connected to the mains supply. This timer cannot be reset.

	732 Mains Time Stp h:m:s
Unit:	h: m: s (hours: minutes: seconds)
Range:	0h: 0m: 0s–65535h: 59m: 59s

NOTE: At 65535 h: 59 m the counter stops. It will not revert to 0h: 0m.

Energy [733]

Displays the total energy consumption.

	733 Energy Stp kWh
Unit:	kWh
Range:	0.0–999999kWh

7.6 View Trip Log [800]

Main menu with parameters for viewing all the logged trip data. In total the VSD saves the last 9trips in the trip memory. The trip memory refreshes on the FIFO principle (First In, First Out). Every trip in the memory is logged on the time of the Run Time [731] counter. At every trip, the actual values of several parameters are stored and available for troubleshooting.

7.6.1 Trip Message log [810]

Display the cause of the trip and what time it occurred. When a trip occurs the status menus are copied to the trip message log. There are nine trip message logs [810]–[890]. When the tenth trip occurs the oldest trip will disappear..

	8x0 Trip message Stp h:mm:ss
Unit:	h: m (hours: minutes)
Range:	0h: 0m–65355h: 59m

810 Ext Trip
Stp 132:12:14

Trip message [811]-[81N]

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
812	712	Motor speed
813	712	Torque
814	714	Shaft Power
815	715	Electrical Power
816	716	Current
817	717	Output voltage
818	718	Frequency
819	719	DC Link voltage
81A	71A	Heat sink temperature
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
81L	731	Run Time
81M	732	Mains Time
81N	733	Energy
81O	310	View reference

Example:

Fig. 34 shows the third trip memory menu [830]: Over temperature trip occurred after 1396 hours and 13 minutes in Run time.

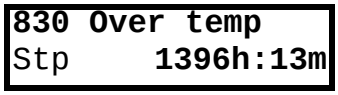


Fig. 34 Trip 3

7.6.2 Reset Trip Log [8A0]

Resets the content of the 9 trip memories.

		8A0 Reset Trip Stp No
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. Troubleshooting, Diagnoses and Maintenance

8.1 Trips, warnings and limits

In order to protect the variable speed drive 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 VSD.

"Normal Trip"

- The VSD stops immediately, the motor coasts to a standstill.
- The relay is active.
- The Trip LED is on.
- The accompanying trip message is displayed.
- The "TRP" status indication is displayed (area E of the display).

"Warning"

- The inverter is close to a trip limit.
- The relay is active.
- The Trip LED is flashing.
- The accompanying warning message is displayed in window [722] Warning.
- One of the warning indications is displayed (area G of the display).

"Limits"

- The inverter is limiting torque and/or frequency to avoid a trip.
- The Trip LED is flashing.
- One of the Limit status indications is displayed (area E of the display).

Tripped Rotation monitor

If there are no pulses from the rotation sensor there is following indications:

- The Trip relay is active.
- The Trip LED is flashing + "Rot. Alarm" shown in the display.

Table 9 List of trips and warnings

Trip/Warning messages	Selections	Trip (Normal/ Soft)	Warning indicators (Area D)
PTC	Trip/Off	Normal/Soft	
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
Power Fault	On	Normal	
Desat	On	Normal	
DClink error	On	Normal	
Ovolt m cut	On	Normal	
Over voltage	Warning		VL
Motor PTC	On	Normal	
Rot.Alarm	On	Normal	

8.2 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. A variable speed drive is mostly just a small part of a complete VSD system. Sometimes it is difficult to determine the cause of the failure, although the variable speed drive 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 VSD 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. See chapter 3.4.3 page 11.

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 drives.

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 VSD or any part of the system (motor cable housing, 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.

8.2.1 Technically qualified personnel

Installation, commissioning, demounting, making measurements, etc., of or at the variable speed drive may only be carried out by personnel technically qualified for the task.

8.2.2 Opening the variable speed drive

WARNING: Always switch the mains voltage off if it is necessary to open the VSD and wait at least 5 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 VSD for repair.

The connections for the control signals and the switches are isolated from the mains voltage. Always take adequate precautions before opening the variable speed drive.

8.2.3 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 variable speed drive. Wait at least 5 minutes before continuing.

