

CUE, 0.55 - 90 kW

Installation and operating instructions



CUE, 0.55 - 90 kW

English (GB)

Installation and operating instructions 4

中文 (CN)

安装和使用说明书 47

(KO)

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Declaration of conformity 133

Original installation and operating instructions

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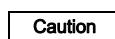
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**Warning**

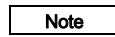
Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document**Warning**

If these safety instructions are not observed, it may result in personal injury.

**Caution**

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

**Note**

Notes or instructions that make the job easier and ensure safe operation.

2. Introduction

This manual introduces all aspects of your Grundfos CUE frequency converter in the power range of 0.55 to 90 kW.

Always keep this manual close to the CUE.

2.1 General description

CUE is a series of external frequency converters especially designed for pumps.

Thanks to the startup guide in the CUE, the installer can quickly set central parameters and put the CUE into operation.

Connected to a sensor or an external control signal, the CUE will quickly adapt the pump speed to the actual demand.

**Caution**

If the pump speed exceeds the rated speed, the pump will be overloaded.

2.2 Applications

The CUE series and Grundfos standard pumps are a supplement to the Grundfos E-pumps range with integrated frequency converter.

A CUE solution offers the same E-pump functionality in these cases:

- in mains voltage or power ranges not covered by the E-pump range
- in applications where an integrated frequency converter is not desirable or permissible.

2.3 References

Technical documentation for Grundfos CUE:

- The manual contains all information required for putting the CUE into operation.
- The data booklet contains all technical information about the construction and applications of the CUE.
- The service instructions contain all required instructions for dismantling and repairing the frequency converter.

Technical documentation is available on www.grundfos.com > Grundfos Product Center.

If you have any questions, please contact the nearest Grundfos company or service workshop.

3. Safety and warnings

3.1 Warning



Warning

Any installation, maintenance and inspection must be carried out by trained personnel.



Warning

Touching the electrical parts may be fatal, even after the CUE has been switched off.

Before performing any work on the CUE, the mains supply and other input voltages must be switched off at least for as long as stated below.

Voltage	Min. waiting time		
	4 minutes	15 minutes	20 minutes
200-240 V	0.75 - 3.7 kW	5.5 - 45 kW	
380-500 V	0.55 - 7.5 kW	11-90 kW	
525-600 V	0.75 - 7.5 kW		
525-690 V			11-90 kW

Wait only for shorter time if stated so on the nameplate of the CUE in question.

3.2 Safety regulations

- The on/off button of the control panel does not disconnect the CUE from the power supply and must therefore not be used as a safety switch.
- The CUE must be earthed correctly and protected against indirect contact according to local regulations.
- The leakage current to earth exceeds 3.5 mA.
- Enclosure class IP20/21 must not be installed freely accessible, but only in a panel.
- Enclosure class IP54/55 must not be installed outdoors without additional protection against weather conditions and the sun.
- Always observe local regulations as to cable cross-section, short-circuit protection and overcurrent protection.

3.3 Installation requirements

The general safety necessitates special considerations as to these aspects:

- fuses and switches for overcurrent and short-circuit protection
- selection of cables (mains current, motor, load distribution and relay)
- net configuration (IT, TN, earthing)
- safety on connecting inputs and outputs (PELV).

3.3.1 IT mains



Warning

Do not connect 380-500 V CUE frequency converters to mains supplies with a voltage between phase and earth of more than 440 V.

In connection with IT mains and earthed delta mains, the mains voltage may exceed 440 V between phase and earth.

3.3.2 Aggressive environment

Caution

The CUE should not be installed in an environment where the air contains liquids, particles or gases which may affect and damage the electronic components.

The CUE contains a large number of mechanical and electronic components. They are all vulnerable to environmental impact.

3.4 Reduced performance under certain conditions

The CUE will reduce its performance under these conditions:

- low air pressure (at high altitude)
- long motor cables.

The required measures are described in the next two sections.

3.4.1 Reduction at low air pressure



Warning

At altitudes above 2000 m, the PELV requirements cannot be met.

PELV = Protective Extra Low Voltage.

At low air pressure, the cooling capacity of air is reduced, and the CUE automatically reduces the performance to prevent overload. It may be necessary to select a CUE with a higher performance.

3.4.2 Reduction in connection with long motor cables

The maximum cable length for the CUE is 300 m for unscreened and 150 m for screened cables. In case of longer cables, contact Grundfos.

The CUE is designed for a motor cable with a maximum cross-section as stated in section 16.7 *Fuses and cable cross-section*.

4. Identification

4.1 Nameplate

The CUE can be identified by means of the nameplate. An example is shown below.



Fig. 1 Example of nameplate

Text	Description
T/C:	CUE (product name) 202P1M2... (internal code)
Prod. no:	Product number: 12345678
S/N:	Serial number: 123456G234 The last three digits indicate the production date: 23 is the week, and 4 is the year 2004.
1.5 kW	Typical shaft power on the motor
IN:	Supply voltage, frequency and maximum input current
OUT:	Motor voltage, frequency and maximum output current. The maximum output frequency usually depends on the pump type.
CHASSIS/IP20	Enclosure class
Tamb.	Maximum ambient temperature

4.2 Packaging label

The CUE can also be identified by means of the label on the packaging.

5. Mechanical installation

The individual CUE cabinet sizes are characterised by their enclosures. The table in section 16.1 *Enclosure* shows the relationship between enclosure class and enclosure type.

5.1 Receipt and storage

Check on receipt that the packaging is intact, and the unit is complete. In case of damage during transport, contact the transport company to complain.

Note that the CUE is delivered in packaging which is not suitable for outdoor storage.

5.2 Transportation and unpacking

To prevent damage during the transport to the site, the CUE must only be unpacked at the installation site.

The packaging contains accessory bag(s), documentation and the unit itself. See fig. 2.

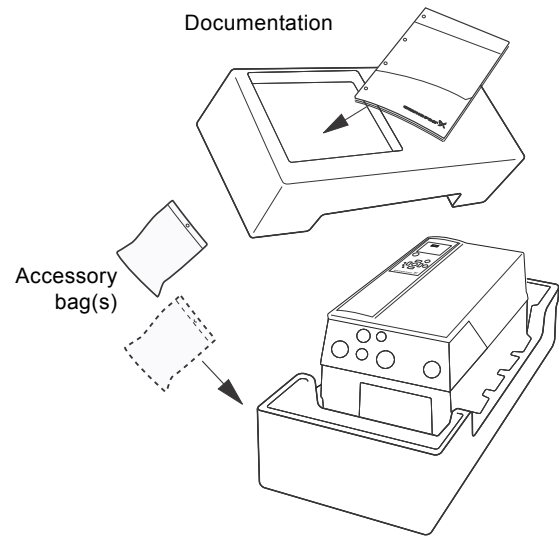


Fig. 2 CUE packaging

5.3 Space requirements and air circulation

CUE units can be mounted side by side, but as a sufficient air circulation is required for cooling, these requirements must be met:

- Sufficient free space above and below the CUE. See table below.
- Ambient temperature up to 50 °C.
- Hang the CUE directly on the wall, or fit it with a back plate. See fig. 3.

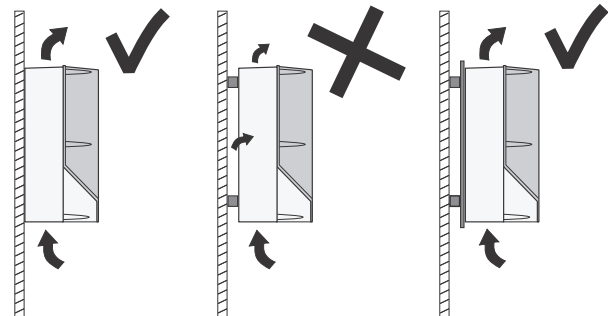


Fig. 3 CUE hung directly on the wall or fitted with a back plate

Required free space above and below the CUE

Enclosure	Space [mm]
A2, A3, A4, A5	100
B1, B2, B3, B4, C1, C3	200
C2, C4	225

For information about enclosures, see table in section 16.1 *Enclosure*.

5.4 Mounting

Caution The user is responsible for mounting the CUE securely on a firm surface.

1. Mark and drill holes. See section 16.3 *Main dimensions and weights*.
2. Fit the screws, but leave loose. Mount the CUE, and tighten the four screws.

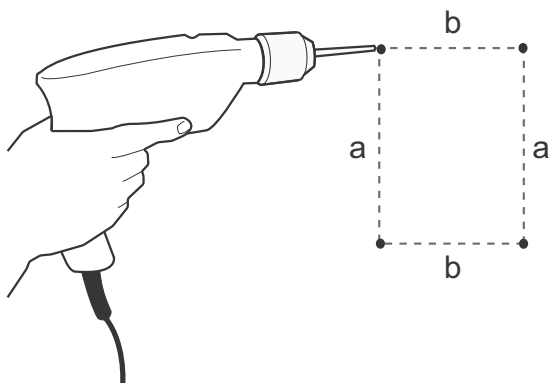


Fig. 4 Drilling of holes

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6. Electrical connection



Warning
The owner or installer is responsible for ensuring correct earthing and protection according to local standards.



Warning
Before making any work on the CUE, the mains supply and other voltage inputs must be switched off for at least as long as stated in section 3. *Safety and warnings*.

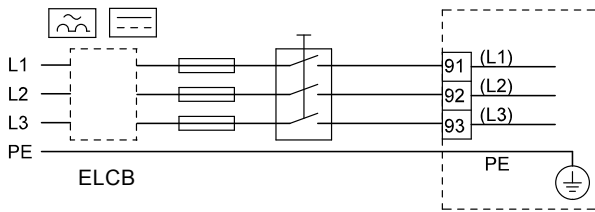


Fig. 5 Example of three-phase mains connection of the CUE with mains switch, backup fuses and additional protection

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6.1 Electrical protection

6.1.1 Protection against electric shock, indirect contact



Warning
The CUE must be earthed correctly and protected against indirect contact according to local regulations.

Caution

The leakage current to earth exceeds 3.5 mA, and a reinforced earth connection is required.

Protective conductors must always have a yellow/green (PE) or yellow/green/blue (PEN) colour marking.

Instructions according to EN IEC 61800-5-1:

- The CUE must be stationary, installed permanently and connected permanently to the mains supply.
- The earth connection must be carried out with duplicate protective conductors or with a single reinforced protective conductor with a cross-section of minimum 10 mm².

6.1.2 Protection against short-circuit, fuses

The CUE and the supply system must be protected against short-circuit.

Grundfos demands that the backup fuses mentioned in section 16.7 *Fuses and cable cross-section* are used for protection against short-circuit.

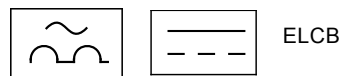
The CUE offers complete short-circuit protection in case of a short-circuit on the motor output.

6.1.3 Additional protection

Caution

The leakage current to earth exceeds 3.5 mA.

If the CUE is connected to an electrical installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols:



The circuit breaker is type B.

The total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the CUE in normal operation can be seen in section 16.8.1 *Mains supply (L1, L2, L3)*.

During startup and in asymmetrical supply systems, the leakage current can be higher than normal and may cause the ELCB to trip.

6.1.4 Motor protection

The motor requires no external motor protection. The CUE protects the motor against thermal overloading and blocking.

6.1.5 Protection against overcurrent

The CUE has an internal overcurrent protection for overload protection on the motor output.

6.1.6 Protection against mains voltage transients

The CUE is protected against mains voltage transients according to EN 61800-3, second environment.

6.2 Mains and motor connection

The supply voltage and frequency are marked on the CUE nameplate. Make sure that the CUE is suitable for the power supply of the installation site.

6.2.1 Mains switch

A mains switch can be installed before the CUE according to local regulations. See fig. 5.

6.2.2 Wiring diagram

The wires in the terminal box must be as short as possible. Excepted from this is the protective conductor which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

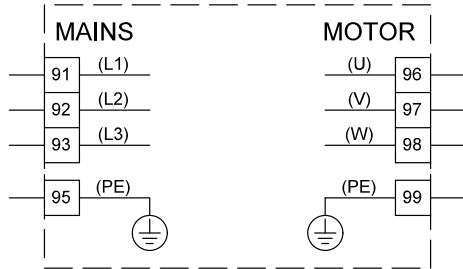


Fig. 6 Wiring diagram, three-phase mains connection

Terminal	Function
91	(L1)
92	(L2)
93	(L3)
95/99	(PE) Earth connection
96	(U)
97	(V)
98	(W)
Three-phase motor connection, 0-100 % of mains voltage	

Note For single-phase connection, use L1 and L2.

6.2.3 Mains connection, enclosures A2 and A3

For information about enclosures, see table in section 16.1 Enclosure.

Caution Check that the mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Fit the mounting plate with two screws.

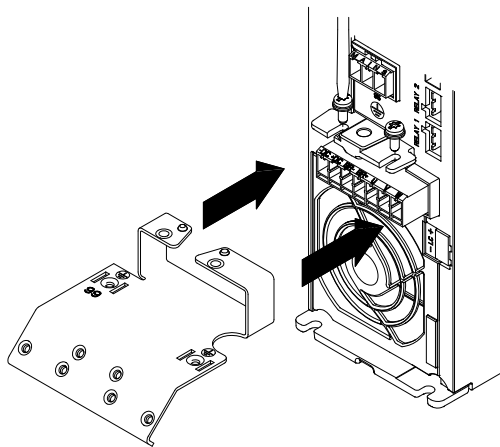


Fig. 7 Fitting the mounting plate

2. Connect the earth conductor to terminal 95 (PE) and the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3) of the mains plug. Put the mains plug into the socket marked "MAINS".

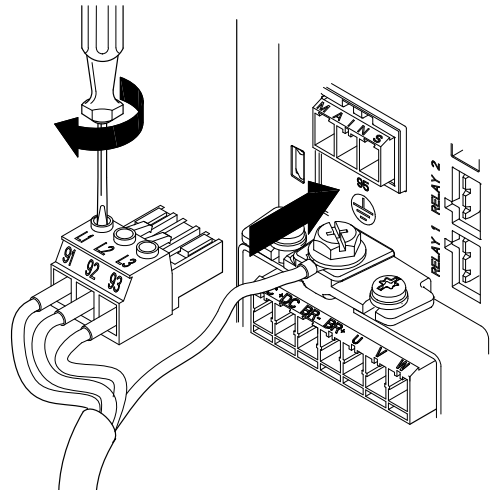


Fig. 8 Connecting the earth conductor and mains conductors

Note For single-phase connection, use L1 and L2.

3. Fix the mains cable to the mounting plate.

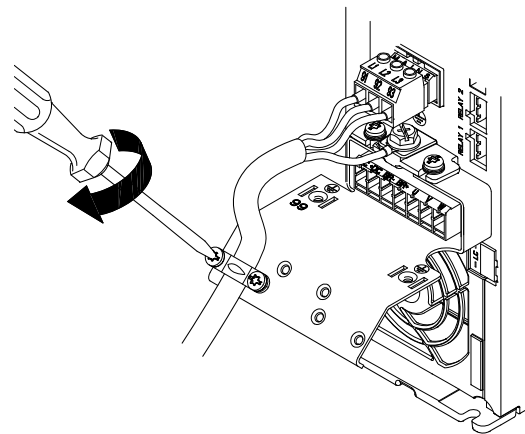


Fig. 9 Fixing the mains cable

6.2.4 Motor connection, enclosures A2 and A3

For information about enclosures, see table in section 16.1 Enclosure.

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE) on the mounting plate. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W) of the motor plug.

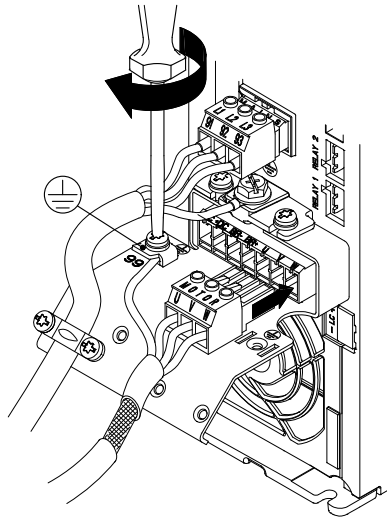


Fig. 10 Connecting the earth conductor and motor conductors

2. Put the motor plug into the socket marked "MOTOR". Fix the screened cable to the mounting plate with a cable clamp.

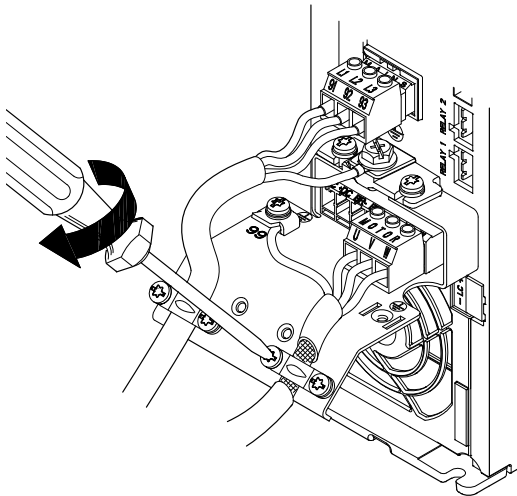


Fig. 11 Connecting the motor plug and fixing the screened cable

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6.2.5 Enclosures A4 and A5

For information about enclosures, see table in section 16.1 Enclosure.

Mains connection

Caution Check that mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Connect the earth conductor to terminal 95 (PE). See fig. 12.
2. Connect the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3) of the mains plug.
3. Put the mains plug into the socket marked "MAINS".
4. Fix the mains cable with a cable clamp.

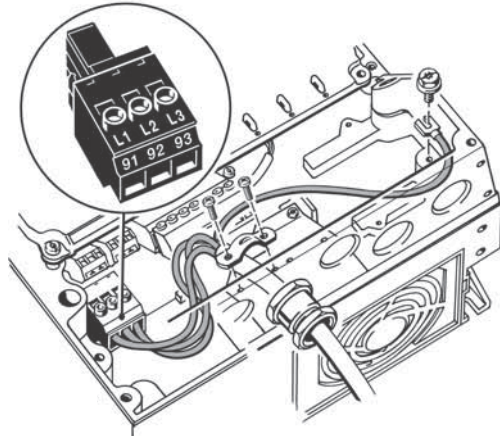


Fig. 12 Mains connection, A4 and A5

Note For single-phase connection, use L1 and L2.

Motor connection

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE). See fig. 13.
2. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W) of the motor plug.
3. Put the motor plug into the socket marked "MOTOR".
4. Fix the screened cable with a cable clamp.

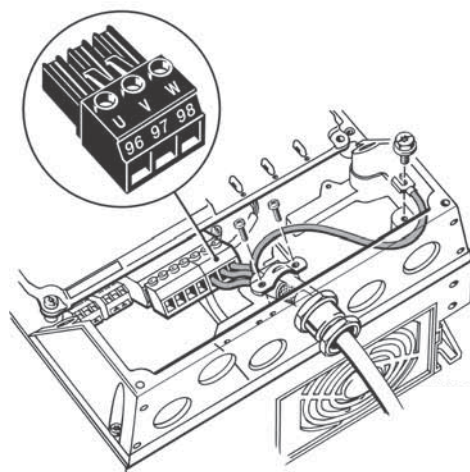


Fig. 13 Motor connection, A5

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6.2.6 Enclosures B1 and B2

For information about enclosures, see table in section 16.1 Enclosure.

Mains connection

Caution Check that mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Connect the earth conductor to terminal 95 (PE). See fig. 14.
2. Connect the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3).
3. Fix the mains cable with a cable clamp.

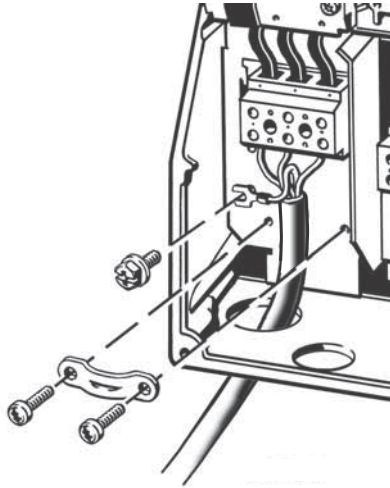


Fig. 14 Mains connection, B1 and B2

Note For single-phase connection, use L1 and L2.

Motor connection

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE). See fig. 15.
2. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W).
3. Fix the screened cable with a cable clamp.

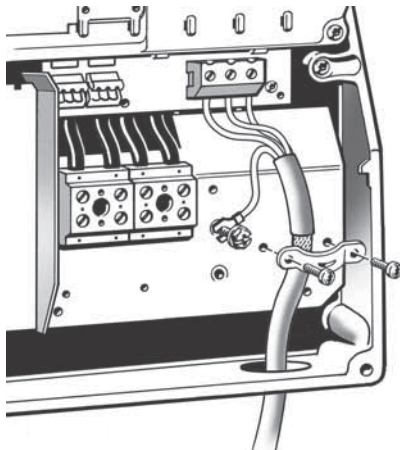


Fig. 15 Motor connection, B1 and B2

6.2.7 Enclosures B3 and B4

For information about enclosures, see table in section 16.1 Enclosure.

Mains connection

Caution Check that mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Connect the earth conductor to terminal 95 (PE). See figures 16 and 17.
2. Connect the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3).
3. Fix the mains cable with a cable clamp.

Motor connection

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE). See figures 16 and 17.
2. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W).
3. Fix the screened cable with a cable clamp.

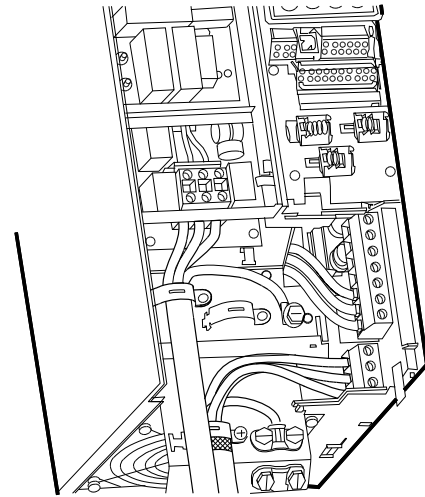


Fig. 16 Mains and motor connection, B3

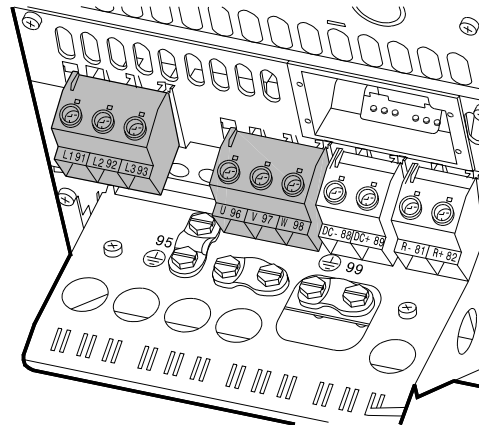


Fig. 17 Mains and motor connection, B4

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TM03 9449 4007

6.2.8 Enclosures C1 and C2

For information about enclosures, see table in section 16.1 Enclosure.

Mains connection

Caution Check that mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Connect the earth conductor to terminal 95 (PE). See fig. 18.
2. Connect the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3).

Motor connection

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE). See fig. 18.
2. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W).
3. Fix the screened cable with a cable clamp.

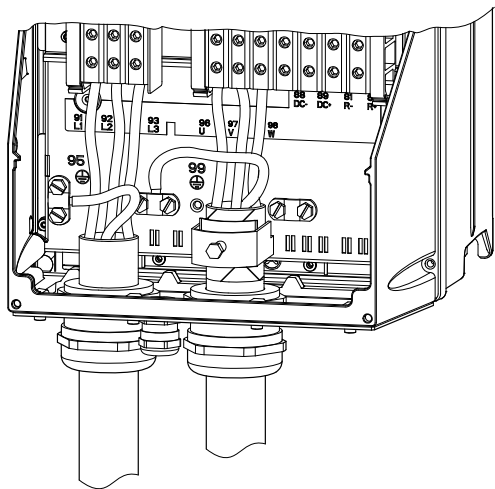


Fig. 18 Mains and motor connection, C1 and C2

6.2.9 Enclosures C3 and C4

For information about enclosures, see table in section 16.1 Enclosure.

Mains connection

Caution Check that mains voltage and frequency correspond to the values on the nameplate of the CUE and the motor.

1. Connect the earth conductor to terminal 95 (PE). See figures 19 and 20.
2. Connect the mains conductors to terminals 91 (L1), 92 (L2), 93 (L3).

Motor connection

Caution The motor cable must be screened for the CUE to meet EMC requirements.

1. Connect the earth conductor to terminal 99 (PE). See figures 19 and 20.
2. Connect the motor conductors to terminals 96 (U), 97 (V), 98 (W).
3. Fix the screened cable with a cable clamp.

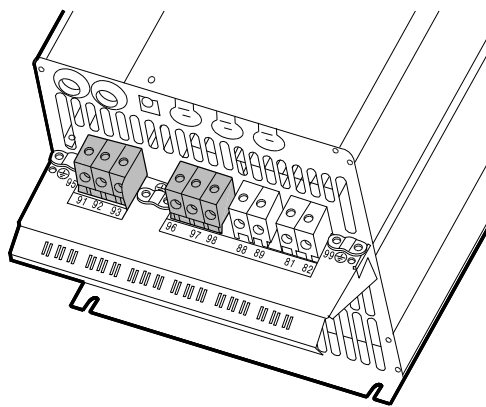


Fig. 19 Mains and motor connection, C3

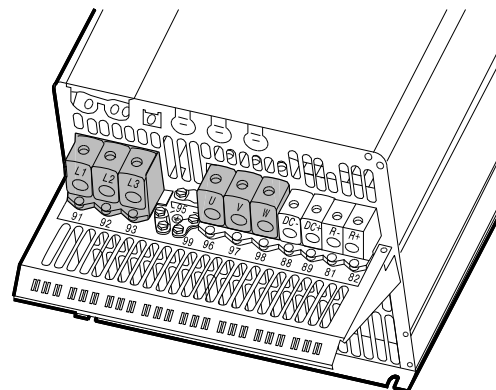


Fig. 20 Mains and motor connection, C4

6.3 Connecting the signal terminals

Caution As a precaution, signal cables must be separated from other groups by reinforced insulation in their entire lengths.

Note If no external on/off switch is connected, short-circuit terminals 18 and 20 using a short wire.

Connect the signal cables according to the guidelines for good practice to ensure EMC-correct installation. See section 6.6 EMC-correct installation.

- Use screened signal cables with a conductor cross-section of min. 0.5 mm² and max. 1.5 mm².
- Use a 3-conductor screened bus cable in new systems.

6.3.1 Minimum connection, signal terminal

Operation is only possible when terminals 18 and 20 are connected, for instance by means of an external on/off switch or a short wire.