8.2.4 Auto reset Trip

If the maximum number of Trips during Auto reset has been reached, the trip message hour counter is marked with an "A".

```
830 OVERVOLT G
Trp A 345:45:12
```

Fig. 35 Auto reset trip

Fig. 35 shows the 3rd trip memory menu [830]: Overvoltage G trip after the maximum Auto reset attempts took place after 345 hours, 45 minutes and 12 seconds of run time.

Table 10 Trip condition, their possible causes and remedial action

Trip condition	Possible Cause	Remedy
Motor PTC	Motor thermistor (PTC) exceeds maximum level.	- Check on mechanical overload on the motor (bearings, gearbox, belt, etc.) - Check the motor cooling system. - Self-cooled motor at low speed, too high load.
Over temp	Heat sink temperature too high: - Too high ambient temperature of the VSD - Insufficient cooling - Too high current - Blocked or stuffed fans	- Check the functionality of the built-in fans. The fans must switch on automatically if the heat sink temperature gets too high. At power up the fans are briefly switched on. - Clean fans - Check the cooling of the cabinet (if applicable).
Over curr F	Motor current exceeds the peak VSD current: - Too short acceleration time. - Too high motor load - Excessive load change - Soft short-circuit between phases or phase to earth - Poor or loose motor cable connections	- Check the acceleration time settings and make them longer if necessary. - Check the motor load. - Check on bad motor cable connections - Check on bad earth cable connection - Check on water or moisture in the motor housing and cable connections.
Over volt (Mains) O(ver) volt M(ains) cut	Too high DC Link voltage, due to too high mains voltage	- Check the main supply voltage - Try to take away the interference cause or use other main supply lines.
Under voltage	Too low DC Link voltage: - Too low or no supply voltage - Mains voltage dips due to starting other major power consuming machines on the same line.	- 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 VSD. - Try to use other mains supply lines if dip is caused by other machinery
Trip (rotation monitor)	The exchanger rotor does not rotate The rotor rotates	- Check drive belt - check that indication is given when the magnet passes the sensor see chapter 6.2.1 page 21. If no indication, replace the rotation sensor. - Check function of the rotation sensor: Measure with a Multimeter between terminal 11 and 16, correct sensor measures < 1V when the magnet passes the sensor.-
Desat	Overload condition in the DC-link: - Hard short-circuit between phases or phase to earth - Saturation of current measurement circuiting - Earth fault - Desaturation of IGBTs - Peak voltage on DC link	- Check on bad motor cable connections - Check on bad earth cable connection - Check on water or moisture in the motor housing and cable connections - See overvoltage trips
Power Fault	Error on power board.	- Check mains supply voltage
Fan Error	Error in fan module	- Check for clogged air inlet filters in panel door and blocking material in fan module.

Table 10 Trip condition, their possible causes and remedial action

Trip condition	Possible Cause	Remedy
Desat	Failure in output stage, desaturation of IGBTs	- Check on bad motor cable connections - Check on bad earth cable connections - Check on water and moisture in the motor housing and cable connections
Desat U+		
Desat U-		
Desat V+		
Desat V-		
Desat W+		
Desat W-		
Desat BCC		
DC link error	DC link voltage ripple exceeds maximum level	- 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 VSD. - Try to use other mains supply lines if dip is caused by other machinery.
PF Curr Err	Error in current balancing: - between different modules. - between two phases within one module.	- Check motor. - Check fuses and line connections
PF Overvolt	Error in voltage balancing	- Check motor. - Check fuses and line connections.
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	- Check mains supply voltage - Check fuses and line connections.
PF Sup Err	Mains supply fault	- Check mains supply voltage - Check fuses and line connections.

8.3 Maintenance

The variable speed drive is designed not to require any servicing or maintenance. There are however some things which must be checked regularly.

All variable speed drives have built-in fan which is speed controlled using heat sink temperature feedback. This means that the fans are only running if the VSD is running and on load. The design of the heat sinks is such that the fan does not blow the cooling air through the interior of the VSD, but only across the outer surface of the heat sink. However, running fans will always attract dust. Depending on the environment the fan and the heat sink will collect dust. Check this and clean the heat sink and the fans when necessary.

If variable speed drives are built into cabinets, also check and clean the dust filters of the cabinets regularly.