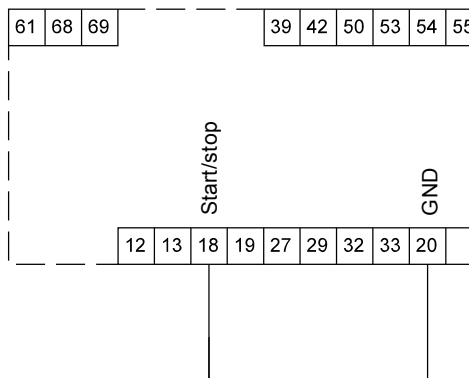


Fig. 21 Required minimum connection, signal terminal

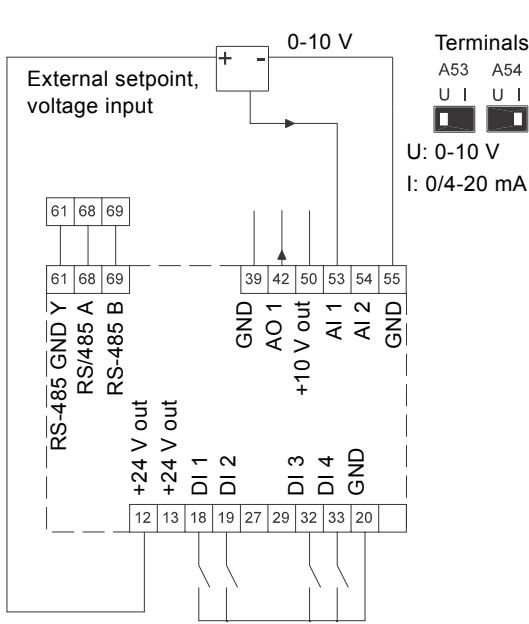
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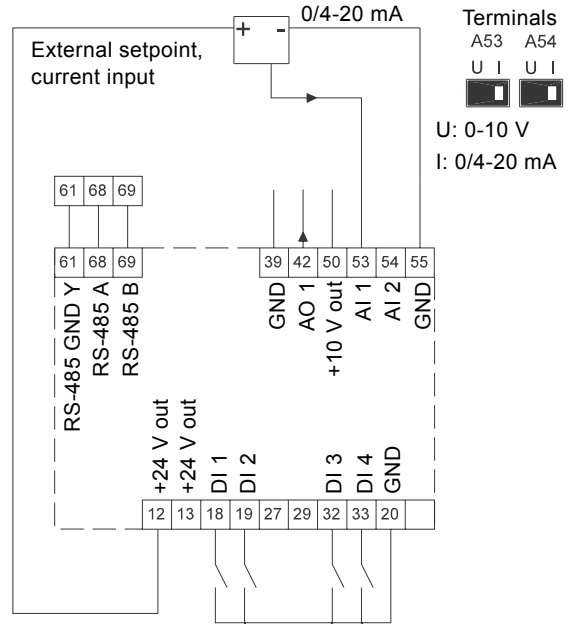
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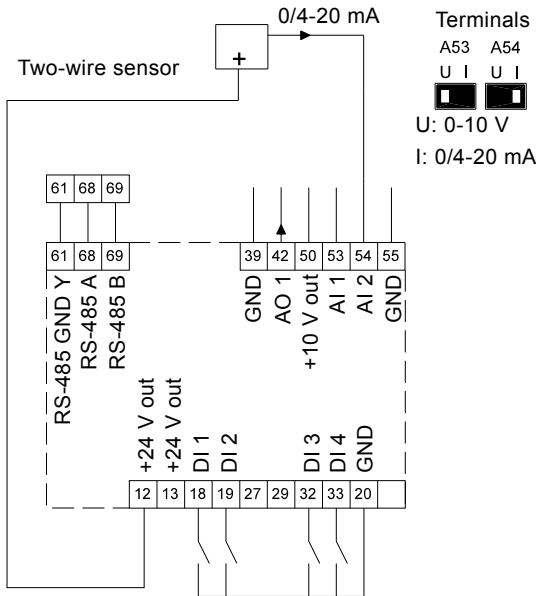
6.3.2 Wiring diagram, signal terminals



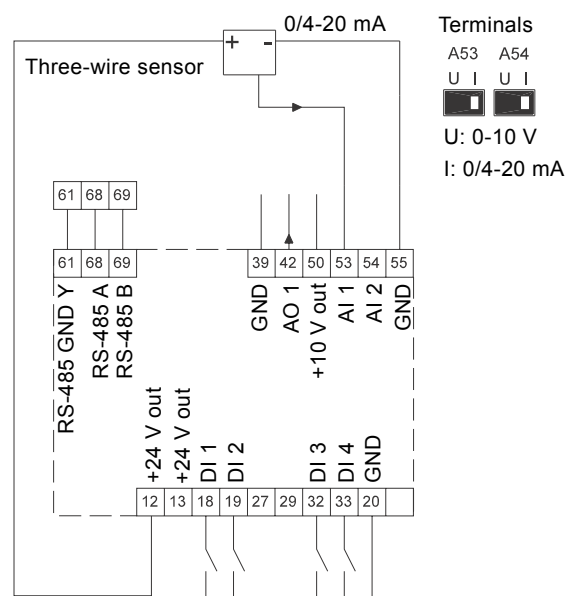
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TM05 1508 2811



TM05 1508 2811



TM05 1505 2811

Terminal	Type	Function	Terminal	Type	Function
12	+24 V out	Supply to sensor	42	AO 1	Analog output, 0-20 mA
13	+24 V out	Additional supply	50	+10 V out	Supply to potentiometer
18	DI 1	Digital input, start/stop	53	AI 1	External setpoint, 0-10 V, 0/4-20 mA
19	DI 2	Digital input, programmable	54	AI 2	Sensor input, sensor 1, 0/4-20 mA
20	GND	Common frame for digital inputs	55	GND	Common frame for analog inputs
32	DI 3	Digital input, programmable	61	RS-485 GND Y	GENIbus, frame
33	DI 4	Digital input, programmable	68	RS-485 A	GENIbus, signal A (+)
39	GND	Frame for analog output	69	RS-485 B	GENIbus, signal B (-)

Terminals 27 and 29 are not used.

Connect the signal cables according to the guidelines for good practice to ensure EMC-correct installation. See section 6.6 EMC-correct installation.

- Use screened signal cables with a conductor cross-section of min. 0.5 mm² and max. 1.5 mm².

Use a 3-conductor screened bus cable in new systems.

Note The RS-485 screen must be connected to frame.

6.3.3 Connection of a thermistor (PTC) to the CUE

The connection of a thermistor (PTC) in a motor to the CUE requires an external PTC relay.

The requirement is based on the fact that the thermistor in the motor only has one layer of insulation to the windings. The terminals in the CUE require two layers of insulation since they are part of a PELV circuit.

A PELV circuit provides protection against electric shock. Special connection requirements apply to this type of circuit. The requirements are described in EN 61800-5-1.

In order to maintain PELV, all connections made to the control terminals must be PELV. For example, the thermistor must have reinforced or double insulation.

6.3.4 Access to signal terminals

All signal terminals are behind the terminal cover of the CUE front. Remove the terminal cover as shown in figures 22 and 23.

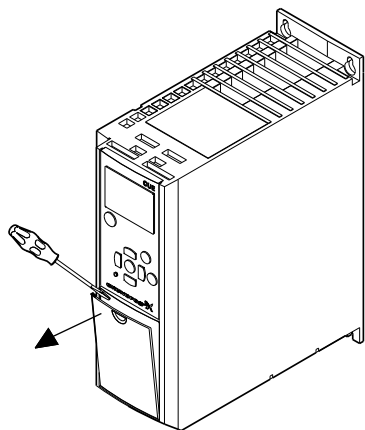


Fig. 22 Access to signal terminals, A2 and A3

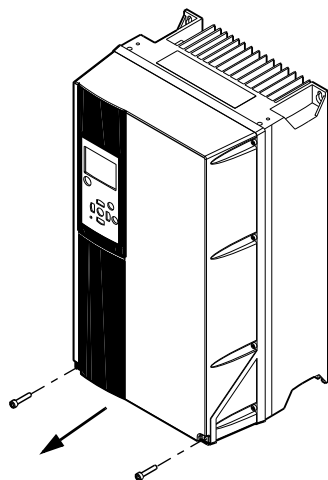


Fig. 23 Access to signal terminals, A4, A5, B1, B2, B3, B4, C1, C2, C3 and C4

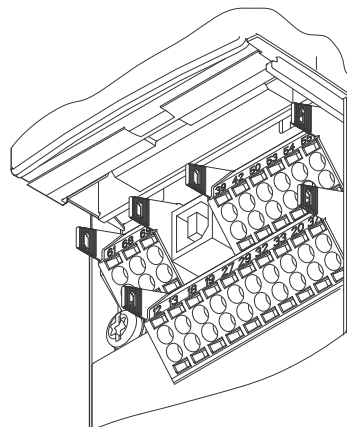


Fig. 24 Signal terminals (all enclosures)

6.3.5 Fitting the conductor

1. Remove the insulation at a length of 9 to 10 mm.
2. Insert a screwdriver with a tip of maximum 0.4 x 2.5 mm into the square hole.
3. Insert the conductor into the corresponding round hole. Remove the screwdriver. The conductor is now fixed in the terminal.

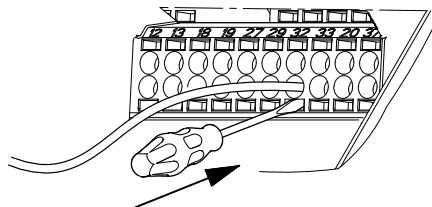


Fig. 25 Fitting the conductor into the signal terminal

6.3.6 Setting the analog inputs, terminals 53 and 54

Contacts A53 and A54 are positioned behind the control panel and used for setting the signal type of the two analog inputs. The factory setting of the inputs is voltage signal "U".

If a 0/4-20 mA sensor is connected to terminal 54, the input must be set to current signal "I".

Note Switch off the power supply before setting contact A54.

Remove the control panel to set the contact. See fig. 26.

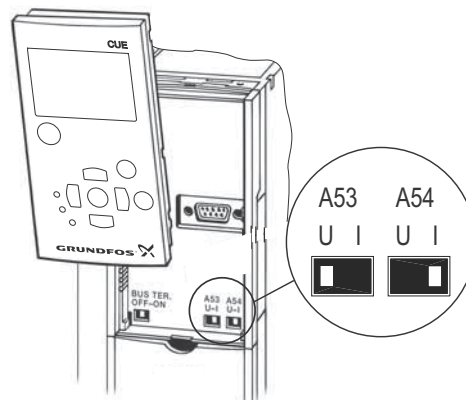


Fig. 26 Setting contact A54 to current signal "I"

TM03 9025 2807

TM03 9003 2807

TM03 9026 2807

TM03 9004 2807

TM03 9104 3407

6.3.7 RS-485 GENIbus network connection

One or more CUE units can be connected to a control unit via GENIbus. See the example in fig. 27.

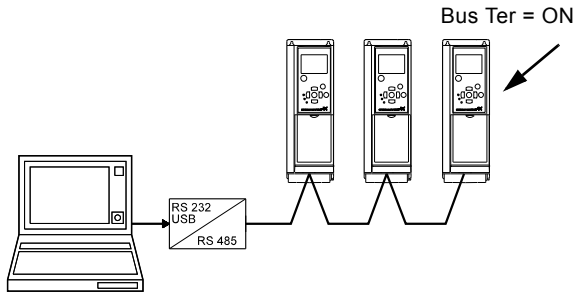


Fig. 27 Example of an RS-485 GENIbus network

The reference potential, GND, for RS-485 (Y) communication must be connected to terminal 61.

If more than one CUE unit is connected to a GENIbus network, the termination contact of the last CUE must be set to "ON" (termination of the RS-485 port).

The factory setting of the termination contact is "OFF" (not terminated).

Remove the control panel to set the contact. See fig. 28.

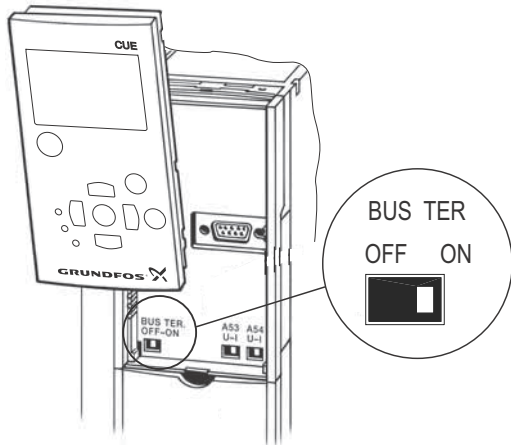


Fig. 28 Setting the termination contact to "ON"

6.4 Connecting the signal relays

Caution

As a precaution, signal cables must be separated from other groups by reinforced insulation in their entire lengths.

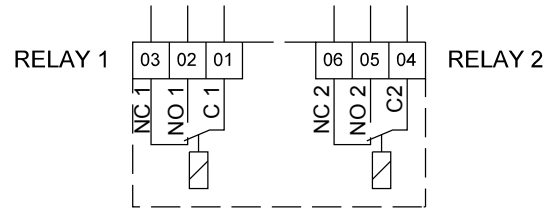


Fig. 29 Terminals for signal relays in normal state (not activated)

Terminal	Function	
C 1	C 2	Common
NO 1	NO 2	Normally open contact
NC 1	NC 2	Normally closed contact

Access to signal relays

The relay outputs are positioned as shown in figures 30 to 35.

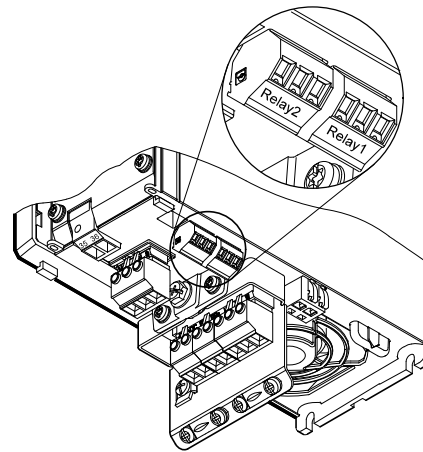


Fig. 30 Terminals for relay connection, A2 and A3

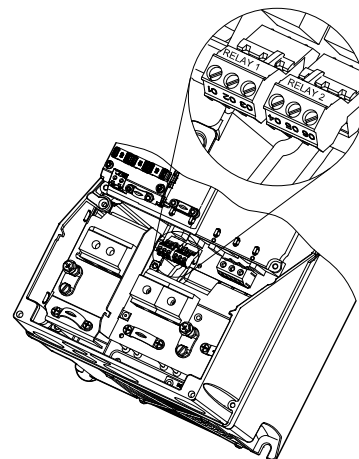


Fig. 31 Terminals for relay connection, A4, A5, B1 and B2

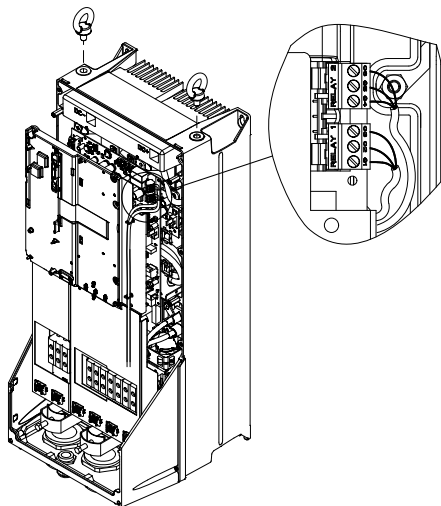


Fig. 32 Terminals for relay connection, C1 and C2

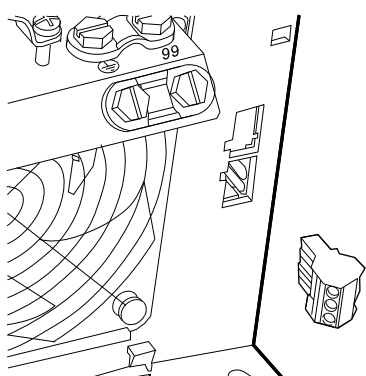


Fig. 33 Terminals for relay connection, B3

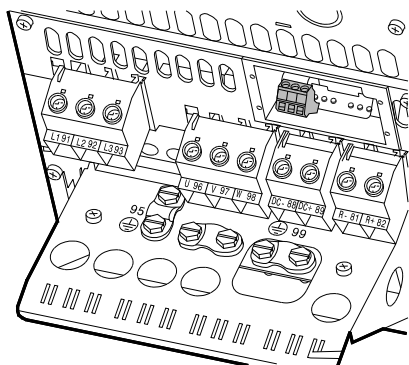


Fig. 34 Terminals for relay connection, B4

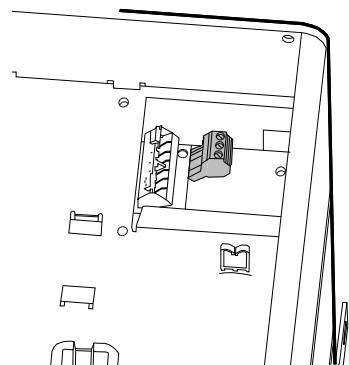


Fig. 35 Terminals for relay connection, C3 and C4, in the upper right corner of the CUE

TM03 9009 2807

TM03 9442 4007

TM03 9441 4007

TM03 9440 4007

6.5 Connecting the MCB 114 sensor input module

The MCB 114 is an option offering additional analog inputs for the CUE.

6.5.1 Configuration of the MCB 114

The MCB 114 is equipped with three analog inputs for these sensors:

- One additional sensor 0/4-20 mA. See section 10.8.14 Sensor 2 (3.16).
- Two Pt100/Pt1000 temperature sensors for measurement of motor bearing temperature or an alternative temperature, such as liquid temperature. See sections 10.8.19 Temperature sensor 1 (3.21) and 10.8.20 Temperature sensor 2 (3.22).

When the MCB 114 has been installed, the CUE will automatically detect if the sensor is Pt100 or Pt1000 when it is switched on.

6.5.2 Wiring diagram, MCB 114

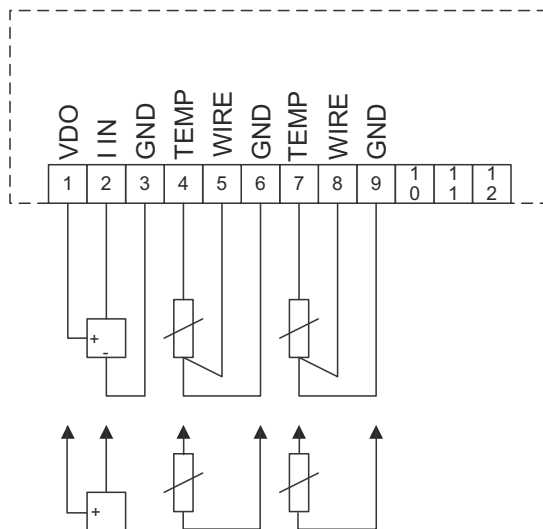


Fig. 36 Wiring diagram, MCB 114

TM04 3273 3908

Terminal	Type	Function
1 (VDO)	+24 V out	Supply to sensor
2 (I IN)	AI 3	Sensor 2, 0/4-20 mA
3 (GND)	GND	Common frame for analog input
4 (TEMP)	AI 4	Temperature sensor 1, Pt100/Pt1000
5 (WIRE)		
6 (GND)	GND	Common frame for temperature sensor 1
7 (TEMP)	AI 5	Temperature sensor 2, Pt100/Pt1000
8 (WIRE)		
9 (GND)	GND	Common frame for temperature sensor 2

Terminals 10, 11 and 12 are not used.

6.6 EMC-correct installation

This section provides guidelines for good practice when installing the CUE. Follow these guidelines to meet EN 61800-3, first environment.

- Use only motor and signal cables with a braided metal screen in applications without output filter.
- There are no special requirements to supply cables, apart from local requirements.
- Leave the screen as close to the connecting terminals as possible. See fig. 37.
- Avoid terminating the screen by twisting the ends. See fig. 38. Use cable clamps or EMC screwed cable entries instead.
- Connect the screen to frame at both ends for both motor and signal cables. See fig. 39. If the controller has no cable clamps, connect only the screen to the CUE. See fig. 40.
- Avoid unscreened motor and signal cables in electrical cabinets with frequency converters.
- Make the motor cable as short as possible in applications without output filter to limit the noise level and minimise leakage currents.
- Screws for frame connections must always be tightened whether a cable is connected or not.
- Keep main cables, motor cables and signal cables separated in the installation, if possible.

Other installation methods may give similar EMC results if the above guidelines for good practice are followed.

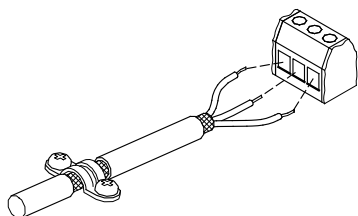


Fig. 37 Example of stripped cable with screen

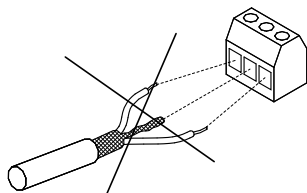


Fig. 38 Do not twist the screen ends

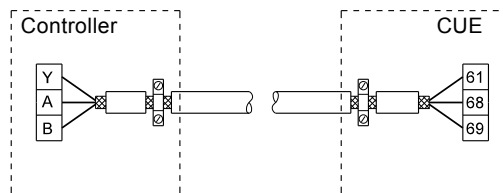


Fig. 39 Example of connection of a 3-conductor bus cable with screen connected at both ends

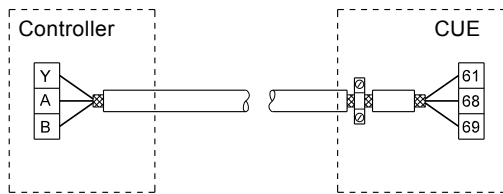


Fig. 40 Example of connection of a 3-conductor bus cable with screen connected at the CUE (controller with no cable clamps)

6.7 RFI filters

To meet the EMC requirements, the CUE comes with the following types of built-in radio frequency interference filter (RFI).

Voltage [V]	Typical shaft power P2 [kW]	RFI filter type
1 x 200-240*	1.1 - 7.5	C1
3 x 200-240	0.75 - 45	C1
3 x 380-500	0.55 - 90	C1
3 x 525-600	0.75 - 7.5	C3
3 x 525-690	11-90	C3

* Single-phase input - three-phase output.

Description of RFI filter types

- C1: For use in domestic areas.
- C3: For use in industrial areas with own low-voltage transformer.

RFI filter types are according to EN 61800-3.

6.7.1 Equipment of category C3

- This type of power drive system (PDS) is not intended to be used on a low-voltage public network which supplies domestic premises.
- Radio frequency interference is expected if used on such a network.

TM02 1325 0901

TM03 8812 2507

TM03 8732 2407

TM03 8731 2407

6.8 Output filters

Output filters are used for reducing the voltage stress on the motor windings and the stress on the motor insulation system as well as for decreasing acoustic noise from the frequency converter-driven motor.

Two types of output filter are available as accessories for the CUE:

- dU/dt filters
- sine-wave filters.

Use of output filters

The table below shows when an output filter is required and the type to use. The selection depends on the following:

- pump type
- motor cable length
- the required reduction of the acoustic noise from the motor.

Pump type	CUE output power	dU/dt filter	Sine-wave filter
SP, BM, BMB with motor voltage from 380 V and up	All	-	0-300 m*
Pumps with MG71 and MG80 up to and including 1.5 kW	Greater than 1.5 kW	-	0-300 m*
Reduction of dU/dt and noise emission, low reduction	All	0-150 m*	-
Reduction of dU/dt, voltage peaks and noise emission, high reduction	All	-	0-300 m*
With motors of 500 V and up	All	-	0-300 m*

* The lengths stated apply to the motor cable.

6.9 Motor cable

To meet EN 61800-3, the motor cable must always be a screened cable, whether an output filter is installed or not.

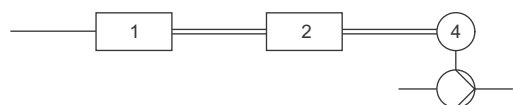
Note

The mains cable need not be a screened cable. See figures 41, 42, 43 and 44.



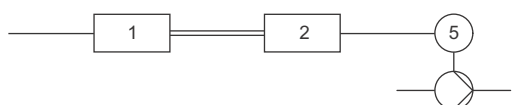
TM04 4289 1109

Fig. 41 Example of installation without filter



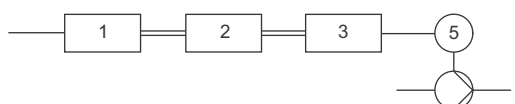
TM04 4290 1109

Fig. 42 Example of installation with filter. The cable between the CUE and filter must be short



TM04 4291 1109

Fig. 43 Submersible pump without connection box. Frequency converter and filter installed close to the well



TM04 4292 1109

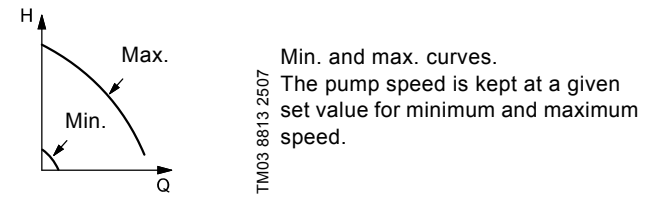
Fig. 44 Submersible pump with connection box and screened cable. Frequency converter and filter installed far away from the well and connection box installed close to the well

Symbol	Designation
1	CUE
2	Filter
3	Connection box
4	Standard motor
5	Submersible motor
One line	Unscreened cable
Double line	Screened cable

7. Operating modes

The following operating modes are set on the control panel in the "OPERATION" menu, display 1.2. See section 10.6.2 *Operating mode (1.2)*.

Operating mode	Description
Normal	The pump is running in the control mode selected
Stop	The pump has been stopped (green indicator light is flashing)
Min.	The pump is running at minimum speed
Max.	The pump is running at maximum speed



Example: Max. curve operation can for instance be used in connection with venting the pump during installation.

Example: Min. curve operation can for instance be used in periods with a very small flow requirement.

8. Control modes

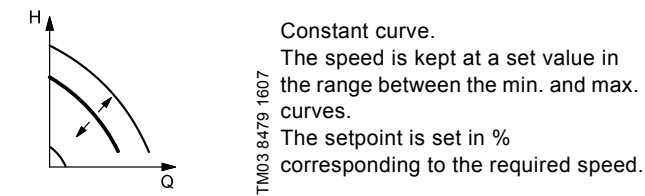
The control mode is set on the control panel in the "INSTALLATION" menu, display 3.1. See section 10.8.1 *Control mode (3.1)*.

There are two basic control modes:

- Uncontrolled operation (open loop).
- Controlled operation (closed loop) with a sensor connected.

See sections 8.1 *Uncontrolled operation (open loop)* and 8.2 *Controlled operation (closed loop)*.

8.1 Uncontrolled operation (open loop)



Example: Operation on constant curve can for instance be used for pumps with no sensor connected.

Example: Typically used in connection with an overall control system such as the MPC or another external controller.

8.2 Controlled operation (closed loop)

<p>TM03 8475 1607</p>		<p>Proportional differential pressure. The differential pressure is reduced at falling flow rate and increased at rising flow rate.</p> <p>TM03 8804 2507</p>
<p>TM03 8476 1607</p>		<p>Constant differential pressure, pump. The differential pressure is kept constant, independently of the flow rate.</p> <p>TM03 8804 2507</p>
<p>TM03 8476 1607</p>		<p>Constant differential pressure, system. The differential pressure is kept constant, independently of the flow rate.</p> <p>TM03 8806 2507</p>
<p>TM03 8476 1607</p>		<p>Constant pressure. The pressure is kept constant, independently of the flow rate.</p> <p>TM03 8805 2507</p>
<p>TM03 8477 1607</p>		<p>Constant pressure with stop function. The outlet pressure is kept constant at high flow rate. On/off operation at low flow rate.</p> <p>TM03 8807 2507</p>
<p>TM03 8482 1607</p>		<p>Constant level. The liquid level is kept constant, independently of the flow rate.</p> <p>TM03 8808 2607</p>
<p>TM03 8482 1607</p>		<p>Constant level with stop function. The liquid level is kept constant at high flow rate. On/off operation at low flow rate.</p> <p>TM03 8809 2607</p>
<p>TM03 8478 1607</p>		<p>Constant flow rate. The flow rate is kept constant, independently of the head.</p> <p>TM03 8810 2507</p>
<p>TM03 8482 1607</p>		<p>Constant temperature. The liquid temperature is kept constant, independently of the flow rate.</p> <p>TM03 8811 2507</p>

9. Menu overview

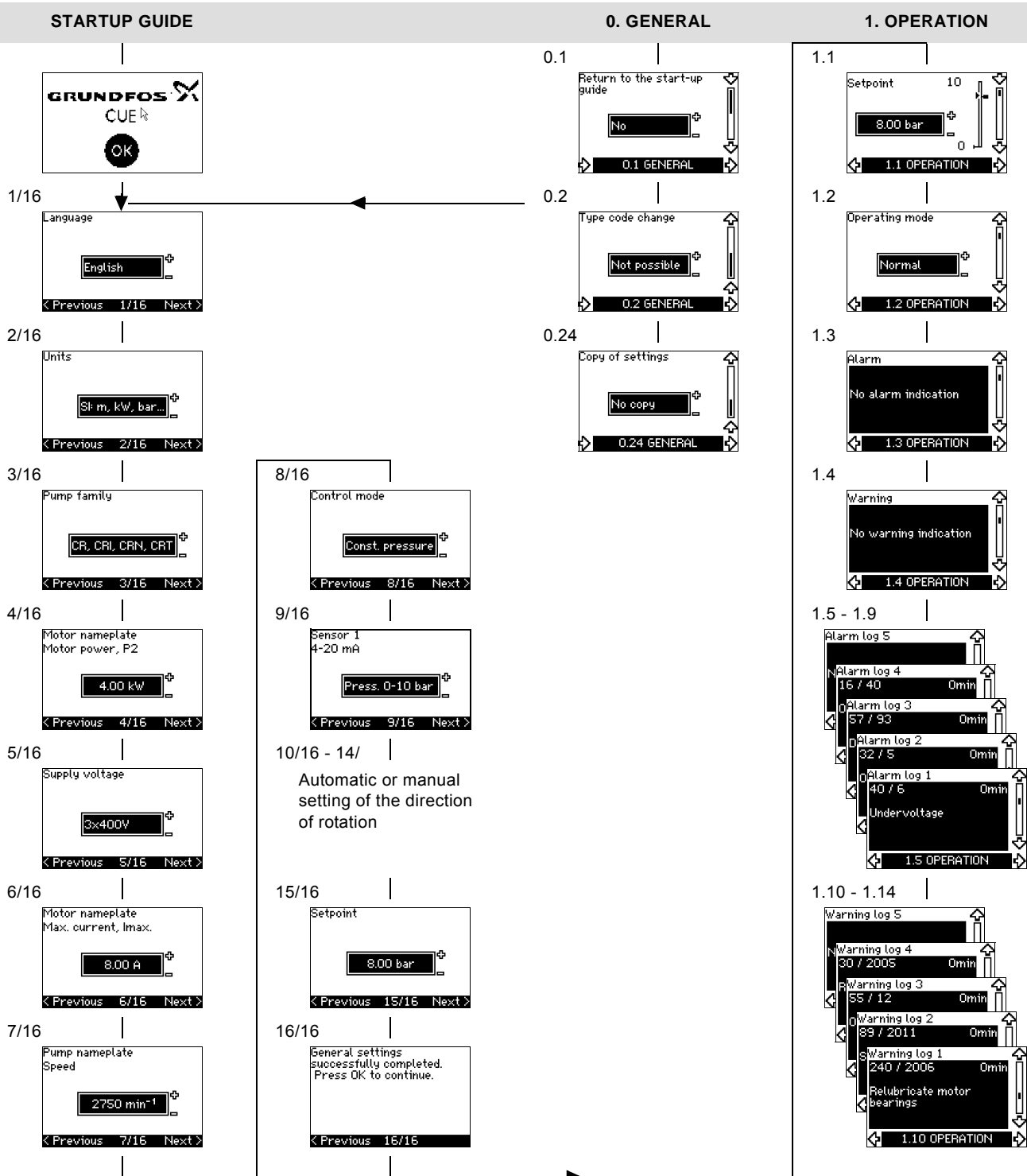


Fig. 45 Menu overview

Menu structure

The CUE has a startup guide, which is started at the first startup. After the startup guide, the CUE has a menu structure divided into four main menus:

1. "GENERAL" gives access to the startup guide for the general setting of the CUE.
2. "OPERATION" enables the setting of setpoint, selection of operating mode and resetting of alarms. It is also possible to see the latest five warnings and alarms.

3. "STATUS" shows the status of the CUE and the pump. It is not possible to change or set values.
4. "INSTALLATION" gives access to all parameters. Here a detailed setting of the CUE can be made.

2. STATUS

2.1 Actual setpoint
8.00 bar
External setpoint
100 %
2.1 STATUS

2.2 Operating mode
Normal
From
CUE menu
2.2 STATUS

2.3 Actual value
7.90 bar
2.3 STATUS

2.4 Measured value sensor 1
7.90 bar
2.4 STATUS

2.5 Measured value sensor 2
0.20 bar
2.5 STATUS

2.6 Speed
2750 min⁻¹
2.6 STATUS

2.7 Input power
21.7 kW
Motor current
0.00 A
2.7 STATUS

2.8 Operating hours
0 h
Power consumption
2605 kWh
2.8 STATUS

2.9 Bearings relubricated
0 times
Replace bearings at
5 times
2.9 STATUS

3. INSTALLATION

2.10 Relubricate motor bearings
Do it now!
2.10 STATUS

2.11 Replace motor bearings
Do it now!
2.11 STATUS

2.12 Temperature sensor 1
Not active
0 °C
2.12 STATUS

2.13 Temperature sensor 2
Not active
0 °C
2.13 STATUS

2.14 Flow rate
90 m³/h
2.14 STATUS

2.15 Accumulated flow
12000 m³
Energy per m³
0.22 kWh/m³
2.15 STATUS

2.16 Firmware version
99.56
2.16 STATUS

2.17 Factory configuration file id
40
2.17 STATUS

3.1 Control mode
Const. pressure
3.1 INSTALLATION

3.2 Controller
Kp 0.50
Ti 0.50 s
3.2 INSTALLATION

3.3 External setpoint
Not active
3.3 INSTALLATION

3.3A External setpoint
Min. 0.00 V
Max. 10.0 V
3.3A INSTALLATION

3.4 Signal relay 1 activated during
Alarm
3.4 INSTALLATION

3.5 Signal relay 2 activated during
Warning
3.5 INSTALLATION

3.6 +/-, OK, On/Off buttons
Active
3.6 INSTALLATION

3.7 Protocol
GENbus
3.7 INSTALLATION

3.8 Pump number
1
3.8 INSTALLATION

3.9 Digital input 2
Ext. fault
3.9 INSTALLATION

3.10 Digital input 3
Dry running
3.10 INSTALLATION

3.11 Digital input 4
Flow switch
3.11 INSTALLATION

3.12 Digital flow input
100 1/pulse
3.12 INSTALLATION

3.13 Analog output
Not active
3.13 INSTALLATION

3.14 Stop function
Not active
ΔH 10 %
3.14 INSTALLATION

3.15 Sensor 1
4-20mA bar
0.00 - 10.0
3.15 INSTALLATION

3.16 Sensor 2
4-20mA %
0.00 - 100
3.16 INSTALLATION

3.17 Duty/standby
Not active
3.17 INSTALLATION

3.18 Operating range
Min. 25 %
Max. 100 %
3.18 INSTALLATION

3.19 Motor bearing monitoring
Active
3.19 INSTALLATION

3.20 Motor bearings
Relubricated
3.20 INSTALLATION

3.21 Temperature sensor 1
Not active
3.21 INSTALLATION

3.22 Temperature sensor 2
Not active
3.22 INSTALLATION

3.23 Standstill heating
Not active
3.23 INSTALLATION

3.24 Ramps
Up 1.00 s
Down 3.00 s
3.24 INSTALLATION

3.25 Switching Frequency
5.0 kHz
3.25 INSTALLATION

10. Setting by means of the control panel

10.1 Control panel



Warning
The on/off button on the control panel does not disconnect the CUE from the power supply and must therefore not be used as a safety switch.



The on/off button has the highest priority. In "off" condition, pump operation is not possible.

The control panel is used for local setting of the CUE. The functions available depend on the pump family connected to the CUE.

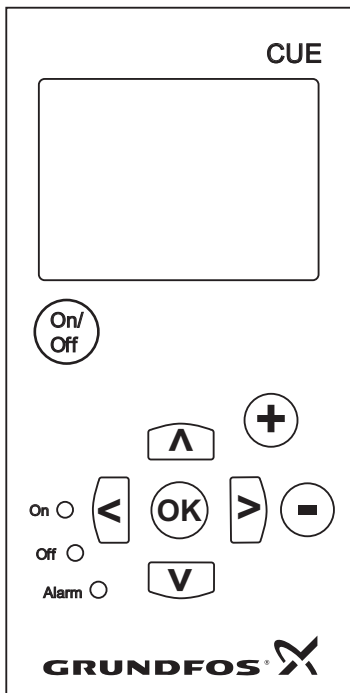


Fig. 46 Control panel of the CUE

Editing buttons

Button	Function
	Makes the pump ready for operation/starts and stops the pump.
	Saves changed values, resets alarms and expands the value field.
	Changes values in the value field.

Navigating buttons

Button	Function
	Navigates from one menu to another. When the menu is changed, the display shown will always be the top display of the new menu.
	Navigates up and down in the individual menu.

The editing buttons of the control panel can be set to these values:

- Active
- Not active.

When set to "Not active" (locked), the editing buttons do not function. It is only possible to navigate in the menus and read values.

Activate or deactivate the buttons by pressing the arrow up and arrow down buttons simultaneously for 3 seconds.

Adjusting the display contrast

Press [OK] and [+] for darker display.
Press [OK] and [-] for brighter display.

Indicator lights

The operating condition of the pump is indicated by the indicator lights on the front of the control panel. See fig. 46.

The table shows the function of the indicator lights.

Indicator light	Function
On (green)	The pump is running or has been stopped by a stop function. If flashing, the pump has been stopped by the user (CUE menu), external start/stop or bus.
Off (orange)	The pump has been stopped with the on/off button.
Alarm (red)	Indicates an alarm or a warning.

Displays, general terms

Figures 47 and 48 show the general terms of the display.

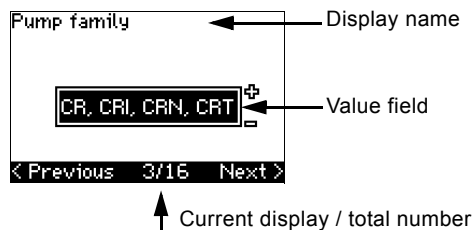


Fig. 47 Example of display in the startup guide

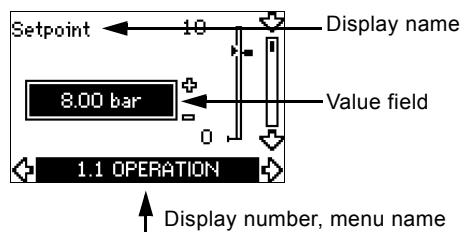


Fig. 48 Example of display in the user menu

TM03 8719 2507

10.2 Back to factory settings

Follow this procedure to get back to the factory settings:

1. Switch off the power supply to the CUE.
2. Press [On/Off], [OK] and [+] while switching on the power supply.

The CUE will reset all parameters to factory settings. The display will turn on when the reset is completed.

10.3 CUE settings



TM04 7313 1810

The startup guide includes all parameters that can be set on the control panel of the CUE.

The document includes a special table for additional PC Tool settings and a page where special PC Tool programming details should be entered.

If you want to download the document, please contact your local Grundfos company.

10.4 Startup guide

Check that equipment connected is ready for startup, and that the CUE has been connected to the power supply.

Note

Have nameplate data for motor, pump and CUE at hand.

Use the startup guide for the general setting of the CUE including the setting of the correct direction of rotation.

The startup guide is started the first time when the CUE is connected to the power supply. It can be restarted in the "GENERAL" menu. Please note that in this case all previous settings will be erased.

Bulleted lists show possible settings. Factory settings are shown in bold.

10.4.1 Welcoming display



- Press [OK]. You will now be guided through the startup guide.

10.4.2 Language (1/16)



Select the language to be used in the display:

- **English UK**
- English US
- German
- French
- Italian
- Spanish
- Portuguese
- Greek
- Dutch
- Swedish
- Finnish
- Danish
- Polish
- Russian
- Hungarian
- Czech
- Chinese
- Japanese
- Korean.

10.4.3 Units (2/16)



Select the units to be used in the display:

- **SI: m, kW, bar...**
- US: ft, HP, psi...

10.4.4 Pump family (3/16)



Select pump family according to the pump nameplate:

- **CR, CRI, CRN, CRT**
- SP, SP-G, SP-NE
- ...

Select "Other" if the pump family is not on the list.

10.4.5 Rated motor power (4/16)

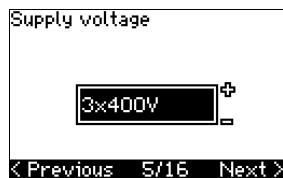


Set the rated motor power, P2, according to the motor nameplate:

- 0.55 - 90 kW.

The setting range is size-related, and the factory setting corresponds to the rated power of the CUE.

10.4.6 Supply voltage (5/16)



Select supply voltage according to the rated supply voltage of the installation site.

Unit 1 x 200-240 V:* Unit 3 x 200-240 V: Unit 3 x 380-500 V:

- 1 x 200 V
- 1 x 208 V
- 1 x 220 V
- 1 x 230 V
- 1 x 240 V.
- 3 x 200 V
- 3 x 208 V
- 3 x 220 V
- 3 x 230 V
- 3 x 240 V.
- 3 x 380 V
- 3 x 400 V
- 3 x 415 V
- 3 x 440 V
- 3 x 460 V
- 3 x 500 V.

Unit 3 x 525-600 V: Unit 3 x 525-690 V:

- 3 x 575 V.
- 3 x 575 V
- 3 x 690 V.

* Single-phase input - three-phase output.

The setting range depends on the CUE type, and the factory setting corresponds to the rated supply voltage of the CUE.

10.4.7 Max. motor current (6/16)



Set the maximum motor current according to the motor nameplate:

- 0-999 A.

The setting range depends on the CUE type, and the factory setting corresponds to a typical motor current at the motor power selected.

Max. current will be limited to the value on the CUE nameplate, even if it is set to a higher value during setup.

10.4.8 Speed (7/16)

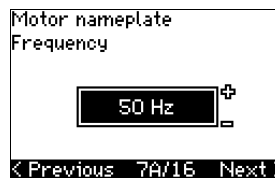


Set the rated speed according to the pump nameplate:

- 0-9999 min⁻¹.

The factory setting depends on previous selections. Based on the set rated speed, the CUE will automatically set the motor frequency to 50 or 60 Hz.

10.4.9 Frequency (7A/16)



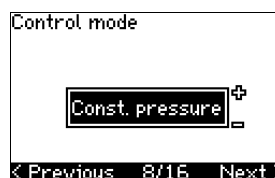
This display appears only if manual entry of the frequency is required.

Set the frequency according to the motor nameplate:

- 40-200 Hz

The factory setting depends on previous selections.

10.4.10 Control mode (8/16)



Select the desired control mode. See section 10.8.1 Control mode (3.1).

- Open loop
- Constant pressure
- Constant differential pressure
- Proportional differential pressure
- Constant flow rate
- Constant temperature
- Constant level
- Constant other value.

The possible settings and the factory setting depend on the pump family.

The CUE will give an alarm if the control mode selected requires a sensor and no sensor has been installed. To continue the setting without a sensor, select "Open loop", and proceed. When a sensor has been connected, set the sensor and control mode in the "INSTALLATION" menu.

10.4.11 Rated flow rate (8A/16)

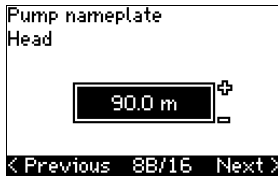


This display appears only if the control mode selected is proportional differential pressure.

Set the rated flow rate according to the pump nameplate:

- 1-6550 m³/h.

10.4.12 Rated head (8B/16)



This display only appears if the control mode selected is proportional differential pressure.

Set the rated head according to the pump nameplate:

- 1-999 m.

10.4.13 Sensor connected to terminal 54 (9/16)



Set the measuring range of the connected sensor with a signal range of 4-20 mA. The measuring range depends on the control mode selected:

Proportional differential pressure: Constant differential pressure:

- | | |
|------------------|------------------|
| • 0-0.6 bar | • 0-0.6 bar |
| • 0-1 bar | • 0-1.6 bar |
| • 0-1.6 bar | • 0-2.5 bar |
| • 0-2.5 bar | • 0-4 bar |
| • 0-4 bar | • 0-6 bar |
| • 0-6 bar | • 0-10 bar |
| • 0-10 bar | • Other. |
| • Other. | |

Constant pressure:

- 0-2.5 bar
- 0-4 bar
- 0-6 bar
- **0-10 bar**
- 0-16 bar
- 0-25 bar
- Other.

Constant flow rate:

- 1-5 m³/h
- **2-10 m³/h**
- 6-30 m³/h
- 15-75 m³/h
- Other.

Constant temperature:

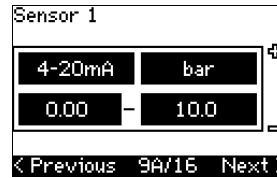
- **-25 to 25 °C**
- 0 to 25 °C
- 50 to 100 °C
- 0 to 150 °C
- Other.

Constant level:

- 0-0.1 bar
- 0-1 bar
- 0-2.5 bar
- 0-6 bar
- 0-10 bar
- Other.

If the control mode selected is "Constant other value", or if the measuring range selected is "Other", the sensor must be set according to the next section, display 9A/16.

10.4.14 Another sensor connected to terminal 54 (9A/16)

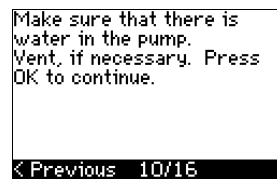


This display only appears when the control mode "Constant other value" or the measuring range "Other" has been selected in display 9/16.

- Sensor output signal:
0-20 mA
4-20 mA.
- Unit of measurement of sensor:
bar, mbar, m, kPa, psi, ft, m³/h, m³/min, m³/s, l/h, l/min, l/s, gal/h, gal/m, gal/s, ft³/min, ft³/s, °C, °F, %.
- Sensor measuring range.

The measuring range depends on the sensor connected and the measuring unit selected.

10.4.15 Priming and venting (10/16)



See the installation and operating instructions of the pump.

The general setting of the CUE is now completed, and the startup guide is ready for setting the direction of rotation:

- Press [OK] to go on to automatic or manual setting of the direction of rotation.

10.4.16 Automatic setting of the direction of rotation (11/16)



Warning

During the test, the pump will run for a short time. Ensure that no personnel or equipment is in danger!

Before setting the direction of rotation, the CUE will make an automatic motor adaptation of certain pump types. This will take a few minutes. The adaptation is carried out during standstill.

Note

The CUE automatically tests and sets the correct direction of rotation without changing the cable connections.

This test is not suitable for certain pump types and will in certain cases not be able to determine with certainty the correct direction of rotation. In these cases, the CUE changes over to manual setting where the direction of rotation is determined on the basis of the installer's observations.

The CUE will now make a motor parameter test and check if the pump is turning in the right...

< Previous 11/16 Next >

...direction. If not, the direction of rotation will automatically be changed. Make sure...

< Previous 11/16 Next >

...that the system is open for flow. The pump will be running during the test. Press OK to continue.

< Previous 11/16

Information displays.

- Press [OK] to continue.

The pump will start in 10 secs. To cancel, press any button.

0 % 100 %

12/16

The pump starts after 10 seconds.

It is possible to interrupt the test and return to the previous display.

Testing the direction of rotation. To interrupt, press any button.

0 % 100 %

13/16

The pump runs with both directions of rotation and stops automatically.

It is possible to interrupt the test, stop the pump and go to manual setting of the direction of rotation.

Test completed and correct direction of rotation is now set. Press OK to continue.

< Previous 14/16

The correct direction of rotation has now been set.

- Press [OK] to set the setpoint. See section 10.4.17 *Setpoint (15/16)*.

It could not automatically be determined if the direction of rotation is correct. Press OK to go to manual test.

< Previous 13/16

The automatic setting of the direction of rotation has failed.

- Press [OK] to go to manual setting of the direction of rotation.

10.4.18 General settings are completed (16/16)

General settings successfully completed. Press OK to continue.

< Previous 16/16

- Press [OK] to make the pump ready for operation or start the pump in the "Normal" operating mode. Then display 1.1 of the "OPERATION" menu will appear.

10.4.19 Manual setting when the direction of rotation is visible (13/16)

It must be possible to observe the motor fan or shaft.

Manual direction of rotation test. Observe the direction of rotation while...

< Previous 13/16 Next >

... the pump is running for a few seconds. Press OK to continue.

< Previous 13/16

Information displays.

- Press [OK] to continue.

The pump will start in 10 secs. To cancel, press any button.

0 % 100 %

13/16

The pump starts after 10 seconds.

It is possible to interrupt the test and return to the previous display.

Feedback

0.00 bar

Motor current

0.00 A

13/16

The pressure will be shown during the test if a pressure sensor is connected. The motor current is always shown during the test.

Is the direction of rotation correct?

Yes

< Previous 13/16 Next >

State if the direction of rotation is correct.

• Yes

Test completed and correct direction of rotation is now set. Press OK to continue.

< Previous 14/16

The correct direction of rotation has now been set.

- Press [OK] to set the setpoint. See section 10.4.17 *Setpoint (15/16)*.

• No

The direction of rotation will be changed, and a new test be made. Press OK to continue.

< Previous 13/16

The direction of rotation is not correct.

- Press [OK] to repeat the test with the opposite direction of rotation.

Setpoint

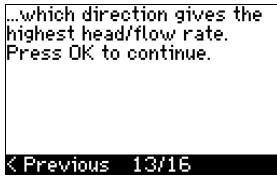
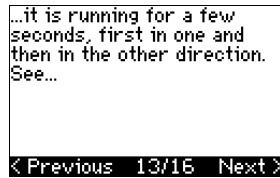
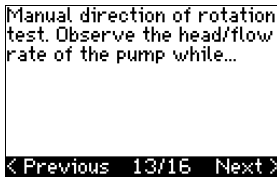
8.00 bar

< Previous 15/16 Next >

Set the setpoint according to the control mode and sensor selected.

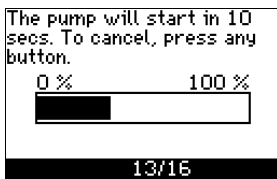
10.4.20 Manual setting when the direction of rotation is not visible (13/16)

It must be possible to observe the head or flow rate.



Information displays.

- Press [OK] to continue.

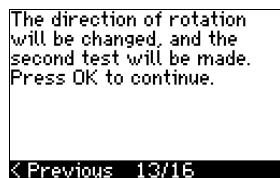
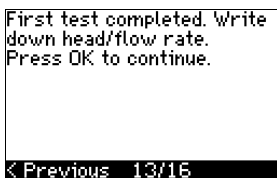


The pump starts after 10 seconds.

It is possible to interrupt the test and return to the previous display.

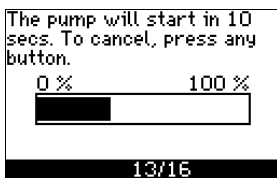


The pressure will be shown during the test if a pressure sensor is connected. The motor current is always shown during the test.



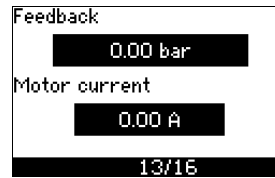
The first test is completed.

- Write down the pressure and/or flow rate, and press OK to continue the manual test with the opposite direction of rotation.

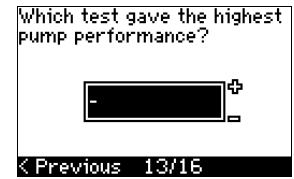
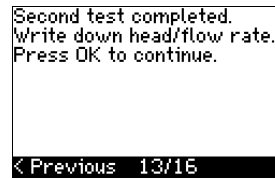


The pump starts after 10 seconds.

It is possible to interrupt the test and return to the previous display.



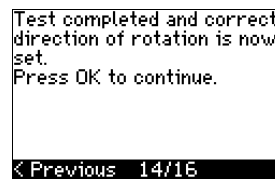
The pressure will be shown during the test if a pressure sensor is connected. The motor current is always shown during the test.



The second test is completed.

Write down the pressure and/or flow rate, and state which test gave the highest pump performance:

- First test
- Second test
- Perform new test.



The correct direction of rotation has now been set.

- Press [OK] to set the setpoint. See section 10.4.17 Setpoint (15/16).

10.5 GENERAL

Note

If the startup guide is started, all previous settings will be erased!

The startup guide must be carried out on a cold motor!

Note

Repeating the startup guide may lead to heating of the motor.

The menu makes it possible to return to the startup guide, which is usually only used during the first startup of the CUE.

10.5.1 Return to startup guide (0.1)



State your choice:

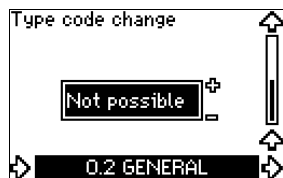
- Yes
- No.

If you select "Yes", all settings will be erased, and the entire startup guide must be completed. The CUE will return to the startup guide, and new settings can be made. Additional settings and the settings available in section 10. *Setting by means of the control panel* will not require a reset.

Back to factory settings

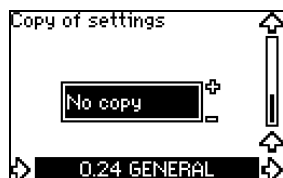
Press [On/Off], [OK] and [+] for a complete reset to factory settings.

10.5.2 Type code change (0.2)



This display is for service use only.

10.5.3 Copy of settings



It is possible to copy the settings of a CUE and reuse them in another one.

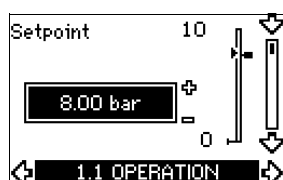
Options:

- No copy.
- to CUE (copies the settings of the CUE).
- to control panel (copies the settings to another CUE).

The CUE units must have the same firmware version. See section 10.7.16 *Firmware version (2.16)*.

10.6 OPERATION

10.6.1 Setpoint (1.1)



- ▶ Setpoint set
- Actual setpoint
- Actual value

Set the setpoint in the units of the feedback sensor.

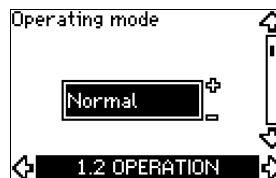
In "Open loop" control mode, the setpoint is set in % of the maximum performance. The setting range will be between the min. and max. curves. See fig. 55.

In all other control modes except proportional differential pressure, the setting range is equal to the sensor measuring range. See fig. 56.

In "Proportional differential pressure" control mode, the setting range is equal to 25 % to 90 % of max. head. See fig. 57.

If the pump is connected to an external setpoint signal, the value in this display will be the maximum value of the external setpoint signal. See section 13.2 *External setpoint*.

10.6.2 Operating mode (1.2)



Set one of the following operating modes:

- **Normal** (duty)
- Stop
- Min.
- Max.

The operating modes can be set without changing the setpoint setting.

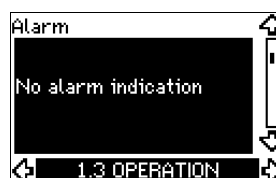
10.6.3 Fault indications

Faults may result in two types of indication: Alarm or warning.

An alarm will activate an alarm indication in CUE and cause the pump to change operating mode, typically to stop. However, for some faults resulting in alarm, the pump is set to continue operating even if there is an alarm.

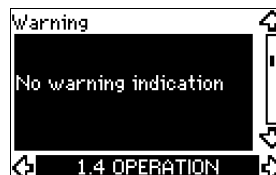
A warning will activate a warning indication in CUE, but the pump will not change operating or control mode.

Alarm (1.3)



In case of an alarm, the cause will appear in the display. See section 15.1 *Warning and alarm list*.

Warning (1.4)

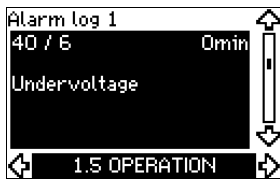


In case of a warning, the cause will appear in the display. See section 15.1 *Warning and alarm list*.