Check external wiring, connections and control signals. Tighten terminal screws if necessary.

9. Technical Data

Output

Purging mode	built-in function
Motor protection	built-in function +PTC
Soft start	built-in function
Alarm output	switch contacts for a max. load of 5 A 250 VAC
Motor capacity	750 W
Max. motor speed	1405 rpm

Input

Mains supply	230 VAC ±10%, 50/60 Hz
Current	Max. 3.5 A
Control signal	0-10 V, 4-20 mA, 10 kΩ potentiometer.
Rotation monitor	Impulse sensor should be connected

General

Protection class	IP 54
Weight	motor unit, 9.5 kg; control unit, 12.5kg.
Ambient temperature	-30° to +40°C
Motor size	IEC 60034-1
Insulation class	F
Gear type	F 050

Table 11: Model designations

Order number	Name	Reduction	Gear rpm	Torque gear	Shaft length*
01-5071-00	EMX-D Motor 10.3:1	10.3:1	8 - 200 rpm	26 Nm	40 mm
01-5071-10	EMX-D Motor 10.3:1	10.3:1	8 - 200 rpm	26 Nm	60 mm
01-5072-00	EMX-D Motor 15.5:1	15.5:1	5 - 135 rpm	39 Nm	40 mm
01-5070-00	EMX-D Control unit				

* Length of outgoing shaft from gearbox. seeFig. 37, page 40

9.1 Dimensions

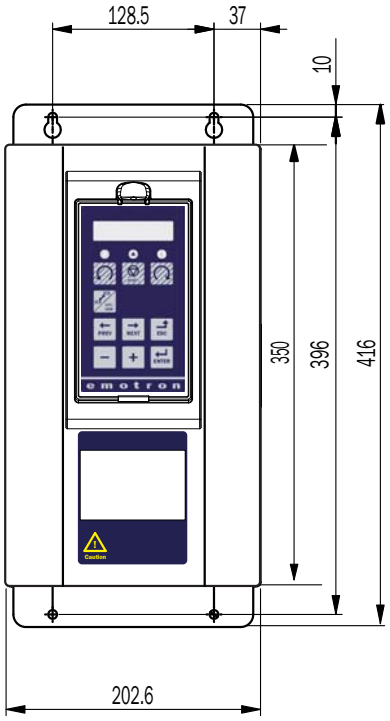
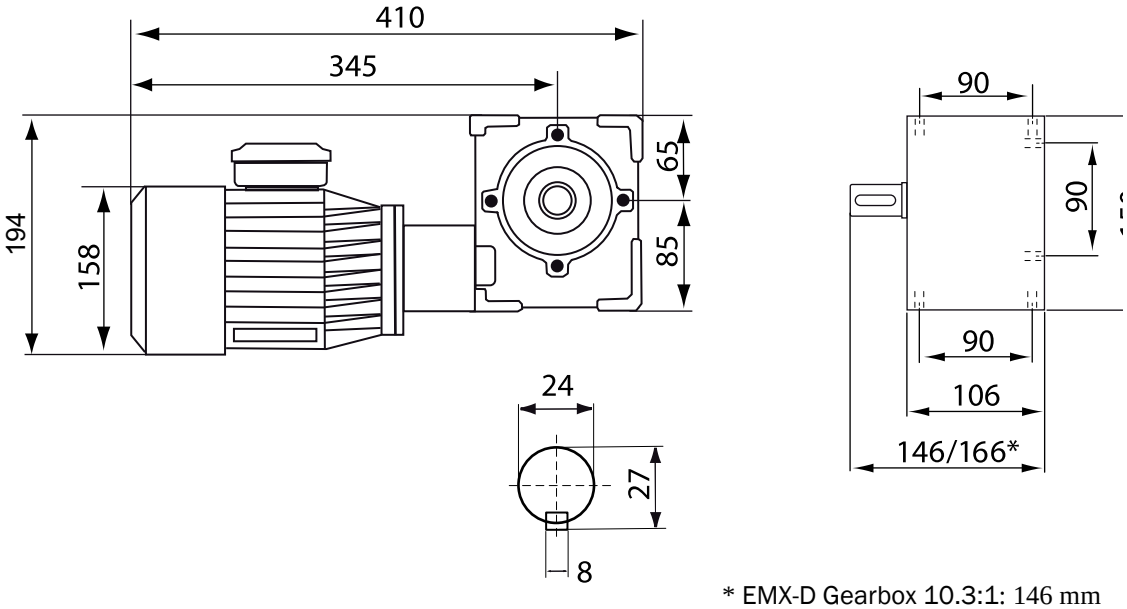