10.6.4 Fault log

For both fault types, alarm and warning, the CUE has a log function.

Alarm log (1.5 - 1.9)

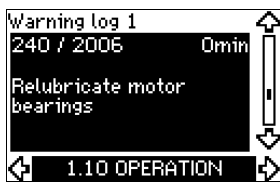


In case of an alarm, the last five alarm indications will appear in the alarm log. "Alarm log 1" shows the latest alarm, "Alarm log 2" shows the latest alarm but one, etc.

The display shows three pieces of information:

- the alarm indication
- the alarm code
- the number of minutes the pump has been connected to the power supply after the alarm occurred.

Warning log (1.10 - 1.14)



In case of a warning, the last five warning indications will appear in the warning log. "Warning log 1" shows the latest fault, "Warning log 2" shows the latest fault but one, etc.

The display shows three pieces of information:

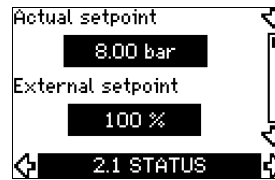
- the warning indication
- the warning code
- the number of minutes the pump has been connected to the power supply after the warning occurred.

10.7 STATUS

The displays appearing in this menu are status displays only. It is not possible to change or set values.

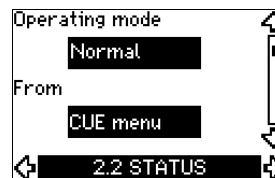
The tolerance of the displayed value is stated under each display. The tolerances are stated as a guide in % of the maximum values of the parameters.

10.7.1 Actual setpoint (2.1)



This display shows the actual setpoint and the external setpoint. The actual setpoint is shown in the units of the feedback sensor. The external setpoint is shown in a range of 0 to 100 %. If the external setpoint influence is deactivated, the value 100 % is shown. See section 13.2 *External setpoint*.

10.7.2 Operating mode (2.2)



This display shows the actual operating mode (Normal, Stop, Min. or Max.). Furthermore, it shows where this operating mode was selected (CUE menu, Bus, External or On/off button).

10.7.3 Actual value (2.3)



This display shows the actual value controlled. If no sensor is connected to the CUE, "-" will appear in the display.

10.7.4 Measured value, sensor 1 (2.4)



This display shows the actual value measured by sensor 1 connected to terminal 54.

If no sensor is connected to the CUE, "-" will appear in the display.

10.7.5 Measured value, sensor 2 (2.5)



This display is only shown if an MCB 114 sensor input module has been installed.

The display shows the actual value measured by sensor 2 connected to an MCB 114.

If no sensor is connected to the CUE, "-" will appear in the display.

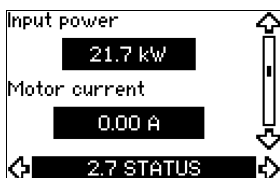
10.7.6 Speed (2.6)



Tolerance: $\pm 5\%$

This display shows the actual pump speed.

10.7.7 Input power and motor current (2.7)



Tolerance: $\pm 10\%$

This display shows the actual pump input power in W or kW and the actual motor current in ampere [A].

10.7.8 Operating hours and power consumption (2.8)



Tolerance: $\pm 2\%$

This display shows the number of operating hours and the power consumption. The value of operating hours is an accumulated value and cannot be reset. The value of power consumption is an accumulated value calculated from the unit's birth, and it cannot be reset.

10.7.9 Lubrication status of motor bearings (2.9)



This display shows how many times the user has given the lubrication stated and when to replace the motor bearings.

When the motor bearings have been relubricated, confirm this action in the "INSTALLATION" menu. See section 10.8.18 *Confirming relubrication/replacement of motor bearings (3.20)*. When relubrication is confirmed, the figure in the above display will be increased by one.

10.7.10 Time until relubrication of motor bearings (2.10)



This display is only shown if display 2.11 is not shown.

The display shows when to relubricate the motor bearings. The controller monitors the operating pattern of the pump and calculates the period between bearing lubrications. If the operating pattern changes, the calculated time until relubrication may change as well.

The estimated time until relubrication takes into account if the pump has been running with reduced speed.

See section 10.8.18 *Confirming relubrication/replacement of motor bearings (3.20)*.

10.7.11 Time until replacement of motor bearings (2.11)



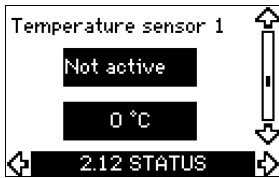
This display is only shown if display 2.10 is not shown.

The display shows when to replace the motor bearings. The controller monitors the operating pattern of the pump and calculates the period between bearing replacements.

The estimated time until replacement of motor bearings takes into account if the pump has been running with reduced speed.

See section 10.8.18 *Confirming relubrication/replacement of motor bearings (3.20)*.

10.7.12 Temperature sensor 1 (2.12)

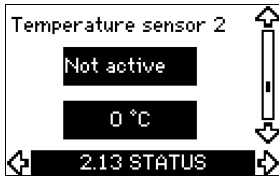


This display is only shown if an MCB 114 sensor input module has been installed.

The display shows the measuring point and the actual value measured by a Pt100/Pt1000 temperature sensor 1 connected to the MCB 114. The measuring point is selected in display 3.21.

If no sensor is connected to the CUE, "-" will appear in the display.

10.7.13 Temperature sensor 2 (2.13)

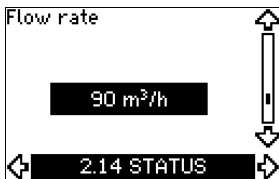


This display is only shown if an MCB 114 sensor input module has been installed.

The display shows the measuring point and the actual value measured by a Pt100/Pt1000 temperature sensor 2 connected to the MCB 114. The measuring point is selected in display 3.22.

If no sensor is connected to the CUE, "-" will appear in the display.

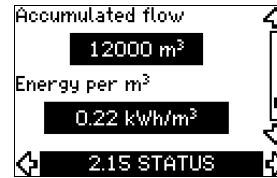
10.7.14 Flow rate (2.14)



This display is only shown if a flowmeter has been configured.

The display shows the actual value measured by a flowmeter connected to the digital pulse input (terminal 33) or the analog input (terminal 54).

10.7.15 Accumulated flow (2.15)



This display is only shown if a flowmeter has been configured.

The display shows the value of the accumulated flow and the specific energy for the transfer of the pumped liquid.

The flow measurement can be connected to the digital pulse input (terminal 33) or the analog input (terminal 54).

10.7.16 Firmware version (2.16)



This display shows the version of the software.

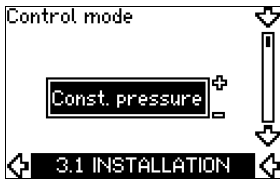
10.7.17 Configuration file (2.17)



This display shows the configuration file.

10.8 INSTALLATION

10.8.1 Control mode (3.1)

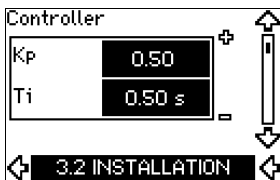


Select one of the following control modes:

- Open loop
- Constant pressure
- Constant differential pressure
- Proportional differential pressure
- Constant flow rate
- Constant temperature
- Constant level
- Constant other value.

Note If the pump is connected to a bus, the control mode cannot be selected via the CUE. See section 13.3 GENIbus signal.

10.8.2 Controller (3.2)



The CUE has a factory setting of gain (K_p) and integral time (T_i). However, if the factory setting is not the optimum setting, the gain and the integral time can be changed in the display.

- The gain (K_p) can be set within the range from 0.1 to 20.
- The integral time (T_i) can be set within the range from 0.1 to 3600 s. If you select 3600 s, the controller will function as a P controller.
- Furthermore, it is possible to set the controller to inverse control, meaning that if the setpoint is increased, the speed will be reduced. In the case of inverse control, the gain (K_p) must be set within the range from -0.1 to -20.

The table below shows the suggested controller settings:

System/application	K_p		T_i
	Heating system ¹⁾	Cooling system ²⁾	
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	- 2.5		100
	0.5	- 0.5	$10 + 5L_2$
	0.5		$10 + 5L_2$
	0.5	- 0.5	$30 + 5L_2^*$
	0.5		0.5^*
	0.5		$L_1 < 5 \text{ m: } 0.5^*$ $L_1 > 5 \text{ m: } 3^*$ $L_1 > 10 \text{ m: } 5^*$

* $T_i = 100$ seconds (factory setting).

1. Heating systems are systems in which an increase in pump performance will result in a rise in temperature at the sensor.
2. Cooling systems are systems in which an increase in pump performance will result in a drop in temperature at the sensor.

L_1 = Distance in [m] between pump and sensor.

L_2 = Distance in [m] between heat exchanger and sensor.

How to set the PI controller

For most applications, the factory setting of the controller constants K_p and T_i will ensure optimum pump operation. However, in some applications an adjustment of the controller may be needed.

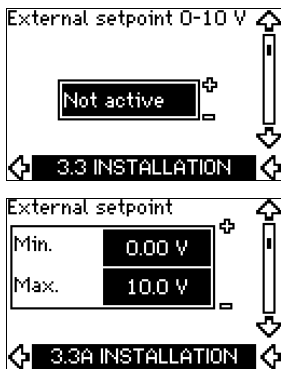
Proceed as follows:

1. Increase the gain (K_p) until the motor becomes unstable. Instability can be seen by observing if the measured value starts to fluctuate. Furthermore, instability is audible as the motor starts hunting up and down. As some systems, such as temperature controls, are slow-reacting, it may be difficult to observe that the motor is unstable.
2. Set the gain (K_p) to half the value of the value which made the motor unstable. This is the correct setting of the gain.
3. Reduce the integral time (T_i) until the motor becomes unstable.
4. Set the integral time (T_i) to twice the value which made the motor unstable. This is the correct setting of the integral time.

General rules of thumb:

- If the controller is too slow-reacting, increase K_p .
- If the controller is hunting or unstable, dampen the system by reducing K_p or increasing T_i .

10.8.3 External setpoint (3.3)



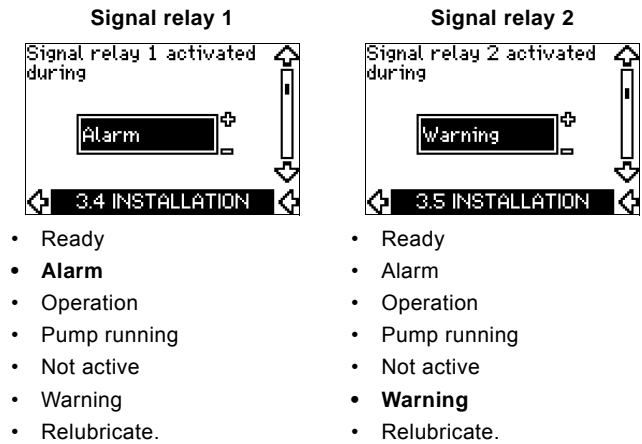
The input for external setpoint signal (terminal 53) can be set to the following types:

- Active
- **Not active.**

If you select "Active", the actual setpoint is influenced by the signal connected to the external setpoint input. See section 13.2 *External setpoint*.

10.8.4 Signal relays 1 and 2 (3.4 and 3.5)

The CUE has two signal relays. In the display below, select in which operating situations the signal relay should be activated.



Note

For the distinction between alarm and warning, see section 10.6.3 *Fault indications*.

10.8.5 Buttons on the CUE (3.6)



The editing buttons (+, -, On/Off, OK) on the control panel can be set to these values:

- **Active**
- Not active.

When set to "Not active" (locked), the editing buttons do not function. Set the buttons to "Not active" if the pump should be controlled via an external control system.

Activate the buttons by pressing the arrow up and arrow down buttons simultaneously for 3 seconds.

10.8.6 Protocol (3.7)



This display shows the protocol selection for the RS-485 port of the CUE. The protocol can be set to these values:

- **GENIbus**
- FC
- FC MC.

If you select "GENIbus", the communication is set according to the Grundfos GENIbus standard. FC and FC MC are for service purposes only.

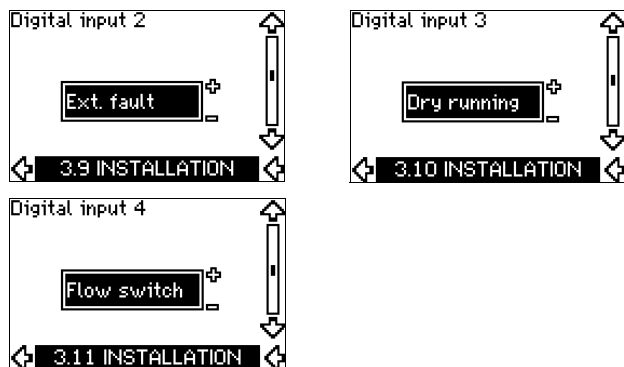
10.8.7 Pump number (3.8)



This display shows the GENibus number. A number between 1 and 199 can be allocated to the pump. In the case of bus communication, a number must be allocated to each pump.

The factory setting is "-".

10.8.8 Digital inputs 2, 3 and 4 (3.9 to 3.11)



The digital inputs of the CUE (terminal 19, 32 and 33) can be set individually to different functions.

Select one of the following functions:

- Min. (min. curve)
- Max. (max. curve)
- Ext. fault (external fault)
- Flow switch
- Alarm reset
- Dry running (from external sensor)
- Accumulated flow (pulse flow, only terminal 33)
- Not active.

The selected function is active when the digital input is activated (closed contact). See also section 13.1 *Digital inputs*.

Min.

When the input is activated, the pump will operate according to the min. curve.

Max.

When the input is activated, the pump will operate according to the max. curve.

Ext. fault

When the input is activated, a timer will be started. If the input is activated for more than 5 seconds, an external fault will be indicated. If the input is deactivated, the fault condition will cease and the pump can only be restarted manually by resetting the fault indication.

Flow switch

When this function is selected, the pump will be stopped when a connected flow switch detects low flow.

It is only possible to use this function if the pump is connected to a pressure sensor or a level sensor, and the stop function is activated. See sections 10.8.11 *Constant pressure with stop function* (3.14) and 10.8.12 *Constant level with stop function* (3.14).

Alarm reset

When the input has been activated, the alarm is reset if the cause of the alarm no longer exists.

Dry running

When this function is selected, lack of inlet pressure or water shortage can be detected. This requires the use of an accessory, such as:

- a Grundfos Liqtec® dry-running switch
- a pressure switch installed on the suction side of a pump
- a float switch installed on the suction side of a pump.

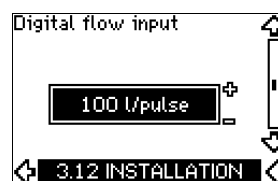
When lack of inlet pressure or water shortage (dry running) is detected, the pump will be stopped. The pump cannot restart as long as the input is activated.

Restarts may be delayed by up to 30 minutes, depending of the pump family.

Accumulated flow

When this function is set for digital input 4 and a pulse sensor is connected to terminal 33, the accumulated flow can be measured.

10.8.9 Digital flow input (3.12)



This display appears only if a flowmeter has been configured in display 3.11.

The display is used for setting the volume for every pulse for the "Accumulated flow" function with a pulse sensor connected to terminal 33.

Setting range:

- 0-1000 litres/pulse.

The volume can be set in the unit selected in the startup guide.

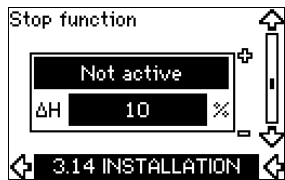
10.8.10 Analog output (3.13)



The analog output can be set to show one of the following options:

- Feedback
- Power input
- Speed
- Output frequency
- External sensor
- Limit 1 exceeded
- Limit 2 exceeded
- Not active.

10.8.11 Constant pressure with stop function (3.14)



Settings

The stop function can be set to these values:

- Active
- **Not active.**

The on/off band can be set to these values:

- ΔH is factory-set to 10 % of the actual setpoint.
- ΔH can be set within the range from 5 % to 30 % of the actual setpoint.

Description

The stop function is used for changing between on/off operation at low flow and continuous operation at high flow.

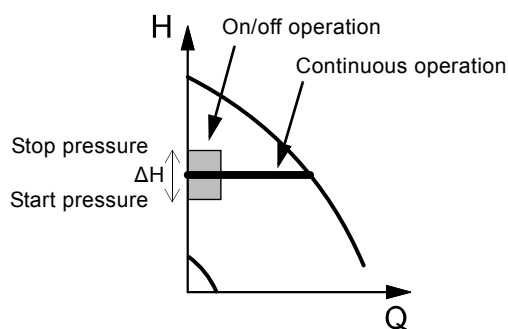


Fig. 49 Constant pressure with stop function.
Difference between start and stop pressures (ΔH)

Low flow can be detected in two different ways:

1. A built-in "low-flow detection function" which functions if the digital input is not set up for flow switch.
2. A flow switch connected to the digital input.

1. Low-flow detection function

The pump will check the flow regularly by reducing the speed for a short time. If there is no or only a small change in pressure, this means that there is low flow.

The speed will be increased until the stop pressure (actual setpoint + $0.5 \times \Delta H$) is reached and the pump will stop after a few seconds. The pump will restart at the latest when the pressure has fallen to the start pressure (actual setpoint - $0.5 \times \Delta H$).

If the flow in the off period is higher than the low-flow limit, the pump will restart before the pressure has fallen to the start pressure.

When restarting, the pump will react in the following way:

1. If the flow is higher than the low-flow limit, the pump will return to continuous operation at constant pressure.
2. If the flow is lower than the low-flow limit, the pump will continue in start/stop operation. It will continue in start/stop operation until the flow is higher than the low-flow limit. When the flow is higher than the low-flow limit, the pump will return to continuous operation.

2. Low-flow detection with flow switch

When the digital input is activated because there is low flow, the speed will be increased until the stop pressure (actual setpoint + $0.5 \times \Delta H$) is reached, and the pump will stop. When the pressure has fallen to start pressure, the pump will start again. If there is still no flow, the pump will reach the stop pressure and stop. If there is flow, the pump will continue operating according to the setpoint.

Operating conditions for the stop function

It is only possible to use the stop function if the system incorporates a pressure sensor, a non-return valve and a diaphragm tank.

The non-return valve must always be installed before the pressure sensor. See figures 50 and 51.

Caution

If a flow switch is used to detect low flow, the switch must be installed on the system side after the diaphragm tank.

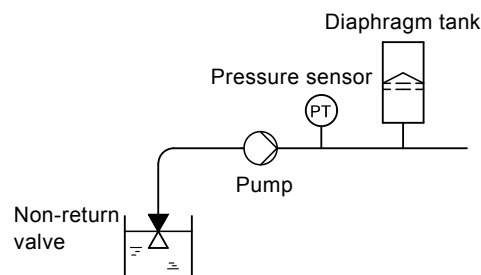


Fig. 50 Position of the non-return valve and pressure sensor in system with suction lift operation

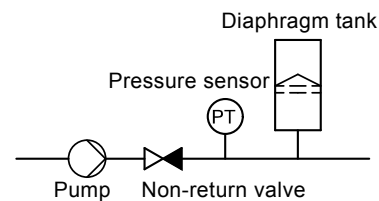


Fig. 51 Position of the non-return valve and pressure sensor in system with positive inlet pressure

Diaphragm tank

The stop function requires a diaphragm tank of a certain minimum size. The tank must be installed as close as possible after the pump and the precharge pressure must be $0.7 \times$ actual setpoint. Recommended diaphragm tank size:

Rated flow rate of pump [m ³ /h]	Typical diaphragm tank size [litres]
0-6	8
7-24	18
25-40	50
41-70	120
71-100	180

If a diaphragm tank of the above size is installed in the system, the factory setting of ΔH is the correct setting.

If the tank installed is too small, the pump will start and stop too often. This can be remedied by increasing ΔH .

10.8.12 Constant level with stop function (3.14)



Settings

The stop function can be set to these values:

- Active
- **Not active.**

The on/off band can be set to these values:

- ΔH is factory-set to 10 % of the actual setpoint.
- ΔH can be set within the range from 5 % to 30 % of the actual setpoint.

A built-in low-flow detection function will automatically measure and store the power consumption at approx. 50 % and 85 % of the rated speed.

If you select "Active", proceed as follows:

1. Close the isolating valve to create a no-flow condition.
2. Press [OK] to start the auto-tuning.

Description

The stop function is used for changing between on/off operation at low flow and continuous operation at high flow.

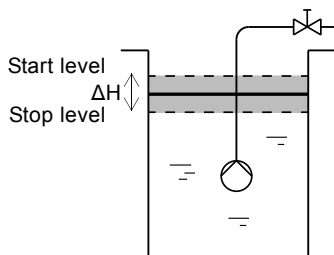


Fig. 52 Constant level with stop function. Difference between start and stop levels (ΔH)

Low flow can be detected in two different ways:

1. With the built-in low-flow detection function.
2. With a flow switch connected to a digital input.

1. Low-flow detection function

The built-in low-flow detection is based on the measurement of speed and power.

When low flow is detected, the pump will stop. When the level has reached the start level, the pump will start again. If there is still no flow, the pump will reach the stop level and stop. If there is flow, the pump will continue operating according to the setpoint.

2. Low-flow detection with flow switch

When the digital input is activated because of low flow, the speed will be increased until the stop level (actual setpoint - $0.5 \times \Delta H$) is reached, and the pump will stop. When the level has reached the start level, the pump will start again. If there is still no flow, the pump will reach the stop level and stop. If there is flow, the pump will continue operating according to the setpoint.

Operating conditions for the stop function

It is only possible to use the constant level stop function if the system incorporates a level sensor, and all valves can be closed.

10.8.13 Sensor 1 (3.15)

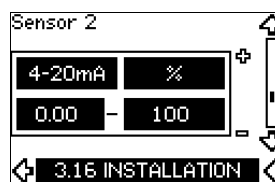


Setting of sensor 1 connected to terminal 54. This is the feedback sensor.

Select among the following values:

- Sensor output signal:
 - 0-20 mA
 - 4-20 mA.
- Sensor unit of measurement:
 - bar, mbar, m, kPa, psi, ft, m^3/h , m^3/s , l/s, gpm, °C, °F, %.
- Sensor measuring range.

10.8.14 Sensor 2 (3.16)



Setting of sensor 2 connected to an MCB 114 sensor input module.

Select among the following values:

- Sensor output signal:
 - 0-20 mA
 - 4-20 mA.**
- Sensor unit of measurement:
 - bar, mbar, m, kPa, psi, ft, m^3/h , m^3/s , l/s, gpm, °C, °F, %.
- Sensor measuring range:
 - 0-100 %.

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10.8.15 Duty/standby (3.17)

**Settings**

The duty/standby function can be set to these values:

- Active
- **Not active.**

Activate the duty/standby function as follows:

1. Connect one of the pumps to the mains supply. Set the duty/standby function to "Not active". Make the necessary settings in the "OPERATION" and "INSTALLATION" menus.
2. Set the operating mode to "Stop" in the "OPERATION" menu.
3. Connect the other pump to the mains supply. Make the necessary settings in the "OPERATION" and "INSTALLATION" menus. Set the duty/standby function to "Active".

The running pump will search for the other pump and automatically set the duty/standby function of this pump to "Active". If it cannot find the other pump, a fault will be indicated.

Note The two pumps must be connected electrically via the GENibus, and nothing else must be connected on the GENibus.

The duty/standby function applies to two pumps connected in parallel and controlled via GENibus. Each pump must be connected to its own CUE and sensor.

The primary targets of the function is the following:

- To start the standby pump if the duty pump is stopped due to an alarm.
- To alternate the pumps at least every 24 hours.

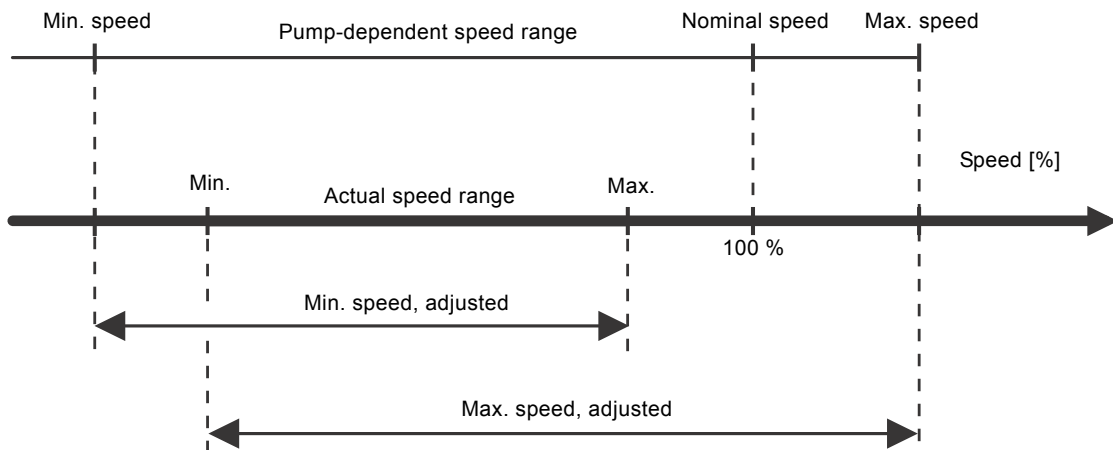
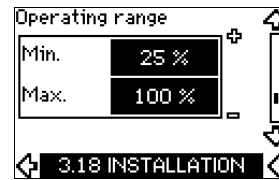


Fig. 53 Setting of the min. and max. curves in % of maximum performance

10.8.16 Operating range (3.18)



How to set the operating range:

- Set the min. speed within the range from a pump-dependent min. speed to the adjusted max. speed. The factory setting depends on the pump family.
- Set the max. speed within the range from adjusted min. speed to the pump-dependent max. speed. The factory setting will be equal to 100 %, i.e. the speed stated on the pump nameplate.

The area between the min. and max. speed is the actual operating range of the pump.

The operating range can be changed by the user within the pump-dependent speed range.

For some pump families, oversynchronous operation (max. speed above 100 %) will be possible. This requires an oversize motor to deliver the shaft power required by the pump during oversynchronous operation.

10.8.17 Motor bearing monitoring (3.19)



The motor bearing monitoring function can be set to these values:

- **Active**
- Not active.

When the function is set to "Active", the CUE will give a warning when the motor bearings are due to be relubricated or replaced.

Description

The motor bearing monitoring function is used to give an indication when it is time to relubricate or replace the motor bearings. See displays 2.10 and 2.11.

The warning indication and the estimated time take into account if the pump has been running with reduced speed. The bearing temperature is included in the calculation if temperature sensors are installed and connected to an MCB 114 sensor input module.

Note The counter will continue counting even if the function is switched to "Not active", but a warning will not be given when it is time for relubrication.

10.8.18 Confirming relubrication/replacement of motor bearings (3.20)



This function can be set to these values:

- Relubricated
- Replaced
- **Nothing done.**

When the motor bearings have been relubricated or replaced, confirm this action in the above display by pressing [OK].

Note Relubricated cannot be selected for a period of time after confirming relubrication.

Relubricated

When the warning "Relubricate motor bearings" has been confirmed,

- the counter is set to 0.
- the number of relubrications is increased by 1.

When the number of relubrications has reached the permissible number, the warning "Replace motor bearings" appears in the display.

Replaced

When the warning "Replace motor bearings" has been confirmed,

- the counter is set to 0.
- the number of relubrications is set to 0.
- the number of bearing changes is increased by 1.

10.8.19 Temperature sensor 1 (3.21)

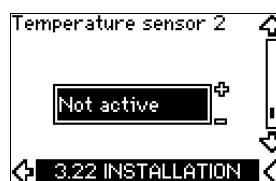


This display is only shown if an MCB 114 sensor input module has been installed.

Select the function of a Pt100/Pt1000 temperature sensor 1 connected to an MCB 114:

- D-end bearing
- ND-end bearing
- Other liq. temp. 1
- Other liq. temp. 2
- Motor winding
- Pumped liq. temp.
- Ambient temp.
- Not active.

10.8.20 Temperature sensor 2 (3.22)



This display is only shown if an MCB 114 sensor input module has been installed.

Select the function of a Pt100/Pt1000 temperature sensor 2 connected to an MCB 114:

- D-end bearing
- ND-end bearing
- Other liq. temp. 1
- Other liq. temp. 2
- Motor winding
- Pumped liq. temp.
- Ambient temp.
- Not active.

10.8.21 Standstill heating (3.23)



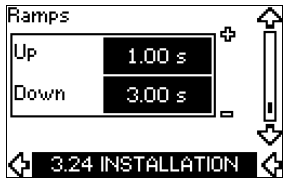
The standstill heating function can be set to these values:

- Active
- **Not active.**

When the function is set to "Active" and the pump is stopped by a stop command, a current will be applied to the motor windings.

The standstill heating function pre-heats the motor to avoid condensation.

10.8.22 Ramps (3.24)

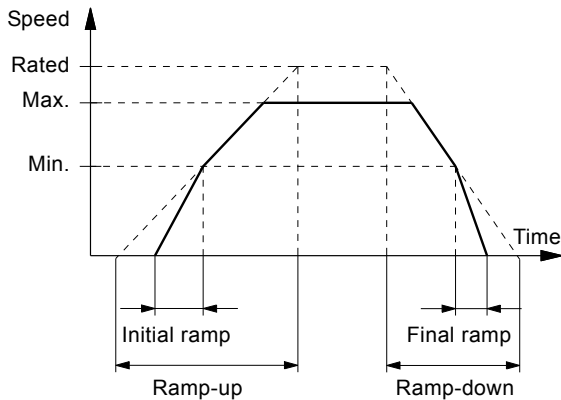


Set the time for each of the two ramps, ramp-up and ramp-down:

- Factory setting:
Depending on power size.
- The range of the ramp parameter:
1-3600 s.

The ramp-up time is the acceleration time from 0 min⁻¹ to the rated motor speed. Choose a ramp-up time such that the output current does not exceed the maximum current limit for the CUE.

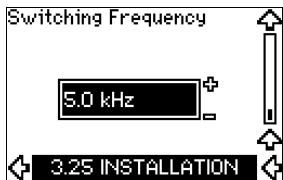
The ramp-down time is the deceleration time from rated motor speed to 0 min⁻¹. Choose a ramp-down time such that no overvoltage arises and such that the generated current does not exceed the maximum current limit for the CUE.



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Fig. 54 Ramp-up and ramp-down, display 3.24

10.8.23 Switching frequency (3.25)



The switching frequency can be changed. The options in the menu depend on the power size of the CUE. Changing the switching frequency to a higher level will increase the losses and thus increase the temperature of the CUE.

We do not recommend increasing the switching frequency if the ambient temperature is high.

11. Setting by means of PC Tool E-products

Special setup requirements differing from the settings available via the CUE require the use of Grundfos PC Tool E-products. This again requires the assistance of a Grundfos service engineer. Contact your local Grundfos company for more information.

12. Priority of settings



The on/off button has the highest priority. In "off" condition, pump operation is not possible.

The CUE can be controlled in various ways at the same time. If two or more operating modes are active at the same time, the operating mode with the highest priority will be in force.

12.1 Control without bus signal, local operating mode

Priority	CUE menu	External signal
1	Stop	
2	Max.	
3		Stop
4		Max.
5	Min.	Min.
6	Normal	Normal

Example: If an external signal has activated the "Max." operating mode, it will only be possible to stop the pump.

12.2 Control with bus signal, remote-controlled operating mode

Priority	CUE menu	External signal	Bus signal
1	Stop		
2	Max.		
3		Stop	Stop
4			Max.
5			Min.
6			Normal

Example: If the bus signal has activated the "Max." operating mode, it will only be possible to stop the pump.

13. External control signals

13.1 Digital inputs

The overview shows functions in connection with closed contact.

Terminal	Type	Function
18	DI 1	<ul style="list-style-type: none"> Start/stop of pump
19	DI 2	<ul style="list-style-type: none"> Min. (min. curve) Max. (max. curve) Ext. fault (external fault) Flow switch Alarm reset Dry running (from external sensor) Not active.
32	DI 3	<ul style="list-style-type: none"> Min. (min. curve) Max. (max. curve) Ext. fault (external fault) Flow switch Alarm reset Dry running (from external sensor) Not active.
33	DI 4	<ul style="list-style-type: none"> Min. (min. curve) Max. (max. curve) Ext. fault (external fault) Flow switch Alarm reset Dry running (from external sensor) Accumulated flow (pulse flow) Not active.

The same function must not be selected for more than one input.

13.2 External setpoint

Terminal	Type	Function
53	AI 1	External setpoint (0-10 V)

The setpoint can be remote-set by connecting an analog signal transmitter to the setpoint input (terminal 53).

Open loop

In "Open loop" control mode (constant curve), the actual setpoint can be set externally within the range from the min. curve to the setpoint set via the CUE menu. See fig. 55.

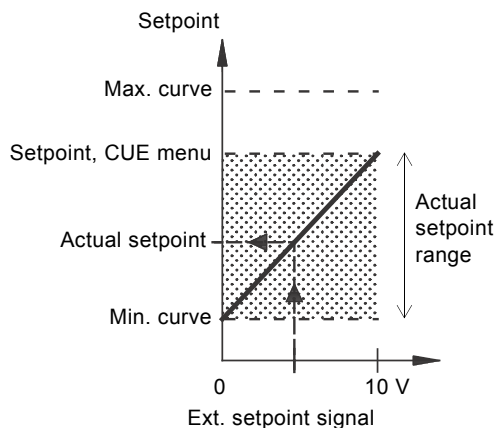


Fig. 55 Relation between the actual setpoint and the external setpoint signal in "Open loop" control mode

Closed loop

In all other control modes, except proportional differential pressure, the actual setpoint can be set externally within the range from the lower value of the sensor measuring range (sensor min.) to the setpoint set via the CUE menu. See fig. 56.

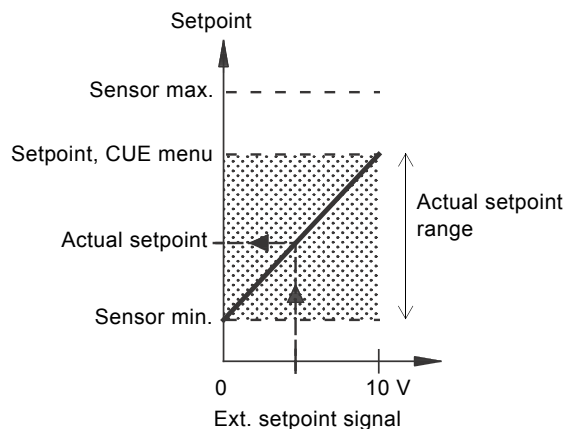


Fig. 56 Relation between the actual setpoint and the external setpoint signal in "Controlled" control mode

Example: At a sensor min. value of 0 bar, a setpoint set via the CUE menu of 3 bar and an external setpoint of 80 %, the actual setpoint will be as follows:

$$\begin{aligned}
 \text{Actual setpoint} &= (\text{setpoint set via the CUE menu} - \text{sensor min.}) \\
 &\quad \times \% \text{ external setpoint signal} + \text{sensor min.} \\
 &= (3 - 0) \times 80 \% + 0 \\
 &= 2.4 \text{ bar}
 \end{aligned}$$

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Proportional differential pressure

In "Proportional differential pressure" control mode, the actual setpoint can be set externally within the range from 25 % of maximum head to the setpoint set via the CUE menu. See fig. 57.

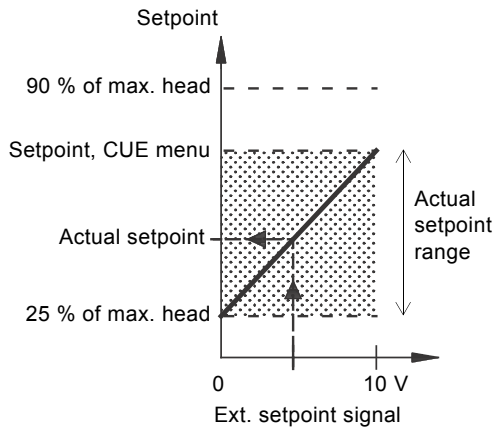


Fig. 57 Relation between the actual setpoint and the external setpoint signal in "Proportional differential pressure" control mode

Example: At a maximum head of 12 metres, a setpoint of 6 metres set via the CUE menu and an external setpoint of 40 %, the actual setpoint will be as follows:

$$\begin{aligned} \text{Actual setpoint} &= (\text{setpoint, CUE menu} - 25 \% \text{ of maximum head}) \times \% \text{ external setpoint signal} + 25 \% \text{ of maximum head} \\ &= (6 - 12 \times 25 \%) \times 40 \% + 12/4 \\ &= 4.2 \text{ m} \end{aligned}$$

13.3 GENibus signal

The CUE supports serial communication via an RS-485 input. The communication is carried out according to the Grundfos GENibus protocol and enables connection to a building management system or another external control system.

Operating parameters, such as setpoint and operating mode, can be remote-set via the bus signal. At the same time, the pump can provide status information about important parameters, such as actual value of control parameter, input power and fault indications.

Contact Grundfos for further details.

Note If a bus signal is used, the number of settings available via the CUE will be reduced.

13.4 Other bus standards

Grundfos offers various bus solutions with communication according to other standards.

Contact Grundfos for further details.

14. Maintenance and service

14.1 Cleaning the CUE

Keep the cooling fins and fan blades clean to ensure sufficient cooling of the CUE.

14.2 Service parts and service kits

For further information on service parts and service kits, visit www.grundfos.com > Grundfos Product Center.

15. Fault finding

15.1 Warning and alarm list

Code and display text	Status			Operating mode	Resetting
	Warning	Alarm	Locked alarm		
1 Too high leakage current			•	Stop	Man.
2 Mains phase failure		•		Stop	Aut.
3 External fault		•		Stop	Man.
16 Other fault		•		Stop	Aut.
30 Replace motor bearings	•			-	Man. ³⁾
32 Overvoltage	•	•		Stop	Aut.
40 Undervoltage	•			-	Aut.
48 Overload		•		Stop	Aut.
49 Overload		•	•	Stop	Man.
55 Overload	•			-	Aut.
57 Dry running		•		Stop	Aut.
64 Too high CUE temperature		•		Stop	Aut.
70 Too high motor temperature		•		Stop	Aut.
77 Communication fault, duty/standby	•			-	Aut.
89 Sensor 1 outside range		•		1)	Aut.
91 Temperature sensor 1 outside range	•			-	Aut.
93 Sensor 2 outside range	•			-	Aut.
96 Setpoint signal outside range		•		1)	Aut.
148 Too high bearing temperature	•	•		-	Aut.
149 Too high bearing temperature	•			-	Aut.
155 Inrush fault		•		Stop	Aut.
175 Temperature sensor 2 outside range	•			-	Aut.
240 Relubricate motor bearings	•			-	Man. ³⁾
241 Motor phase failure	•	•		-	Aut.
242 AMA did not succeed ²⁾	•			-	Man.

1) In case of an alarm, the CUE will change the operating mode depending on the pump type.

2) AMA, Automatic Motor Adaptation. Not active in the present software.

3) Warning is reset in display 3.20.

15.2 Resetting of alarms

In case of a fault or malfunction of the CUE, check the alarm list in the "OPERATION" menu. The latest five alarms and latest five warnings can be found in the log menus.

Contact a Grundfos technician if an alarm occurs repeatedly.

15.2.1 Warning

The CUE will continue the operation as long as the warning is active. The warning remains active until the cause no longer exists. Some warnings may switch to alarm condition.

15.2.2 Alarm

In case of an alarm, the CUE will stop the pump or change the operating mode depending on the alarm type and pump type. See section *15.1 Warning and alarm list*.

Pump operation will be resumed when the cause of the alarm has been remedied and the alarm has been reset.

Resetting an alarm manually

- Press [OK] in the alarm display.
- Press [On/Off] twice.
- Activate a digital input DI 2-DI 4 set to "Alarm reset" or the digital input DI 1 (start/stop).

If it is not possible to reset an alarm, the reason may be that the fault has not been remedied, or that the alarm has been locked.

15.2.3 Locked alarm

In case of a locked alarm, the CUE will stop the pump and become locked. Pump operation cannot be resumed until the cause of the locked alarm has been remedied and the alarm has been reset.

Resetting a locked alarm

- Switch off the power supply to the CUE for about 30 seconds. Switch on the power supply, and press OK in the alarm display to reset the alarm.

15.3 Indicator lights

The table shows the function of the indicator lights.

Indicator light	Function
On (green)	The pump is running or has been stopped by a stop function. If flashing, the pump has been stopped by the user (CUE menu), external start/stop or bus.
Off (orange)	The pump has been stopped with the on/off button.
Alarm (red)	Indicates an alarm or a warning.

15.4 Signal relays

The table shows the function of the signal relays.

Type	Function
Relay 1	<ul style="list-style-type: none"> • Ready Pump running • Alarm Warning • Operation Relubricate
Relay 2	<ul style="list-style-type: none"> • Ready Pump running • Alarm Warning • Operation Relubricate

See also fig. 29.

16. Technical data

16.1 Enclosure

The individual CUE cabinet sizes are characterised by their enclosures. The table shows the relationship of enclosure class and enclosure type.

Example:

Read from the nameplate:

- Supply voltage = 3 x 380-500 V.
- Typical shaft power = 1.5 kW.
- Enclosure class = IP20.

The table shows that the CUE enclosure is A2.

Typical shaft power P2		Enclosure										
		1 x 200-240 V			3 x 200-240 V		3 x 380-500 V		3 x 525-600 V		3 x 525-690 V	
[kW]	[HP]	IP20	IP21	IP55	IP20	IP55	IP20	IP55	IP20	IP55	IP21	IP55
0.55	0.75											
0.75	1											
1.1	1.5	A3		A5								
1.5	2				A2	A4	A2	A4	A3	A5		
2.2	3											
3	4		B1	B1								
3.7	5				A3	A5						
4	5						A2	A4				
5.5	7.5		B1	B1								
7.5	10		B2	B2	B3	B1	A3	A5	A3	A5		
11	15											
15	20											
18.5	25				B4	B2	B3	B1			B2	B2
22	30											
30	40				C3	C1	B4	B2				
37	50											
45	60				C4	C2						
55	75						C3	C1			C2	C2
75	100											
90	125						C4	C2				

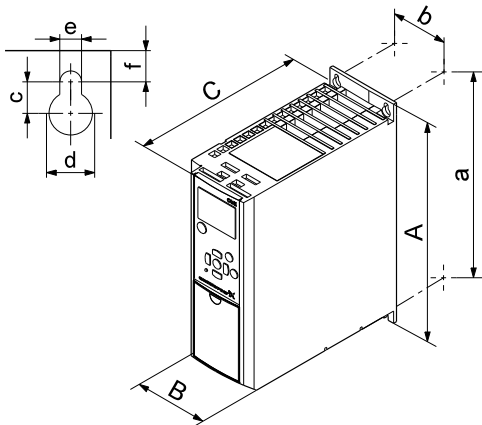
16.2 Cable gland

Select standard gland holes for CUE frequency converters used outside USA and Canada.

Select imperial gland holes for CUE frequency converters used inside USA and Canada.

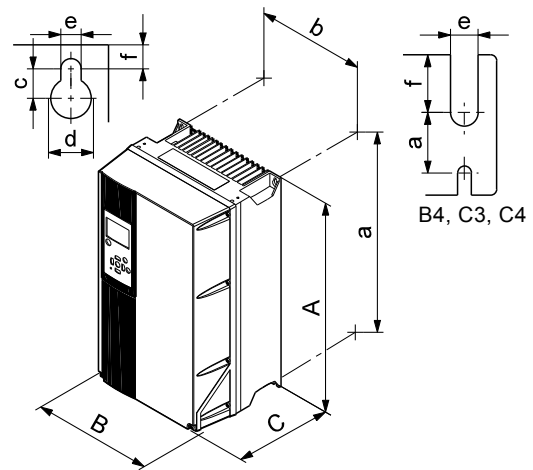
Enclosure	Standard gland holes	Imperial gland holes
A3 IP20/21 / NEMA type 1	3 x 22.5 (1/2")	3 x 22.5 (1/2")
	3 x 28.4 (3/4")	3 x 28.4 (3/4")
A4 IP55 / NEMA type 12	1 x 22.5 (1/2")	1 x 22.5 (1/2")
	3 x 28.4 (3/4")	3 x 28.4 (3/4")
A5 IP55 / NEMA type 12	6 x 26.3	6 x 28.4 (3/4")
B1 IP21 / NEMA type 1	2 x 22.5 (1/2")	2 x 22.5 (1/2")
	3 x 37.2	3 x 34.7 (1")
B1 IP55 / NEMA type 12	2 x 21.5	2 x 22.5 (1/2")
	1 x 26.3	1 x 28.4 (3/4")
	3 x 33.1	3 x 34.7 (1")
B2 IP21 / NEMA type 1 and B2 IP55 / NEMA type 12	1 x 21.5	1 x 22.5 (1/2")
	1 x 26.3	1 x 28.4 (3/4")
	1 x 33.1	1 x 34.7 (1")
	2 x 42.9	2 x 44.2 (1 1/4")

16.3 Main dimensions and weights



TM03 9000 2807

Fig. 58 Enclosures A2 and A3



TM03 9002 2807

Fig. 59 Enclosures A4, A5, B1, B2, B3, B4, C1, C2, C3 and C4

Enclosure	Height [mm] ¹⁾		Width [mm] ¹⁾		Depth [mm] ¹⁾		Screw holes [mm]				Weight [kg]
	A	a	B	b	C	C ²⁾	c	Ød	Øe	f	
A2	268	257	90	70	205	219	8	11	5.5	9	4.9
IP21/NEMA1	375	350	90	70	205	219	8	11	5.5	9	5.3
A3	268	257	130	110	205	219	8	11	5.5	9	6.6
IP21/NEMA1	375	350	130	110	205	219	8	11	5.5	9	7
A4	420	401	200	171	175	175	8.2	12	6.5	6	9.2
A5	420	402	242	215	200	200	8.2	12	6.5	9	14
B1	480	454	242	210	260	260	12	19	9	9	23
B2	650	624	242	210	260	260	12	19	9	9	27
B3	399	380	165	140	248	262	8	12	6.8	7.9	12
IP21/NEMA1	475	-	165	-	249	262	8	12	6.8	7.9	-
B4	520	495	231	200	242	242	-	-	8.5	15	23.5
IP21/NEMA1	670	-	255	-	246	246	-	-	8.5	15	-
C1	680	648	308	272	310	310	12	19	9	9.8	45
C2	770	739	370	334	335	335	12	19	9	9.8	65
C3	550	521	308	270	333	333	-	-	8.5	17	35
IP21/NEMA1	755	-	329	-	337	337	-	-	8.5	17	-
C4	660	631	370	330	333	333	-	-	8.5	17	50
IP21/NEMA1	950	-	391	-	337	337	-	-	8.5	17	-
D1	1209	1154	420	304	380	-	20	11	11	25	104
D2	1589	1535	420	304	380	-	20	11	11	25	151

¹⁾ The dimensions are maximum height, width and depth.

16.4 Surroundings

Relative humidity	5-95 % RH
Ambient temperature	Max. 50 °C
Average ambient temperature over 24 hours	Max. 45 °C
Minimum ambient temperature at full operation	0 °C
Minimum ambient temperature at reduced operation	-10 °C
Temperature during storage and transportation	-25 to 65 °C
Storage duration	Max. 6 months
Maximum altitude above sea level without performance reduction	1000 m
Maximum altitude above sea level with performance reduction	3000 m

Note The CUE comes in a packaging which is not suitable for outdoor storage.

16.5 Terminal torques

Enclosure	Torque [Nm]			
	Mains	Motor	Earth	Relay
A2	1.8	1.8	3	0.6
A3	1.8	1.8	3	0.6
A4	1.8	1.8	3	0.6
A5	1.8	1.8	3	0.6
B1	1.8	1.8	3	0.6
B2	4.5	4.5	3	0.6
B3	1.8	1.8	3	0.6
B4	4.5	4.5	3	0.6
C1	10	10	3	0.6
C2	14 ¹⁾ /24 ²⁾	14 ¹⁾ /24 ²⁾	3	0.6
C3	10	10	3	0.6
C4	14 ¹⁾ /24 ²⁾	14 ¹⁾ /24 ²⁾	3	0.6

1) Conductor cross-section $\leq 95 \text{ mm}^2$

2) Conductor cross-section $\geq 95 \text{ mm}^2$.

16.6 Cable length

Maximum length, screened motor cable	150 m
Maximum length, unscreened motor cable	300 m
Maximum length, signal cable	300 m

16.7 Fuses and cable cross-section



Warning

Always comply with local regulations as to cable cross-sections.

16.7.1 Cable cross-section to signal terminals

Maximum cable cross-section to signal terminals, rigid conductor	1.5 mm ²
Maximum cable cross-section to signal terminals, flexible conductor	1.0 mm ²
Minimum cable cross-section to signal terminals	0.5 mm ²

16.7.2 Non-UL fuses and conductor cross-section to mains and motor

Typical shaft power P2	Maximum fuse size	Fuse type	Maximum conductor cross-section ¹⁾
[kW]	[A]		[mm ²]
1 x 200-240 V			
1.1	20	gG	4
1.5	30	gG	10
2.2	40	gG	10
3	40	gG	10
3.7	60	gG	10
5.5	80	gG	10
7.5	100	gG	35
3 x 200-240 V			
0.75	10	gG	4
1.1	20	gG	4
1.5	20	gG	4
2.2	20	gG	4
3	32	gG	4
3.7	32	gG	4
5.5	63	gG	10
7.5	63	gG	10
11	63	gG	10
15	80	gG	35
18.5	125	gG	50
22	125	gG	50
30	160	gG	50
37	200	aR	95
45	250	aR	120
3 x 380-500 V			
0.55	10	gG	4
0.75	10	gG	4
1.1	10	gG	4
1.5	10	gG	4
2.2	20	gG	4
3	20	gG	4
4	20	gG	4
5.5	32	gG	4
7.5	32	gG	4
11	63	gG	10
15	63	gG	10
18.5	63	gG	10
22	63	gG	35
30	80	gG	35
37	100	gG	50
45	125	gG	50
55	160	gG	50
75	250	aR	95
90	250	aR	120
3 x 525-600 V			
0.75	10	gG	4
1.1	10	gG	4
1.5	10	gG	4
2.2	20	gG	4
3	20	gG	4
4	20	gG	4
5.5	32	gG	4
7.5	32	gG	4
3 x 525-690 V			
11	63	gG	35
15	63	gG	35
18.5	63	gG	35
22	63	gG	35
30	63	gG	35
37	80	gG	95
45	100	gG	95
55	125	gG	95
75	160	gG	95
90	160	gG	95

¹⁾ Screened motor cable, unscreened supply cable. AWG. See section 16.7.3 *UL fuses and conductor cross-section to mains and motor.*

16.7.3 UL fuses and conductor cross-section to mains and motor

Typical shaft power P2 [kW]	Fuse type							Maximum conductor cross-section ¹⁾ [AWG] ²⁾
	Bussmann RK1	Bussmann J	Bussmann T	SIBA RK1	Littel Fuse RK1	Ferraz-Shawmut CC	Ferraz-Shawmut RK1	
1 x 200-240 V								
1.1	KTN-R20	-	-	-	-	-	-	10
1.5	KTN-R30	-	-	-	-	-	-	7
2.2	KTN-R40	-	-	-	-	-	-	7
3	KTN-R40	-	-	-	-	-	-	7
3.7	KTN-R60	-	-	-	-	-	-	7
5.5	-	-	-	-	-	-	-	7
7.5	-	-	-	-	-	-	-	2
3 x 200-240 V								
0.75	KTN-R10	JKS-10	JJN-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1.1	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
1.5	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
2.2	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3.7	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
5.5	KTN-R50	JKS-50	JJN-50	5012406-050	KLN-R50	-	A2K-50R	7
7.5	KTN-R50	JKS-60	JJN-60	5012406-050	KLN-R60	-	A2K-50R	7
11	KTN-R60	JKS-60	JJN-60	5014006-063	KLN-R60	A2K-60R	A2K-60R	7
15	KTN-R80	JKS-80	JJN-80	5014006-080	KLN-R80	A2K-80R	A2K-80R	2
18.5	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
22	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
30	FWX-150	-	-	2028220-150	L25S-150	A25X-150	A25X-150	1/0
37	FWX-200	-	-	2028220-200	L25S-200	A25X-200	A25X-200	4/0
45	FWX-250	-	-	2028220-250	L25S-250	A25X-250	A25X-250	250 MCM
3 x 380-500 V								
0.55	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
0.75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1.1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1.5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2.2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5.5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7.5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
11	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
15	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
18.5	KTS-R50	JKS-50	JJS-50	5014006-050	KLS-R50	-	A6K-50R	7
22	KTS-R60	JKS-60	JJS-60	5014006-063	KLS-R60	-	A6K-60R	2
30	KTS-R80	JKS-80	JJS-80	2028220-100	KLS-R80	-	A6K-80R	2
37	KTS-R100	JKS-100	JJS-100	2028220-125	KLS-R100	-	A6K-100R	1/0
45	KTS-R125	JKS-150	JJS-150	2028220-125	KLS-R125	-	A6K-125R	1/0
55	KTS-R150	JKS-150	JJS-150	2028220-160	KLS-R150	-	A6K-150R	1/0
75	FWH-220	-	-	2028220-200	L50S-225	-	A50-P225	4/0
90	FWH-250	-	-	2028220-250	L50S-250	-	A50-P250	250 MCM
3 x 525-600 V								
0.75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1.1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1.5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2.2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5.5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7.5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3 x 525-690 V								
11	KTS-R-25	JKS-25	JJS-25	5017906-025	KLSR025	HST25	A6K-25R	1/0
15	KTS-R-30	JKS-30	JJS-30	5017906-030	KLSR030	HST30	A6K-30R	1/0
18.5	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
22	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
30	KTS-R-60	JKS-60	JJS-60	5014006-063	KLSR060	HST60	A6K-60R	1/0
37	KTS-R-80	JKS-80	JJS-80	5014006-080	KLSR075	HST80	A6K-80R	1/0
45	KTS-R-90	JKS-90	JJS-90	5014006-100	KLSR090	HST90	A6K-90R	1/0
55	KTS-R-100	JKS-100	JJS-100	5014006-100	KLSR100	HST100	A6K-100R	1/0
75	KTS-R125	JKS-125	JJS-125	2028220-125	KLS-125	HST125	A6K-125R	1/0
90	KTS-R150	JKS-150	JJS-150	2028220-150	KLS-150	HST150	A6K-150R	1/0

1) Screened motor cable, unscreened supply cable.

2) American Wire Gauge.

16.8 Inputs and outputs

16.8.1 Mains supply (L1, L2, L3)

Supply voltage	200-240 V ± 10 %
Supply voltage	380-500 V ± 10 %
Supply voltage	525-600 V ± 10 %
Supply voltage	525-690 V ± 10 %
Supply frequency	50/60 Hz
Maximum temporary imbalance between phases	3 % of rated value
Leakage current to earth	> 3.5 mA
Number of cut-ins, enclosure A	Max. 2 times/min.
Number of cut-ins, enclosures B and C	Max. 1 time/min.

Note Do not use the power supply for switching the CUE on and off.

16.8.2 Motor output (U, V, W)

Output voltage	0-100 % ¹⁾
Output frequency	0-100 Hz ²⁾
Switching on output	Not recommended

1) Output voltage in % of supply voltage.

2) Depending on the pump family selected.