Fig. 36 Dimensions, control unit



* EMX-D Gearbox 10.3:1: 146 mm
EMX-D Gearbox 10.3:1: 166 mm
EMX-D Gearbox 15.5:1: 146 mm

Fig. 37 Dimensions, motor and gearbox (mm)

9.2 Control signals

Table 12

Terminal	Name:	Function (Default):	Signal:	Type:
1	+10 V	+10 VDC Supply voltage	+10 VDC, max 10 mA	output
2	AnIn1	Control signal +	0 -10 VDC or 4–20 mA	analogue input
6	-10 V	-10VDC Supply voltage	-10 VDC, max 10 mA	output
7	Common	Control signal -	0V	output
8	DigIn 1	RunL	0-8/24 VDC	digital input
9	DigIn 2	RunR	0-8/24 VDC	digital input
11	+24 V	+24VDC Supply voltage	+24 VDC, 100 mA	output
12	Common	Signal ground	0 V	output
13	AnOut 1	Min speed to max speed	0 - 10 VDC	analogue output
15	Common	Signal ground	0 V	output
16	DigIn 4	Rotation monitor	0-8/24 VDC	digital input
17	DigIn 5	Priority switch	0-8/24 VDC	digital input
18	DigIn 6	Max speed	0-8/24 VDC	digital input
Terminal X2				
31	N/C 1	Relay 1 output Trip, active when the VSD is in a TRIP condition N/C is opened when the relay is active (valid for all relays) N/O is closed when the relay is active (valid for all relays)	potential free change over 0.1 – 2 A/U_{max} 250 VAC or 42 VDC	relay output
32	COM 1			
33	N/O 1			

10. Menu List

					DEFAULT	CUSTOM
000	EMX-D Options					
	010	EMX-D Pars				
		011	Rot Sensor	On		
		012	G-box ratio	10.3		
		013	Mot Max Speed	200 rpm		
		014	Mot Prio Ref	200 rpm		
		015	Purge Time	12 s		
		016	Purge Speed	10 rpm		
		017	Hold Torque	off		
		018	MCC	off		
		019	MCC Time	0.0 s		
		01A	MCC Speed	6.5 rpm		
		01B	Slip Comp	on		
100	Preferred View					
200	Main Setup					
	210	Operation				
		211	Language	English		
300	Process					
	310	View ref				
700	Oper/Status					
	710	Operation				
		711	Process Val			
		712	Speed			
		713	Torque			
		714	Shaft Power			
		715	Electrical Power			
		716	Current			
		717	Output volt			
		718	Frequency			
		719	DC Voltage			
		71A	Heatsink Tmp			
	720	Status				
		721	VSD Status			
		722	Warning			
		723	DigIn Status			
		724	DigOut Status			
		725	AnIn Status 1-2			
		726	AnIn Status 3-4			
		727	AnOut Status 1-2			
	730	Stored Val				
		731	Run Time	00:00:00		
		732	Mains Time	00:00:00		
		733	Energy	kWh		
800	View TripLog					
	810	Trip Message				
		811	Process Value			
		812	Speed			
		813	Torque			
		814	Shaft Power			
		815	Electrical Power			
		816	Current			
		817	Output voltage			
		818	Frequency			
		819	DC Link voltage			
		81A	Heatsink Tmp			
		81C	FI Status			
		81D	DigIn status			
		81E	DigOut status			
		81F	AnIn status 1 2			
		81G	AnIn status 3 4			
		81H	AnOut status 1 2			
		81L	Run Time			
		81M	Mains Time			
		81N	Energy			
820	Trip Message (821 - 82N)					
830	Trip Message (831 - 83N)					
840	Trip Message (841 - 84N)					
850	Trip Message (851 - 85N)					
860	Trip Message (861 - 86N)					
870	Trip Message (871 - 87N)					
880	Trip Message (881 - 88N)					
890	Trip Message (891 - 89N)					
8A0	Reset Trip			No		

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