16.8.3 RS-485 GENiBus connection

Terminal number	68 (A), 69 (B), 61 GND (Y)
-----------------	----------------------------

The RS-485 circuit is functionally separated from other central circuits and galvanically separated from the supply voltage (PELV).

16.8.4 Digital inputs

Terminal number	18, 19, 32, 33
Voltage level	0-24 VDC
Voltage level, open contact	> 19 VDC
Voltage level, closed contact	< 14 VDC
Maximum voltage on input	28 VDC
Input resistance, R _i	Approx. 4 kΩ

All digital inputs are galvanically separated from the supply voltage (PELV) and other high-voltage terminals.

16.8.5 Signal relays

Relay 01, terminal number	1 (C), 2 (NO), 3 (NC)
Relay 02, terminal number	4 (C), 5 (NO), 6 (NC)
Maximum terminal load (AC-1) ¹⁾	240 VAC, 2 A
Maximum terminal load (AC-15) ¹⁾	240 VAC, 0.2 A
Maximum terminal load (DC-1) ¹⁾	50 VDC, 1 A
Minimum terminal load	24 VDC 10 mA 24 VAC 20 mA

1) IEC 60947, parts 4 and 5.

C Common

NO Normally open

NC Normally closed

The relay contacts are galvanically separated from other circuits by reinforced insulation (PELV).

16.8.6 Analog inputs

Analog input 1, terminal number	53
Voltage signal	A53 = "U" ¹⁾
Voltage range	0-10 V
Input resistance, R _i	Approx. 10 kΩ
Maximum voltage	± 20 V
Current signal	A53 = "I" ¹⁾
Current range	0-20, 4-20 mA
Input resistance, R _i	Approx. 200 Ω
Maximum current	30 mA
Maximum fault, terminals 53, 54	0.5 % of full scale
Analog input 2, terminal number	54
Current signal	A54 = "I" ¹⁾
Current range	0-20, 4-20 mA
Input resistance, R _i	Approx. 200 Ω
Maximum current	30 mA
Maximum fault, terminals 53, 54	0.5 % of full scale

1) The factory setting is voltage signal "U".

All analog inputs are galvanically separated from the supply voltage (PELV) and other high-voltage terminals.

16.8.7 Analog output

Analog output 1, terminal number	42
Current range	0-20 mA
Maximum load to frame	500 Ω
Maximum fault	0.8 % of full scale

The analog output is galvanically separated from the supply voltage (PELV) and other high-voltage terminals.

16.8.8 MCB 114 sensor input module

Analog input 3, terminal number	2
Current range	0/4-20 mA
Input resistance	< 200 Ω
Analog inputs 4 and 5, terminal number	4, 5 and 7, 8
Signal type, 2- or 3-wire	Pt100/Pt1000

Note When using Pt100 with 3-wire cable, the resistance must not exceed 30 Ω.

16.9 Sound pressure level

The sound pressure of the CUE is maximum 70 dB(A).

The sound pressure level of a motor controlled by a frequency converter may be higher than that of a corresponding motor which is not controlled by a frequency converter. See section 6.7 *RFI filters*.

17. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

中文版本

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**警告**

装机前, 先仔细阅读本安装操作手册。安装和运行必须遵守当地规章制度并符合公认的良好操作习惯。

1. 本文献中所用符号**警告**

不执行这些安全须知可能会引起人身伤害。

小心

不遵守这些指导可能会造成设备故障或设备损坏。

注意

遵守注意事项或使用说明可以简化作业并可保证操作安全。

2. 概述

本手册对功率在 0.55 - 90 kW 范围内的格兰富 CUE 变频器作全面介绍。

将本手册放在 CUE 附近可以随时拿到的地方。

2.1 概述

CUE 是一个专门为水泵设计的外设变频器产品系列。

通过 CUE 中的启动指南, 安装者可以快速设置各项中心参数并将 CUE 投入应用。

通过连接一个传感器或一个外部控制信号, CUE 能够迅速调整水泵速度以适应实际需求。

小心

如果泵速超过额定速率, 泵将可能会过载。

2.2 应用

CUE 系列产品和格兰富标准水泵是对配置整合变频器的格兰富 E- 泵产品的补充。

在这些情况下, CUE 解决方案所提供的功能性与 E- 泵相同:

- 在 E- 泵范围以外的主电源电压或功率范围内
- 在不适合或不允许使用整合变频器的应用中。

2.3 参考资料

针对格兰富CUE的技术文献:

- 操作指南包含使用CUE所需了解的全部信息。
- 数据手册包含关于CUE结构和应用的全部技术信息。
- 服务指导含拆卸与修理变频器所需了解的全部指导。

技术文献可以在此处查寻: www.grundfos.com > Grundfos Product Center.

如您有任何问题, 请与附近的格兰富公司或服务站联系。

3. 安全与警告

3.1 警告



警告

安装、维护和检测工作只能由经过培训的人员来执行。



警告

接触电气部件可以有致命危险, 即便是在CUE电源切断之后。

在对CUE开展任何工作之前, 主电源和其它输入电压必须至少已经断开了以下所述的时间。

电压	最短等候时间		
	4分钟	15分钟	20分钟
200-240 V	0.75 - 3.7 kW	5.5 - 45 kW	
380-500 V	0.55 - 7.5 kW	11-90 kW	
525-600 V	0.75 - 7.5 kW		
525-690 V			11-90 kW

只能在所指CUE铭牌上作出说明时才能够减短等候时间。

3.2 安全规范

- 控制板上的开/关按钮不能够将CUE与电源电压断开, 因此不可以将它当作安全开关使用。
- CUE必须根据国家法规正确接地并防止间接接触。
- 地线的泄漏电流超过 3.5 mA。
- 封装等级IP20/21 不可以被无保护安装, 而只能是安装在一个挡板内。
- 封装等级IP54/55 在没有额外的防候和防晒保护时不可以在室外安装。
- 电缆横截面、短路防护和过流防护都必须遵守国家 and 地方法规。

3.3 安装要求

通用安全要求用户必须对以下几个方面作特殊考虑:

- 针对过流的保险丝和开关以及短路保护
- 电缆的选择 (主电源电流、电机、负载分配和继电器)
- 网络配置 (IT、NT、地线)
- 输入和输出连接方面的安全 (PELV)。

3.3.1 IT 主电源

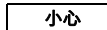


警告

不要将 380-500 V CUE 变频器连接到相和地之间电压超过 440 V 的工业电网上。

在与 IT 主电源和接地的 delta 主电源连接时, 相与地之间的电源电压可以超过 440 V。

3.3.2 侵蚀性环境



小心

CUE安装环境内的空气中不应该含有可以影响或损害电气原件的液体、粒子或气体。

CUE含有大量的机械和电气元件。这些元件都容易受环境影响。

3.4 特定条件下的性能缩减

在下列条件下CUE会降低其工作性能:

- 低气压 (高海拔时)
- 长机电缆

尺寸测量的要求在以后两节中描述。

3.4.1 低气压时的性能降低



警告

在海拔高度2000米以上时, PELV不能实现。

PELV = 保护性特低电压。

在低气压时, 空气的制冷能力下降, CUE自动降低工作性能以防止过载。

可能有必要选择一个性能较高的CUE。

3.4.2 长机电缆时的性能降低

CUE的最大电缆长度为300米未屏蔽电缆和150米屏蔽电缆。如果电缆长度超出以上, 联系格兰富。

CUE的设计适用于最大截面的机电电缆, 如该章节 16.7 保险丝和电缆截面中所述。

4. 标识

4.1 铭牌

CUE可以通过其自身铭牌来识别。见下列说明。



图 1 铭牌举例

字符	描述
T/C:	CUE(产品名称) 202P1M2... (内部编码)
Prod. no:	产品编号: 12345678
S/N:	系列号: 123456G234 最后三位数说明生产日期: 23为星期, 4是指2004年。
1.5 kW	电机的标准轴功率
IN:	电源电压、电源频率和最大输入电流
OUT:	电机电压、电机频率和最大输出电流 最大输出 频率通常取决于水泵型号。
CHASSIS/IP20:	封装等级
Tamb.:	环境最高温度

4.2 包装标签

CUE可以通过外包装上的标签来识别。

5. 机械安装

每个CUE柜的尺寸大小取决于它的封装等级。参见该节 16.1 封装中的封装等级和封装类型之间的关系表。

5.1 接收和储存

收货时检查包装是否完好无损，设备是否完整齐全。如果运输过程中造成损坏，联系运输公司并提出投诉。

注意CUE交货时的包装不适合室外存放。

5.2 运输与拆箱

只允许在安装现场拆卸CUE以防止在向安装现场运输途中可能发生的损坏。

包装中包括附件袋、技术文献以及设备本身。见图2。

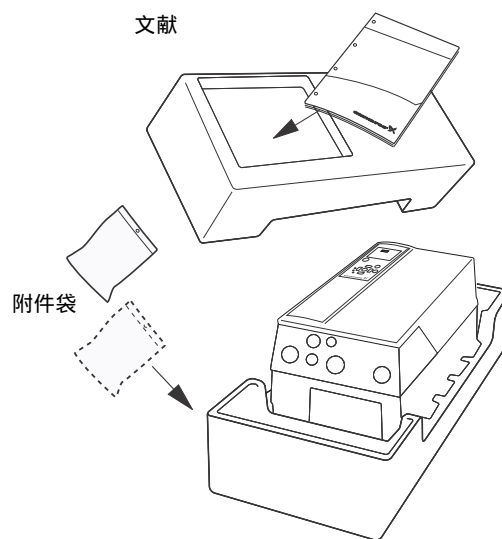


图 2 CUE包装

5.3 空间要求和空气流通

可以将CUE并排安装，但必须达到以下要求才能实现充分的空气流通：

- CUE的上方和下方留有足够的自由空间。参见下表。
- 环境温度为摄氏50度以下。
- 将CUE直接挂在墙上，或安装在一块背板上。见图3。

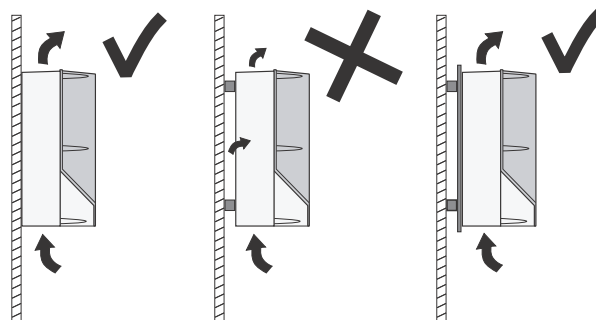


图 3 CUE直接挂在墙上或安装在一块背板上

CUE上下方的空间尺寸要求

封装	空间 [mm]
A2, A3, A4, A5	100
B1, B2, B3, B4, C1, C3	200
C2, C4	225

有关封装的资料，参见该节 16.1 封装中的表。

5.4 安装方式

小心 用户有责任将CUE安全地固定在一个坚固的平面上。

1. 标记钻孔位置并钻孔。见章节 16.3 主要尺寸和重量中的尺寸。
2. 安装螺丝，但留有一定松度。安装CUE，然后拧紧四个螺丝。

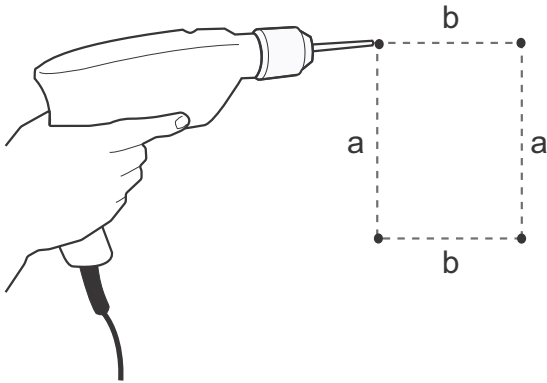


图 4 钻孔图

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6. 电气连接



警告
用户或安装人员负责根据国家和当地法规正确安装接地和防护。



警告
在对CUE开展任何工作之前，主电源和其它输入电压必须至少已经断开了在该节 3. 安全与警告中所述的时间。

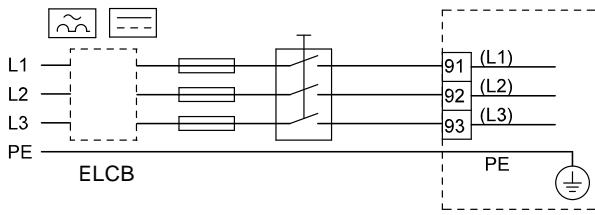


图 5 举例说明CUE的三相主电源连接连同主电源开关、备用保险丝以及附加保护

TM03 8525 1807

6.1 电气保护

6.1.1 防止触电、间接接触



警告
CUE必须根据国家法规正确接地并防止间接接触。

小心

地线的泄漏电流超过 3.5 mA，并要求配置一个强化地线连接。

保护性导体必须一直有黄/绿(PE)或黄/绿/蓝(PEN)颜色标记。

根据 EN IEC 61800-5-1作出的指导：

- CUE必须固定不动，为永久安装并与电网供电永久连接。
- 地线连接必须是由双重保护导体或者是一个截面面积10 mm²以上的单保护导体来实现。

6.1.2 防止短路、保险丝

CUE及其供电系统必须配有短路保护装置。

格兰富要求应该使用在章节 16.7 保险丝和电缆截面中所述备用保险丝来提供短路保护。

在电机输出发生短路情况下，CUE提供完全短路保护。

6.1.3 附加保护

小心

地线的泄漏电流超过 3.5 mA。

如果在CUE所连接的系统中使用了漏地断路器 (ELCB) 作为附加保护措施，则该断路器必须是一个标有以下标签的型号：



该断路器为B型。

安装中所有电气设备的全部泄漏电流均应在考虑在内。

常规运行中CUE的泄漏电流见该节 16.8.1 主电源供应 (L1, L2, L3)。

在启动期间和不对称供电系统中，泄漏电流可以高于正常并可能引起ELCB跳闸。

6.1.4 电机保护

电机不需要外部电机保护。CUE保护电机不会发生过热和阻塞。

6.1.5 过流保护

CUE有一个内置的过流保护可以防止电机输出侧的过载。

6.1.6 工频电压瞬变保护

CUE根据EN 61800-3, 二级环境标准对主电源电压瞬变提供保护。

6.2 连接主电源和电机

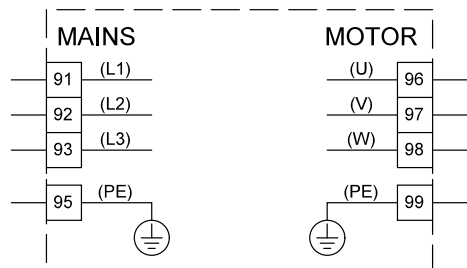
供电电压和供电频率在CUE的铭牌上作出说明。请确保CUE与安装现场中电源之间的匹配性。

6.2.1 主电源开关

可以根据地方规范在CUE的前方安装一个主电源开关。见图5。

6.2.2 接线图

接线盒中的线路必须尽可能短。但保护性导线例外，该导线的长度必须足够长而使它能够在电缆被无意拉出时成为线路中的最后一个被断开。



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图6 接线图，三相主电源连接

端子	功能
91	(L1)
92	(L2)
93	(L3)
95/99	(PE) 地线连接
96	(U)
97	(V)
98	(W)

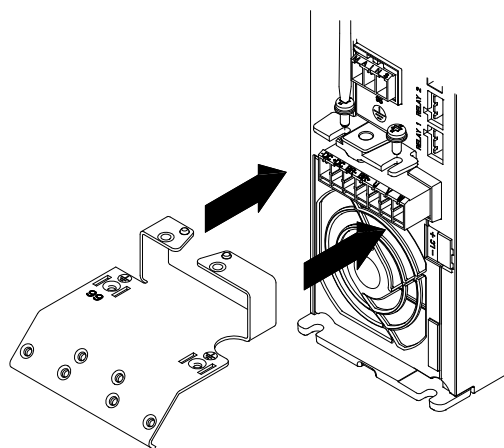
注意 对于单相连接，使用 L1 和 L2。

6.2.3 连接主电源，封装 A2 和 A3

有关封装的资料，参见该节 16.1 封装中的表。

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

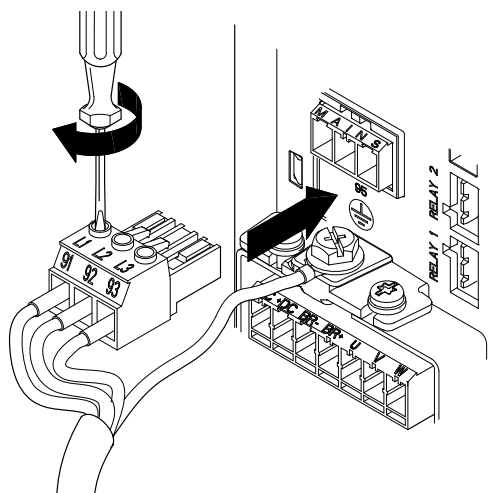
1. 用两个螺丝固定安装板。



TM03 9010 2807

图7 固定安装板

2. 将地线连接到终端 95 (PE)，将主电源线连接到主电源插头的终端 91 (L1), 92 (L2), 93 (L3)。将主电源插头放入标有“主电源”的插座内。

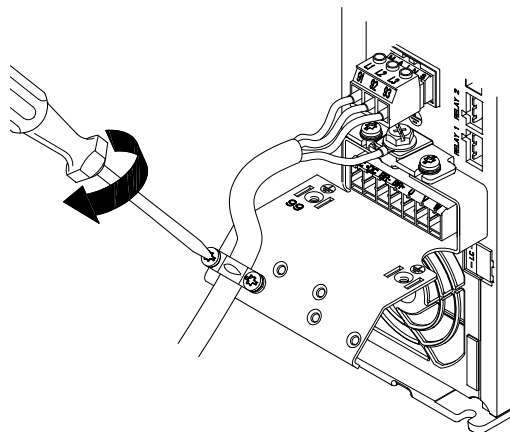


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图8 连接地线和主电源线

注意 对于单相连接，使用 L1 和 L2。

3. 将主电源电缆在固定板上固定。



TM03 9014 2807

图9 固定主电源电缆

6.2.4 电机连接, 封装 A2 和 A3

有关封装的资料, 参见该节 16.1 封装中的表。

小心 根据EMC规定, CUE必需采用屏蔽的电机电缆。

1. 将地线连接到位于固定板上的终端 99 (PE)。将电机导线连接到电机插头的终端 96 (U), 97 (V), 98 (W)。

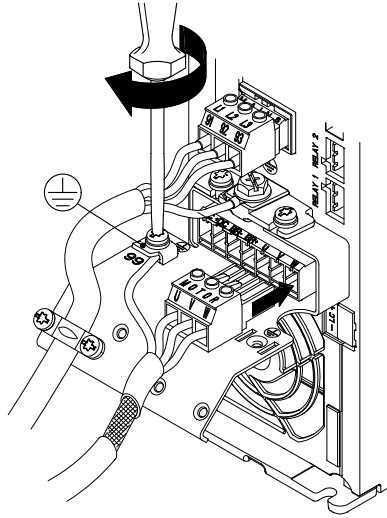


图 10 连接地线和电机导线

2. 将电机插头放入标有"电机"的插座内。用一个电缆夹将屏蔽电缆在固定板上固定。

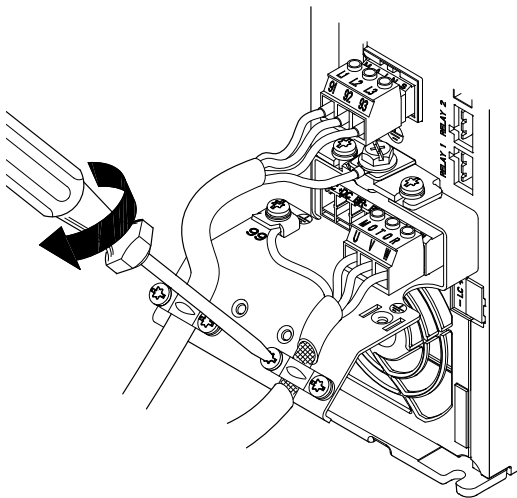


图 11 连接电机插头及固定屏蔽电缆

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TM03 9012 2807

6.2.5 封装 A4 和 A5

有关封装的资料, 参见该节 16.1 封装中的表。

工频连接

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

1. 将地线连接到终端 95 (PE)。见图12。
2. 将主电源线连接到主电源插头的终端 91 (L1), 92 (L2), 93 (L3)。
3. 将主电源插头放入标有"主电源"的插座内。
4. 用一个电缆夹固定主电源电缆。

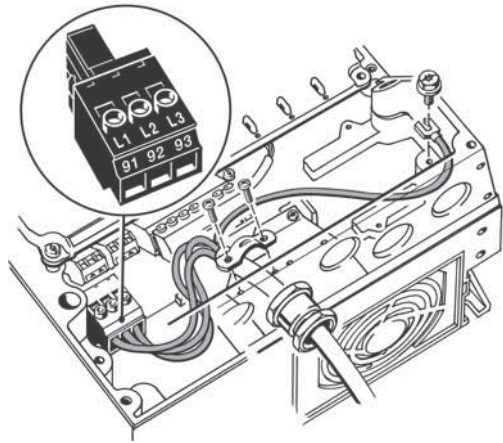


图 12 主电源连接, A4和A5

注意 对于单相连接, 使用 L1 和 L2。

电机连接

小心 根据EMC规定, CUE必需采用屏蔽的电机电缆。

1. 将地线连接到终端 99 (PE)。见图13。
2. 将电机导线连接到电机插头的终端 96 (U), 97 (V), 98 (W)。
3. 将电机插头放入标有"电机"的插座内。
4. 用电缆夹固定屏蔽电缆。

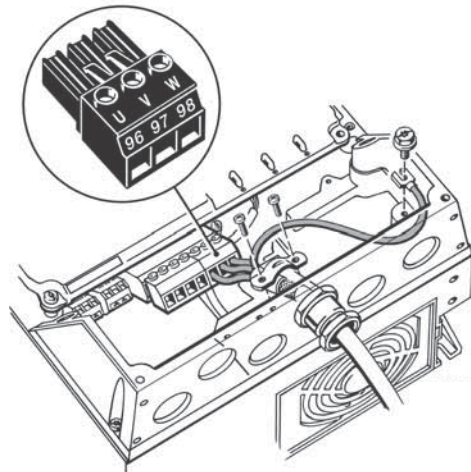


图 13 电机连接, A5

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TM03 9018 2807

6.2.6 封装 B1 和 B2

有关封装的资料，参见该节 16.1 封装中的表。

工频连接

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

1. 将地线连接到终端 95 (PE)。见图14。
2. 将主电源线连接到终端 91 (L1), 92 (L2), 93 (L3)。
3. 用一个电缆夹固定主电源电缆。

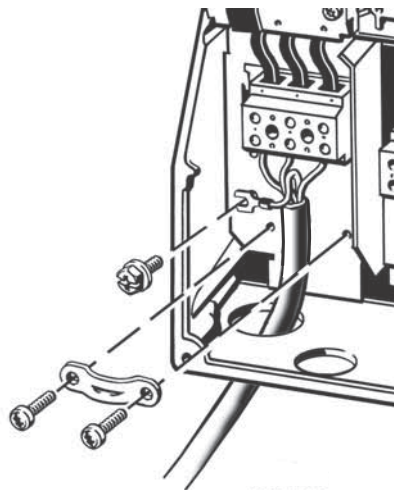


图 14 主电源连接，B1 和 B2

注意 对于单相连接，使用 L1 和 L2。

电机连接

小心 根据EMC规定，CUE必需采用屏蔽的电机电缆。

1. 将地线连接到终端 99 (PE)。见图15。
2. 将电机导线连接到终端 96 (U), 97 (V), 98 (W)。
3. 用电缆夹固定屏蔽电缆。

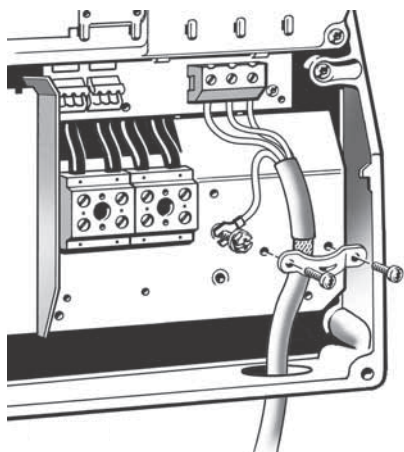


图 15 电机连接，B1 和 B2

6.2.7 封装 B3 和 B4

有关封装的资料，参见该节 16.1 封装中的表。

工频连接

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

1. 将地线连接到终端 95 (PE)。见图16和17。
2. 将主电源线连接到终端 91 (L1), 92 (L2), 93 (L3)。
3. 用一个电缆夹固定主电源电缆。

电机连接

小心 根据EMC规定，CUE必需采用屏蔽的电机电缆。

1. 将地线连接到终端 99 (PE)。见图16和17。
2. 将电机导线连接到终端 96 (U), 97 (V), 98 (W)。
3. 用电缆夹固定屏蔽电缆。

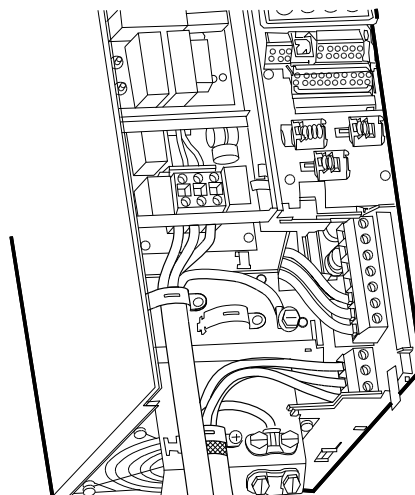


图 16 主电源与电机连接，B3

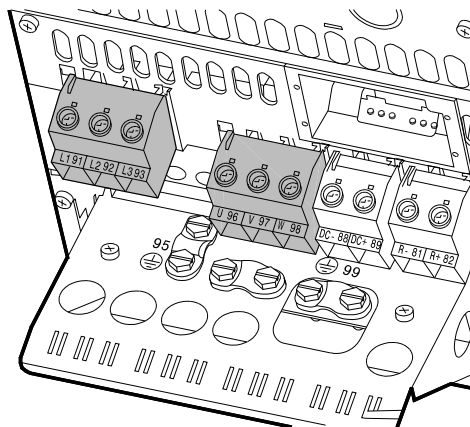


图 17 主电源与电机连接，B4

TM03 9019 2807

TM03 9446 4007

TM03 9020 2807

TM03 9449 4007

6.2.8 封装 C1 和 C2

有关封装的资料，参见该节 16.1 封装中的表。

工频连接

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

1. 将地线连接到终端 95 (PE)。见图18。
2. 将主电源线连接到终端 91 (L1), 92 (L2), 93 (L3)。

电机连接

小心 根据EMC规定，CUE必需采用屏蔽的电机电缆。

1. 将地线连接到终端 99 (PE)。见图18。
2. 将电机导线连接到终端 96 (U), 97 (V), 98 (W)。
3. 用电缆夹固定屏蔽电缆。

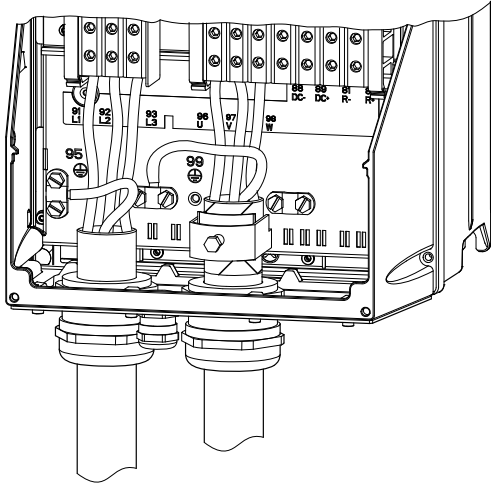


图 18 主电源和电机连接，C1 和 C2

6.2.9 封装 C3 和 C4

有关封装的资料，参见该节 16.1 封装中的表。

工频连接

小心 检查主电源电压和主电源频率是否与CUE和电机铭牌上所示数值一致。

1. 将地线连接到终端 95 (PE)。见图19和20。
2. 将主电源线连接到终端 91 (L1), 92 (L2), 93 (L3)。

电机连接

小心 根据EMC规定，CUE必需采用屏蔽的电机电缆。

1. 将地线连接到终端 99 (PE)。见图19和20。
2. 将电机导线连接到终端 96 (U), 97 (V), 98 (W)。
3. 用电缆夹固定屏蔽电缆。

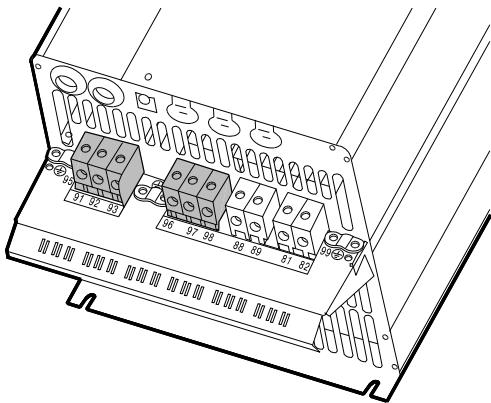


图 19 主电源和电机连接，C3

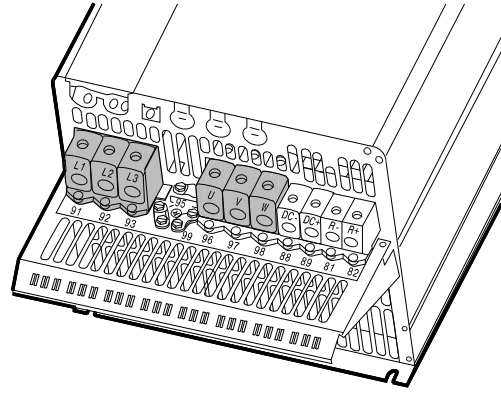


图 20 主电源和电机连接，C4

6.3 连接信号终端

小心 作为预防措施，信号线必须以全长加强绝缘来与其它线路组分隔。

注意 如果未连接外部开关，则短路终端 18 和 20 使用一个短路电线。

按照良好工作习惯进行信号线的连接，以保证EMC正确安装。见章节 6.6 电磁兼容问题 -- 正确的安装方式。

- 使用导线截面最小 0.5 mm² 和最大 1.5 mm² 的屏蔽信号线电缆。
- 在新系统中使用一个三芯屏蔽总线电缆。

6.3.1 最少连接，信号线连接端子

运行只有在终端 18 和 20 被连接时才可能实现，比方说通过一个外部开关或一个短路线。

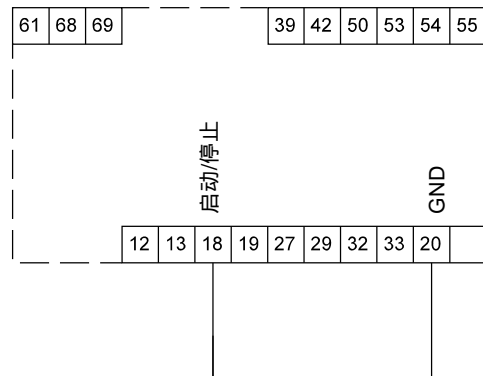
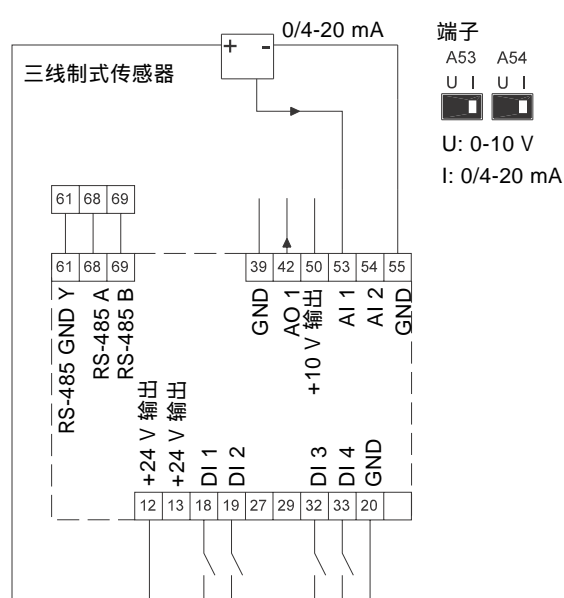
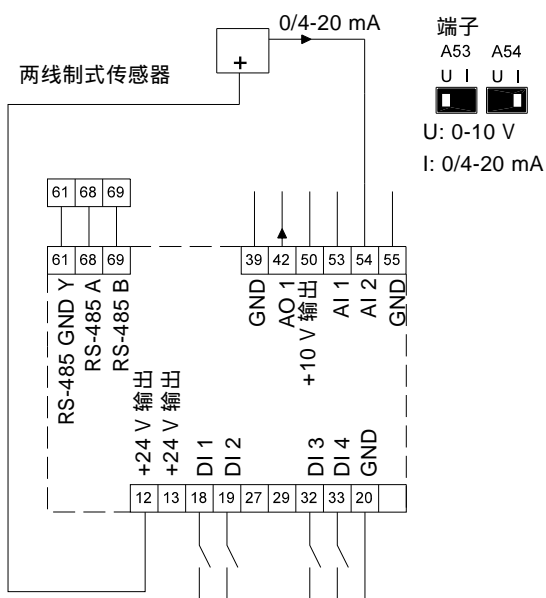
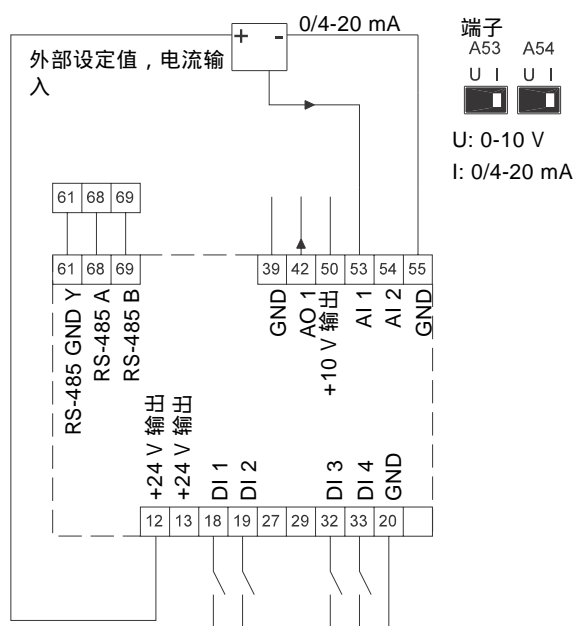
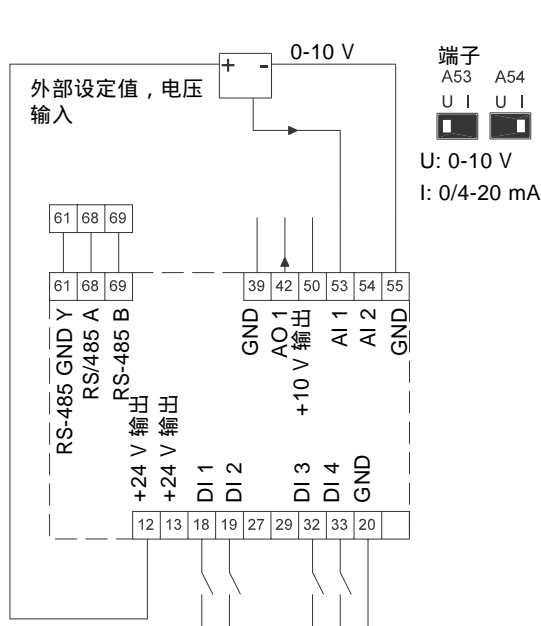


图 21 需要的最少连接，信号线连接端子

6.3.2 接线图，信号端子



端子	类型	功能	端子	类型	功能
12	+24 V 输出	传感器供电	42	AO 1	模拟输出, 0-20 mA
13	+24 V 输出	其它供电	50	+10 V 输出	电位计供电
18	DI 1	数字输入, 启动/停机	53	AI 1	外部设定值, 0-10 V, 0/4-20 mA
19	DI 2	数字输入, 可编程	54	AI 2	传感器输入, 传感器 1, 0/4-20 mA
20	GND	数字输入共用框架	55	GND	模拟输入的共用框架
32	DI 3	数字输入, 可编程	61	RS-485 GND Y	GENIbus, 框架
33	DI 4	数字输入, 可编程	68	RS-485 A	GENIbus, 信号 A (+)
39	GND	模拟输出框架	69	RS-485 B	GENIbus, 信号 B (+)

端子 27, 29 为备用端子。

按照良好工作习惯进行信号线的连接，以保证EMC正确安装。见章节6.6 电磁兼容问题 --正确的安装方式。

- 使用导线截面最小 0.5 mm² 和最大 1.5 mm² 的屏蔽信号线电缆。在新系统中使用一个三芯屏蔽总线电缆。

注意 RS-485 屏蔽必须连接到框架。

6.3.3 热敏电阻（正温度系数热敏电阻）(PTC) 与CUE之间的连接

位于发动机内的电热调节器 (PTC)与CUE之间的连接需要一个外部 PTC继电器。

该需求是由于热敏电阻到与电机绕组之间仅有一层绝缘层而提出的。位于CUE内的连接端子，由于其属于PELV电路（保护特低电压电路）的一部分，所以要求两层绝缘。

PELV电路（保护特低电压电路）提供防电击保护。该类型的电路有需要与之匹配的特殊连接要求。具体要求在EN 61800-5-1中有详细说明。

为了保证特低电压防护（功能），所有连接到控制端子的连接线均需要特低电压防护。例如，电热调节器必须配备强化或双层绝缘。

6.3.4 接触信号终端

所有信号终端均位于CUE前方终端盖的后面。如图22和23，拆除终端盖。

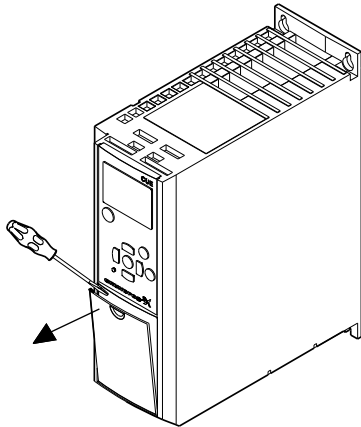


图 22 接触信号终端，A2 和 A3

TM03 9003 2807

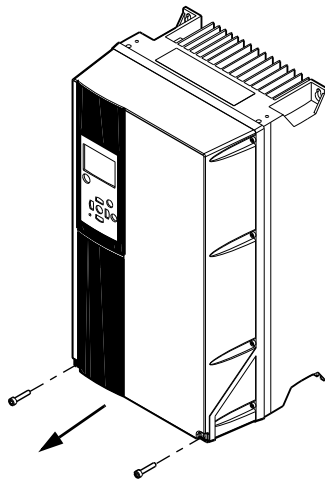


图 23 接触信号终端，A4, A5, B1, B2, B3, B4, C1, C2, C3和 C4

TM03 9004 2807

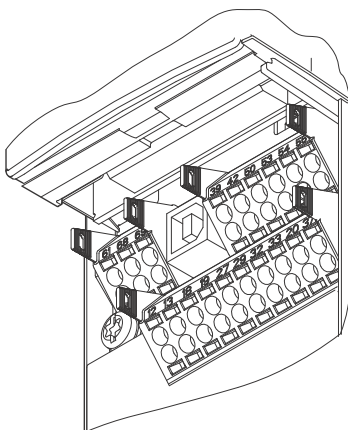


图 24 信号终端 (所有封装)

TM03 9025 2807

6.3.5 导线安装

1. 拆去9-10 mm长度绝缘。
2. 将一把刀头最大为0.4 x 2.5 mm的螺丝刀插入方孔内。
3. 将导线插入对应的圆孔内。取出螺丝刀。此时导线在终端内安装完毕。

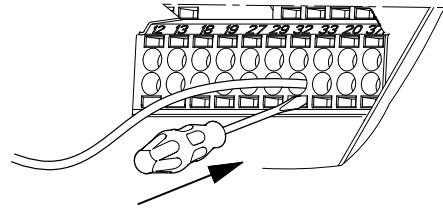


图 25 将导线装入信号终端

TM03 9026 2807

6.3.6 设置模拟输入，终端 53 和 54

触电53 和 54 位于控制面板的后方，用于两个模拟输入信号种类的设置。

该输入的工厂设置为电压信号 "U"。

注意

如果终端 54 是用于连接一个0/4-20 mA传感器，则该输入必须被设置成电流信号 "I"。

在设置触点A54之前先切断电源。

移开控制板进行触点设置。见图26。

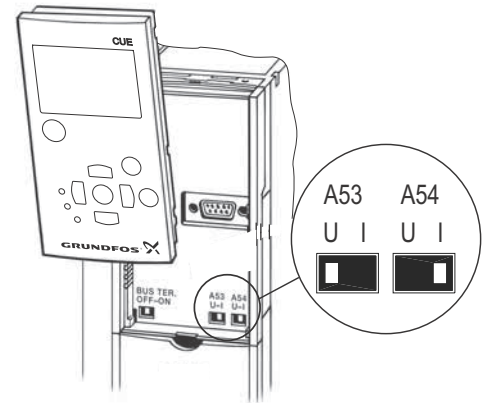
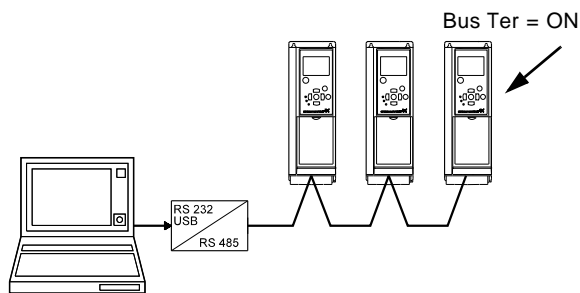


图 26 将触点 A54 设置到电流信号 "I"

TM03 9104 3407

6.3.7 RS-485 GENIbus网络连接

可以通过GENIbus将一个或一个以上的CUE与控制设备连接。见图27中的例子。



TM03 9005 2807

图 27 RS-485 GENIbus网络举例

用于 RS-485 (Y) 通信的基准电位、GND必须连接到端子 61。
 如果在一个 GENIbus网络中连接多个CUE，则最后一个CUE的终端触点必须被设置为 "ON" (RS-485 端口的终端)。
 终端触点的工厂设置为 "OFF" (未经终端)。
 打开控制板进行触点设置。见图28。

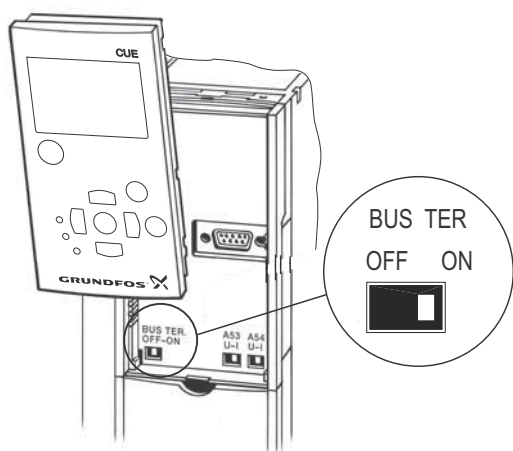
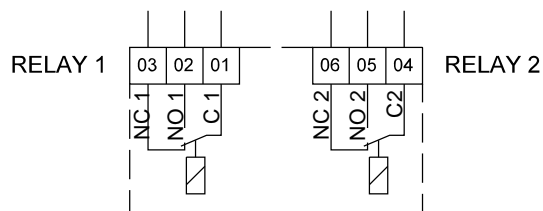


图 28 设置终端触点到 "ON"

TM03 9006 2807

6.4 连接信号继电器

小心 作为预防措施，信号线必须以全长加强绝缘来与其它线路组分隔。



TM03 8801 2507

图 29 正常状态下用于信号继电器的端子(未启用)

端子		功能
C 1	C 2	公共端
NO 1	NO 2	常开触点
NC 1	NC 2	常闭触点

接近信号继电器

继电器输出的位置如图30至35所示。

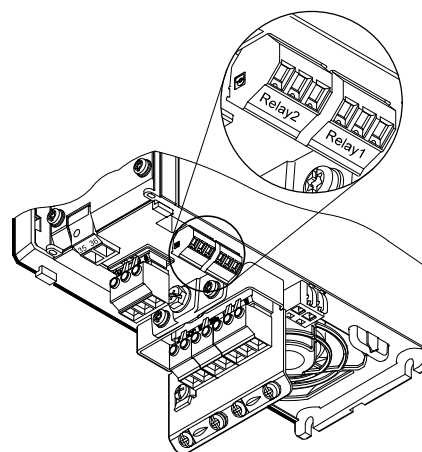


图 30 用于连接继电器的终端, A2 和 A3

TM03 9007 2807

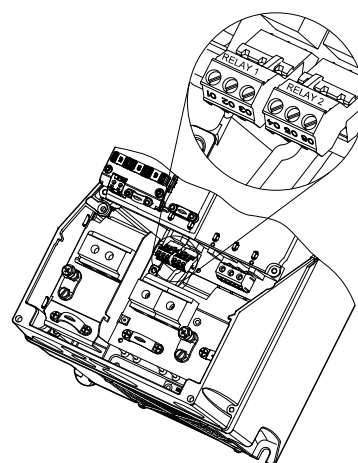


图 31 用于连接继电器的终端, A4, A5, B1 和 B2

TM03 9008 2807

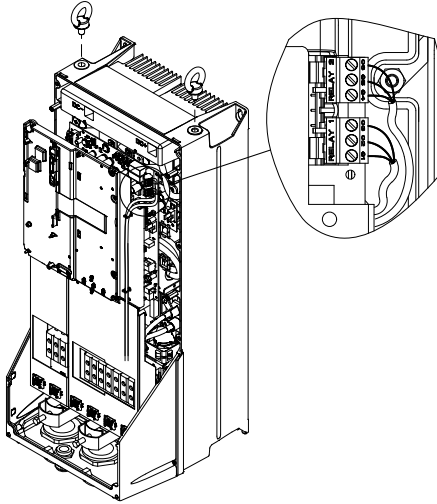


图 32 用于连接继电器的终端, C1 和 C2

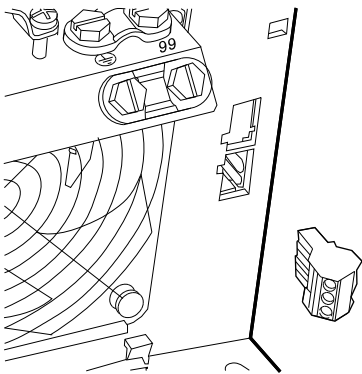


图 33 用于连接继电器的终端, B3

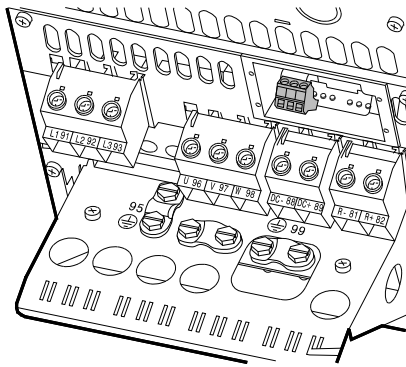


图 34 用于连接继电器的终端, B4

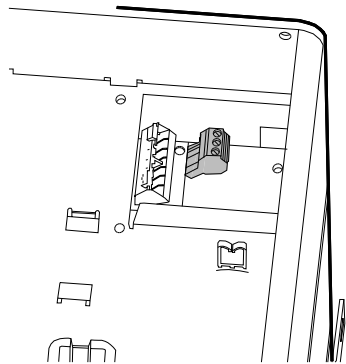


图 35 用于连接继电器的终端, C3 和 C4, 位于CUE的右上角

6.5 连接MCB 114 传感器输入模块

MCB 114 是一个选项, 可以为CUE提供附加模拟输入。

6.5.1 MCB 114 配置

MCB 114 配置有三个模拟输入可用于以下传感器:

- 一个额外的 0/4-20 mA 传感器。见章节 10.8.14 传感器 2 (3.16)。
- 两个Pt100/Pt1000 温度传感器用于测量电机轴承温度或其它替代温度如液体温度。见章节 10.8.19 温度传感器 1 (3.21)和 10.8.20 温度传感器 2 (3.22)。

在MCB 114安装完毕之后, CUE会在接通电源时自动探测传感器是 Pt 100还是Pt 1000。

6.5.2 接线图, MCB 114

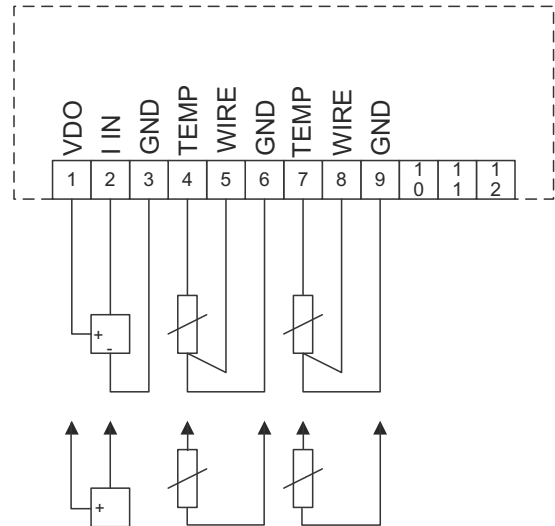


图 36 接线图, MCB 114

端子	类型	功能
1 (VDO)	+24 V 输出	传感器供电
2 (I IN)	AI 3	传感器 2, 0/4-20 mA
3 (GND)	GND	模拟输入的共用框架
4 (TEMP)	AI 4	温度传感器 1, Pt100/Pt1000
5 (WIRE)		
6 (GND)	GND	温度传感器 1 的共用框架
7 (TEMP)	AI 5	温度传感器 2, Pt100/Pt1000
8 (WIRE)		
9 (GND)	GND	温度传感器 2 的共用框架

端子10, 11和12为备用端子。

TM03 9009 2807

TM03 9442 4007

TM03 9441 4007

TM03 9440 4007

TM04 3273 3908

6.6 电磁兼容问题 --正确的安装方式

该节对安装CUE的良好操作习惯作出指导性描述。遵循这些指导可以帮助用户达到EN 61800-3, 一级环境标准。

- 在没有输出滤波器的应用中仅使用带编织金属屏蔽的电机电缆和信号电缆。
- 除地方性要求之外, 对供电电缆不作其它特殊要求。
- 将屏蔽安装在尽量靠近终端的位置。见图37。
- 不要用扭转末端的方法来终端屏蔽。见图38。应该使用电缆夹或EMC螺旋电缆引入。
- 对于电机电缆和信号电缆, 分别在它们的两端将屏蔽连接到框架。见图39。如果控制器没有电缆夹, 则仅将屏蔽连接到CUE。见图40。
- 避免在变频器的电气柜中出现未屏蔽的电机电缆和信号电缆。
- 在无输出滤波器的应用中电机电缆应越短越好以降低噪声水平并减少泄漏电流。
- 框架接头的螺丝必须一直处于拧紧状态, 无论是否连接电缆。
- 可能的话, 保持主电源电缆、电机电缆和信号电缆的绝缘各自隔开。

如果遵循以上良好操作习惯, 其它的安装方法也可以达到相同的EMC结果。

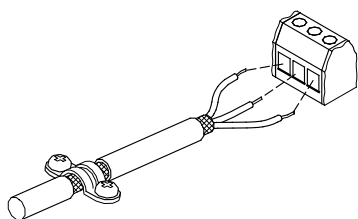


图 37 举例说明剥离的电缆与屏蔽

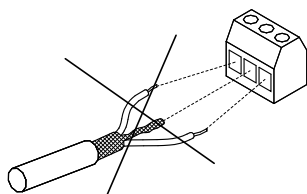


图 38 不要扭转屏蔽末端

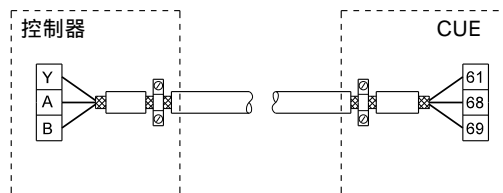


图 39 举例说明一个三芯总线电缆两端带屏蔽

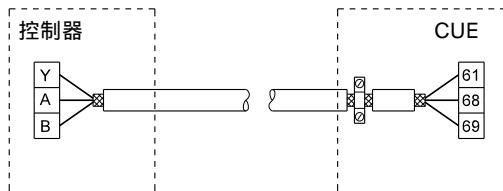


图 40 举例说明一个三芯总线电缆带屏蔽连接到CUE (控制器无电缆夹)

6.7 RFI滤波器

为达到EMC要求, CUE配备以下种类的内置射频干扰滤波器 (RFI)。

电压	标准轴功率 P2	RFI滤波器型号
1 x 200-240 V*	1.1 - 7.5 kW	C1
3 x 200-240 V	0.75 - 45 kW	C1
3 x 380-500 V	0.55 - 90 kW	C1
3 x 525-600 V	0.75 - 7.5 kW	C3
3 x 525-690 V	11-90 kW	C3

* 单相输入 - 三相输出。

RFI滤波器说明

C1: 适用于国内

C3: 用于配备自用低压变压器的工业区。

RFI滤波器符合EN 61800-3 标准。

6.7.1 C3 类设备

- 该类电源驱动系统(PDS)不是设计用于向居民区住房供电的共用低电压电网上。
- 如果使用此类电网, 辐射干扰是可以预计的。

TM02 1325 0901

TM03 8812 2507

TM03 8732 2407

TM03 8731 2407

6.8 输出滤波器

输出滤波器用于降低电机绕组的电压强度以及电机绝缘系统的疲劳度，以及降低变频器驱动电机的听觉噪声。

有两种类型的输出滤波器可以作为配件供货：

- dU/dt 滤波器
- 正弦波滤波器

使用输出滤波器

下表显示了什么时候需要输出滤波器以及要使用的类型。滤波器选择主要基于以下因素：

- 泵型
- 电机电缆长度
- 需要将电机噪声降至何种程度。

型号	CUE输出功率	dU/dt 滤波器	正弦波滤波器
配置 380 V 及以上电机电压的 SP、BM、BMB	全部	-	0-300 米*
带MG71和MG80，最大不超过1.5 kW的泵	大于1.5 kW	-	0-300 米*
减小dU/dt和噪音排放，减小量低	全部	0-150 米*	-
减小dU/dt、峰值电压和噪音排放，减小量高	全部	-	0-300 米*
500 V及以上电机	全部	-	0-300 米*

* 所述长度适用于电机电缆。

6.9 电机电缆

为了满足EN 61800-3标准，无论是否安装了输出滤波器，电机电缆必须始终采用屏蔽电缆。

注意

主电源电缆无需采用屏蔽电缆。

见图41、42、43和44。



图 41 未配滤波器的安装示范

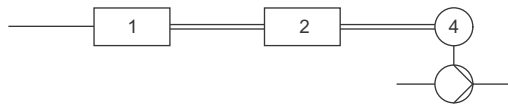


图 42 配滤波器的安装示范。CUE和滤波器之间的电缆必须很短

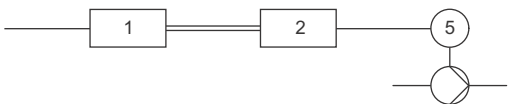


图 43 不带电缆连接箱的潜水泵。变频器和滤波器应靠近井道安装

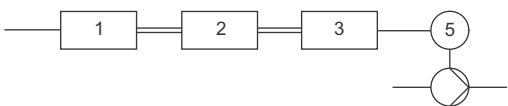


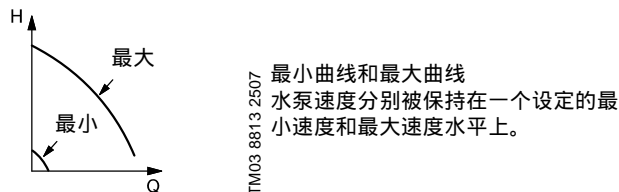
图 44 带电缆连接箱和屏蔽电缆的潜水泵。变频器和滤波器应远离井道安装，电缆连接箱应靠近井道安装

符号	名称
1	CUE
2	滤波器
3	电缆连接箱
4	标准电机
5	潜水式电动机
单线	非屏蔽电缆
双线	屏蔽电缆

7. 运行模式

以下运行模式可以在“运行”菜单的显示 1.2 中通过控制板进行设置。
见章节 10.6.2 运行模式 (1.2)。

运行模式	描述
正常	泵在选定的控制模式中运行
停止	泵已经被停止 (绿色指示灯闪烁)
最小	泵以最小速度运行
最大	泵以最大速度运行



举例: 最大曲线运行可用于安装过程中对泵的除气。

举例: 最小曲线运行可用于极小流量需求期间。

8. 控制模式

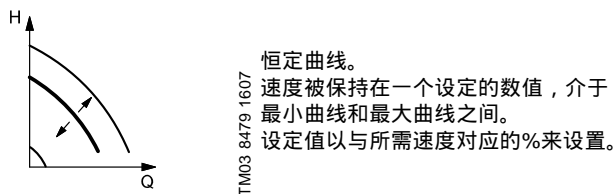
控制模式可以在“安装”菜单的显示 3.1 中通过控制板设置。
见章节 10.8.1 控制模式 (3.1)。

有两个基本控制模式:

- 无控制运行 (开环)。
- 带传感器的控制运行 (闭环)。

见章节 8.1 无控制运行 (开环) 和 8.2 控制运行 (闭环)。

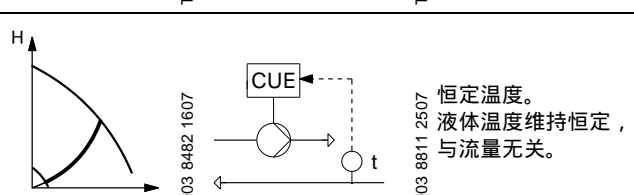
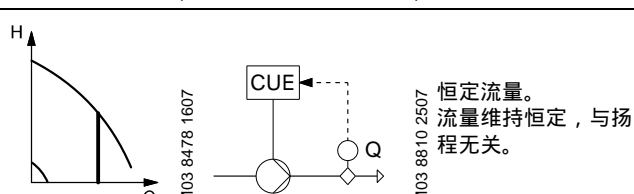
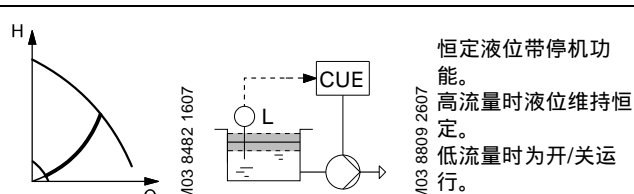
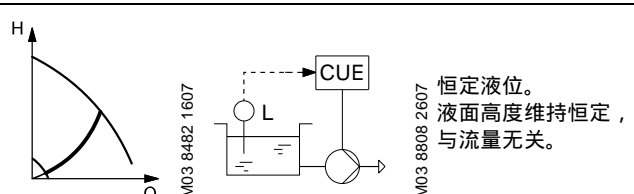
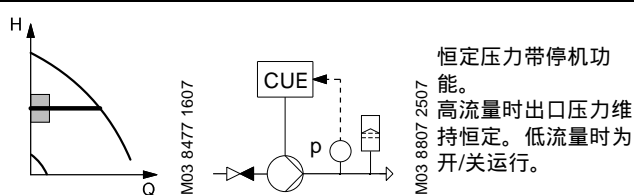
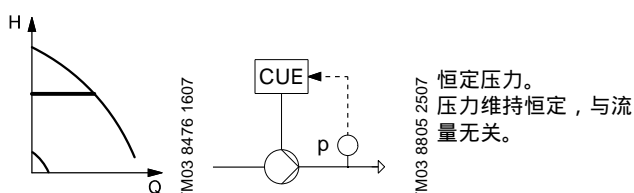
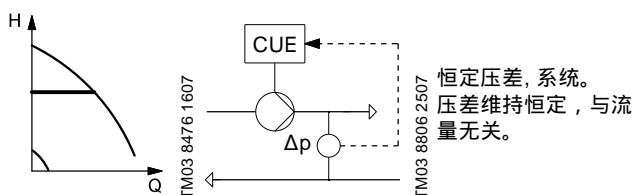
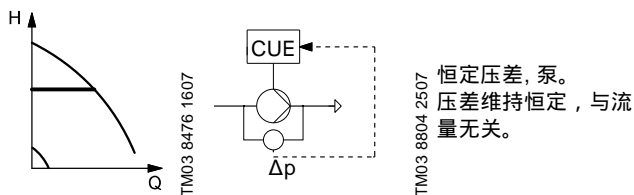
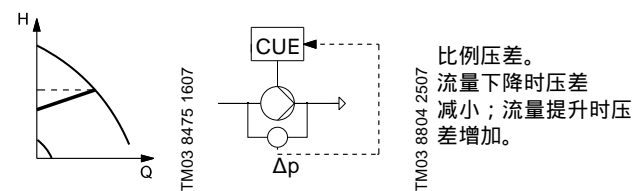
8.1 无控制运行 (开环)



举例: 恒定曲线下的运行可用于未连接传感器的泵。

举例: 典型说来是与整体控制系统连接, 如MPC或另一个外部控制器。

8.2 控制运行 (闭环)



9. 菜单总览

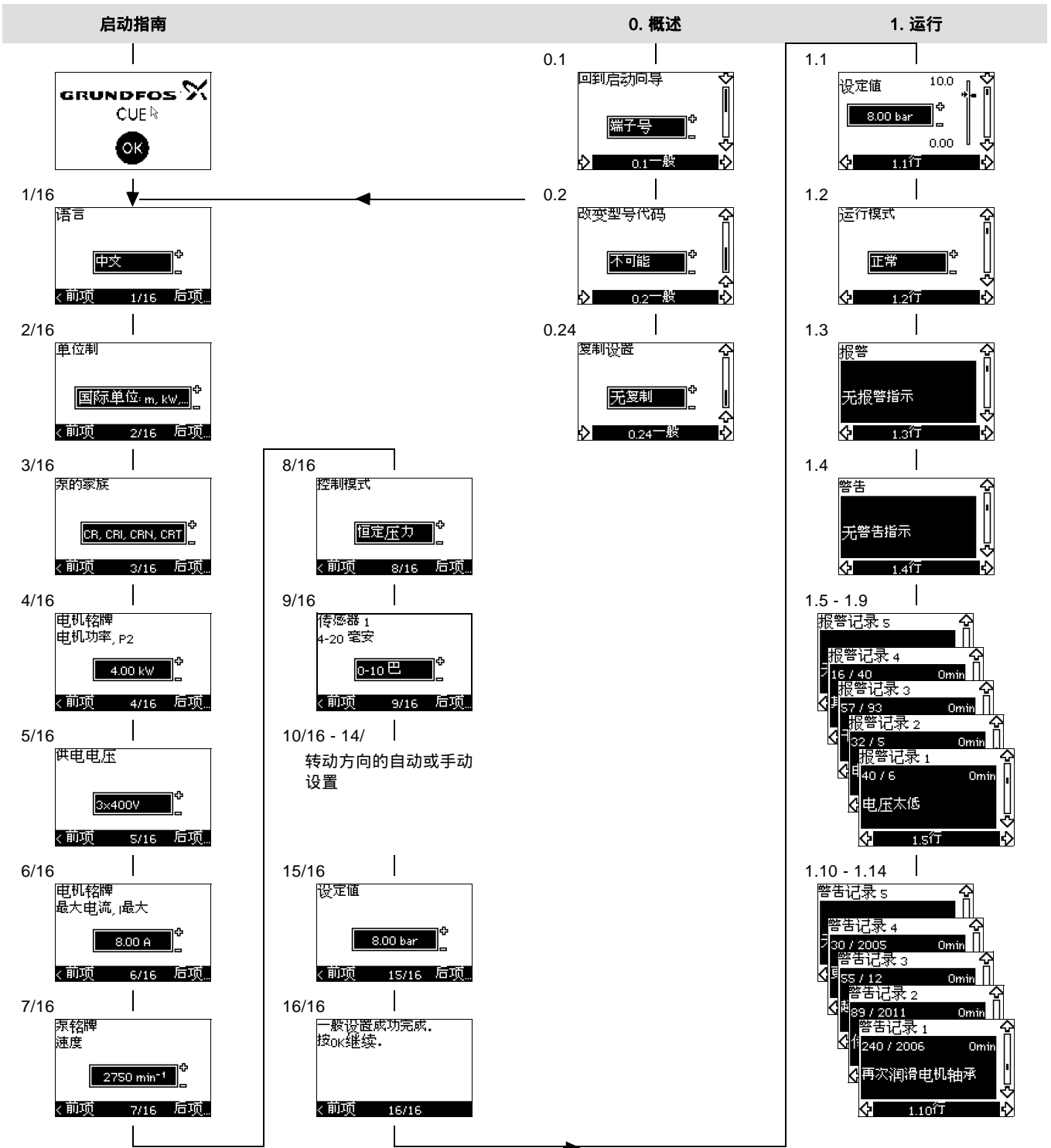


图 45 菜单总览

菜单结构

CUE有一个启动指南, 该指南在首次启动时运行。启动指南以后, CUE菜单结构划分为四个主菜单:

1. "通用" (GENERAL) 菜单允许通用菜单访问启动指南进行 CUE 基本设置。
2. "运行" (OPERATION) 菜单允许设定值设置, 运行模式选择以及报警重置。还可以查看最近五次警告和报警。
3. "状态" (STATUS) 菜单显示CUE和泵的状态。不可以对数值进行改动或设置。
4. "安装" (INSTALLATION) 菜单允许对所有参数的访问。CUE 的具体设置在此处进行。

2. 状态

2.1 实际设定值
8.00 bar
外部设定值
100 %
2.1

2.2 运行模式
正常
来自
CUE菜单
2.2

2.3 实际值
7.90 bar
2.3

2.4 传感器 1 实测值
7.90 bar
2.4

2.5 传感器 2 实测值
0.20 -
2.5

2.6 速度
2750 min⁻¹
2.6

2.7 输入功率
21.7 kW
耗电量
2605 kWh
2.7

2.8 运行计时
0 h
耗电量
2605 kWh
2.8

2.9 轴承已再次润滑
0 次数
轴承更换时间
5 次数
2.9

3. 安装

2.10 再次润滑电机轴承
立刻执行!
2.10

2.11 更换电机轴承
立刻执行!
2.11

2.12 温度传感器 1
未激活
0 °C
2.12

2.13 温度传感器 2
未激活
0 °C
2.13

2.14 流量
90 m³/h
2.14

2.15 果汁流量
12000 m³
每立方方能量
0.22 kWh/m³
2.15

2.16 固件版本
99.56
2.16

2.17 工厂配置文件 id
40
2.17

3.1 控制模式
恒定压力
3.1 安

3.2 控制器
Kp 0.50
Ti 0.50 s
3.2 安

3.3 External setpoint
Not active
3.3 INSTALLATION

3.3A External setpoint
Min. 0.00 V
Max. 10.0 V
3.3A INSTALLATION

3.4 信号继电器 1
激活时间
报警
3.4 安

3.5 信号继电器 2
激活时间
警告
3.5 安

3.6 +/-, OK, 开/关按钮
激活
3.6 安

3.7 协议
GENibus
3.7 安

3.8 泵号
1
3.8 安

3.9 数字输入 2
外部故障
3.9 安

3.10 数字输入 3
干转
3.10 安

3.11 数字输入 4
流量开关
3.11 安

3.12 数字流量输入
100 升/脉冲
3.12 安

3.13 模拟输出
不活跃
3.13 安

3.14 停机功能
激活
ΔH 10 %
3.14 安

3.15 传感器 1
4-20 mA bar
0.00 10.0
3.15 安

3.16 传感器 2
4-20 mA %
0.00 100
3.16 安

3.17 工作/备用
未激活
3.17 安

3.18 工作范围
最小 25 %
最大 100 %
3.18 安

3.19 电机轴承监控
激活
3.19 安

3.20 电机轴承
已再次润滑
3.20 安

3.21 温度传感器 1
未激活
3.21 安

3.22 温度传感器 2
未激活
3.22 安

3.23 停机时加热
未激活
3.23 安

3.24 变速
加速 1.00 s
减速 3.00 s
3.24 安

3.25 开关频率
5.0 kHz
3.25 安

10. 通过控制板进行设置

10.1 控制面板



警告

控制面板上的开/关按钮不能够将CUE与电源电压断开，因此不可以将它当作安全开关使用。



开/关按钮有最高优先权。在 "off" 状态时，水泵运行不可能实现。

控制面板用于CUE的现场设置。设置功能的可选性取决于连接到CUE的泵家族类型。

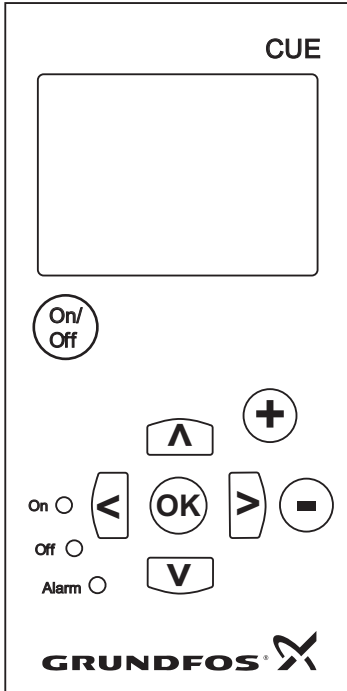


图 46 CUE的控制板

修改按钮

按钮	功能
	使泵进入待机状态/启动和停泵。
	保存改动的设置，清除报警以及展开菜单。
	修改数值在有效的范围内。

导航按钮

按钮	功能
	从一个菜单转到另一个菜单。当菜单改变后，显示的菜单屏总是新菜单的最上屏。
	在单个菜单中上下导航。

控制板的修改按钮可以被设置成下值：

- 激活
- 未激活。

如果设置为"未激活"(锁定)，则修改按钮不行使功能。只允许在菜单中导航和数值浏览。

同时按下箭头和下箭头3秒钟时间可以启用或停用按钮功能。

调节显示对比度

按[OK] 和 [+] 获得更暗的显示。

按[OK] 和 [-] 获得更亮的显示。

指示灯

位于控制板前面的指示灯可以显示水泵的运行状态。见图46。

下表说明指示灯的功能。

指示灯	功能
开 (绿色)	水泵在运行之中或已经通过停机功能被停止。 如果此灯闪烁，表示水泵已经通过以下途径被停止：用户(CUE菜单)、外部启动/停机或总线。
关 (橙色)	水泵已经通过开/关按钮被停止。
报警 (红色)	指示一次报警或警告。

显示, 一般项目

图47和图48说明一般显示项目。

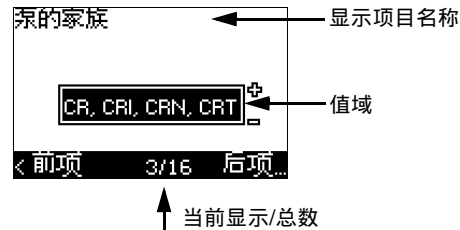


图 47 启动指南中显示举例

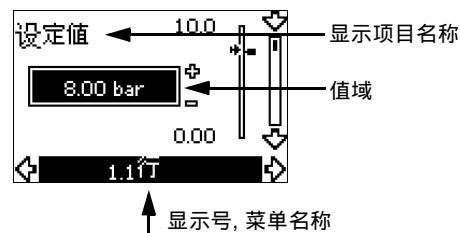


图 48 用户菜单中显示举例

TM03 8719 2507

10.2 恢复出厂设置

按照以下步骤操作以恢复工厂设置:

1. 切断CUE的电源供应。
2. 在接通电源的同时按下[On/Off], [OK] 和 [+].

此时CUE全部参数恢复到工厂设置。显示屏幕会在重置完成后接通。

10.3 CUE设置



TM04 7313 1810

启动指南包括所有能在CUE控制面板上设置的参数。

文档包括一份额外的用于设置PC-tool参数的特殊表格, 以及用于填写PC-tool编程的细节的一页内容。

如果你想下载文件, 请联系在您当地的格兰富公司。

10.4 启动向导

注意

检查连接的设备是否可以启动; 检查CUE是否已经与电源电压连接。

将电机、水泵和CUE的铭牌数据准备好。

采用启动指南对CUE的一般项目进行设置, 包括正确转动方向的设置。

启动指南在CUE连接到电源时首次开始运行。该指南可以在"一般"菜单中重新运行。请注意在这种情况下所有既往设置将会被清除。

带点条目显示可用设置。出厂设置为粗体显示。

10.4.1 欢迎显示



- 按下 [ok]。启动指南现在会全程指导用户。

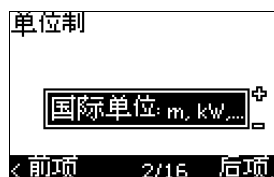
10.4.2 语言 (1/16)



选择显示语言:

- 英式英语
- 美式英语
- 德语
- 法语
- 意大利语
- 西班牙语
- 葡萄牙语
- 希腊语
- 荷兰语
- 瑞典语
- 芬兰语
- 丹麦语
- 波兰语
- 俄语
- 匈牙利语
- 捷克语
- 汉语
- 日语
- 朝鲜语

10.4.3 单位 (2/16)



选择显示单位:

- 国际单位: m, kW, bar...
- 美制单位: ft, HP, psi...

10.4.4 水泵家族 (3/16)



根据泵的铭牌选择水泵家族:

- CR, CRI, CRN, CRT
- SP, SP-G, SP-NE
- ...

如果您需选的泵型不在清单内, 请选择 "Other" (其它)。

10.4.5 额定电机功率 (4/16)



根据电机铭牌选择额定电机功率, P2:

- 0.55 - 90 kW。

设置范围与尺寸有关, 工厂设置与CUE的额定功率一致。

10.4.6 电源电压 (5/16)



根据安装现场的供电电压选择电源电压。

单元 1 x 200-240 V:* 单元 3 x 200-240 V: 单元 3 x 380-500 V:

- | | | |
|--------------|--------------|--------------|
| • 1 x 200 V | • 3 x 200 V | • 3 x 380 V |
| • 1 x 208 V | • 3 x 208 V | • 3 x 400 V |
| • 1 x 220 V | • 3 x 220 V | • 3 x 415 V |
| • 1 x 230 V | • 3 x 230 V | • 3 x 440 V |
| • 1 x 240 V. | • 3 x 240 V. | • 3 x 460 V |
| | | • 3 x 500 V. |

单元 3 x 525-600 V: 单元 3 x 525-690 V:

- | | |
|--------------|--------------|
| • 3 x 575 V. | • 3 x 575 V |
| | • 3 x 690 V. |

* 单相输入 - 三相输出。

设置范围取决于CUE类型，工厂设置与CUE的额定电源电压一致。

10.4.7 最大电机电流(6/16)



根据电机铭牌设置最大电机电流:

- 0-999 A.

设置范围取决于CUE类型，工厂设置与选定电机功率下的标准电机电流一致。

即使在设置CUE时，电流设置高了一点，但最大电流不能超过CUE铭牌上的数值。

10.4.8 速度 (7/16)



根据水泵铭牌设置额定速度:

- 0-9999 最小⁻¹.

工厂设置取决于此前各选项。在所设额定速度基础上，CUE会将电机频率自动设置到 50 或 60 赫兹。

10.4.9 频率 (7A/16)



该显示只有在需要手动输入频率时才会出现。

根据电机铭牌设置频率:

- 40-200 Hz

工厂设置取决于此前各选项。

10.4.10 控制模式 (8/16)



选择用户需要的控制模式。见章节 10.8.1 控制模式 (3.1)。

- 开环
- 恒定压力
- 恒定压差
- 比例压差
- 恒定流量
- 恒定温度
- 恒定液位
- 其它恒定值。

可选设置与工厂设置取决于水泵家族。

如果所选的控制模式需要连接传感器而传感器尚未安装，则CUE会发出报警。此时如需在未连接传感器情况下继续设置，请选择 "Open loop" (开环)，然后继续。如果传感器已经连接，则在 INSTALLATION (安装) 菜单中设置传感器和控制模式。

10.4.11 额定流量 (8A/16)

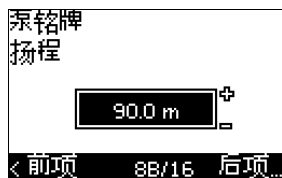


此显示只有在控制模式选择为比例压差时才会出现。

根据水泵铭牌设置额定流量:

- 1-6550 m³/h.

10.4.12 额定扬程 (8B/16)



此显示只有在控制模式选择为比例压差时才会出现。
根据水泵铭牌设置额定扬程:

- 1-999米

10.4.13 传感器连接到终端 54 (9/16)



用一个4-20 mA范围内的信号对所接传感器的测量范围进行设置。
测量范围取决于所选控制模式:

比例压差:

- 0-0.6巴
- 0-1巴
- 0-1.6巴
- 0-2.5巴
- **0-4巴**
- 0-6巴
- 0-10巴
- 其它。

恒定压力:

- 0-2.5巴
- 0-4巴
- 0-6巴
- **0-10巴**
- 0-16巴
- 0-25巴
- 其它。

恒定温度:

- **-25 至 25 °C**
- 0至25 °C
- 50至100 °C
- 0至150 °C
- 其它。

恒定压差:

- 0-0.6巴
- 0-1.6巴
- 0-2.5巴
- **0-4巴**
- 0-6巴
- 0-10巴
- 其它。

恒定流量:

- 1-5 m³/h
- **2-10 m³/h**
- 6-30 m³/h
- 15-75 m³/h
- 其它。

恒定液位:

- 0-0.1巴
- 0-1巴
- 0-2.5巴
- 0-6巴
- 0-10巴
- 其它。

如果控制模式选择为 "其它恒定值", 或者测量范围选择 "其它", 则传感器必须按照下一节, 显示 9A/16 所述进行设置。

10.4.14 另一个传感器连接到终端 54 (9A/16)

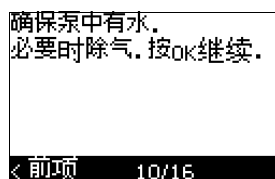


只有在显示 9/16 中已经选择了控制模式 "其它恒定值" 或测量范围 "其它" 时该显示才会出现。

- 传感器输入信号:
0-20 mA
4-20 mA.
- 传感器测量单位:
bar, mbar, m, kPa, psi, ft, m³/h, m³/min, m³/s, l/h, l/min, l/s, gal/h, gal/m, gal/s, ft³/min, ft³/s, °C, °F, %.
- 传感器测量范围。

测量范围取决于所接传感器和选定的测量单位。

10.4.15 启动注水和除气 (10/16)



参见水泵安装和操作指导。

CUE的一般设置此时已经完成, 启动指南现在可以对转动方向进行设置:

- 按[OK]进入转动方向的自动或手动设置。

10.4.16 转动方向的自动设置 (11/16)



警告

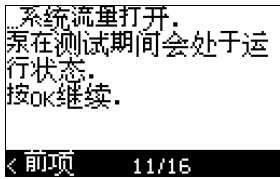
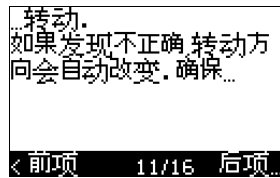
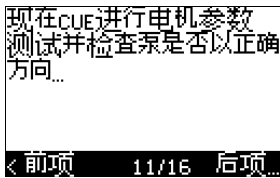
测试期间, 水泵会短暂运转一段时间。确保人员或设备不会发生危险!

注意

在设置运转方向之前, CUE会对某些泵型作自动电机适应。该自适应需要数分钟时间。自适应是在止转期间完成。

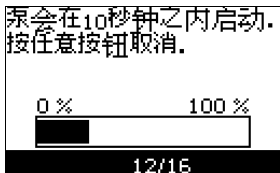
CUE自动测试和设置正确的转动方向, 毋需改变电缆连接。

该测试在某些泵型不适用且在某些情况下不能够完全肯定正确的转动方向。在这种情况下, CUE切换到手动设置, 也就是说此时转动方向的设置是基于安装者的目察结果。



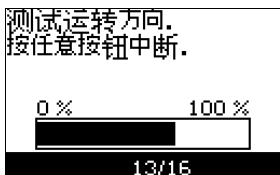
信息显示。

- 按 [OK] 继续。



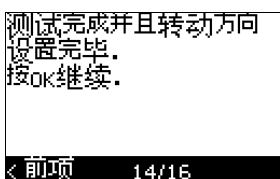
水泵在10秒钟后启动。

可以中断测试并回到以前显示。



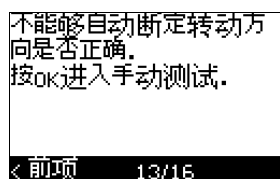
水泵以两个转动方向运转并自动停止。

可以中断测试, 停止水泵和进入转动方向的手动设置。



现在正确的转动方向已经被设置。

- 按 [OK] 设置设定值。见章节 10.4.17 设定值 (15/16)。



转动方向的自动设置失败。

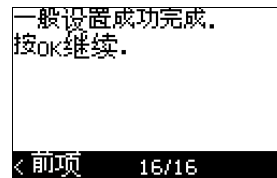
- 按 [OK] 进入转动方向的手动设置。

10.4.17 设定值 (15/16)



根据控制模式和所接传感器设置设定值。

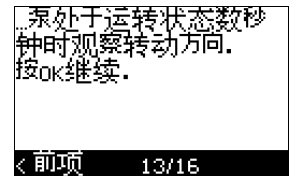
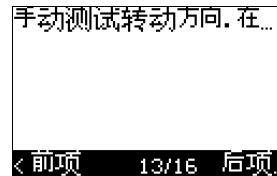
10.4.18 一般设置执行完毕 (16/16)



- 按 [OK] 使水泵可以投入运行或在运行模式“正常”中启动水泵。此时“运行”菜单的显示 1.1 会出现。

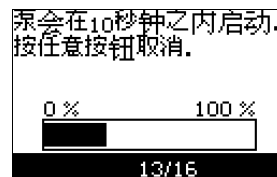
10.4.19 转动方向可见时的手动设置 (13/16)

必须可以观察到电机风扇或轴。



信息显示。

- 按 [OK] 继续。

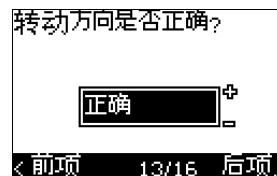


水泵在10秒钟后启动。

可以中断测试并回到以前显示。

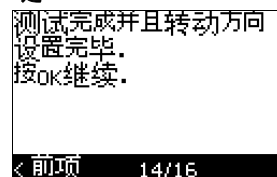


如果连接了压力传感器, 则测试过程中会显示压力。电机电流在测试过程中始终显示。



说明转动方向是否正确。

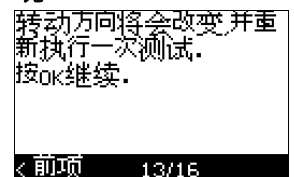
- 是



现在正确的转动方向已经被设置。

- 按 [OK] 设置设定值。见章节 10.4.17 设定值 (15/16)。

- 无

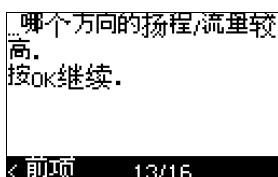
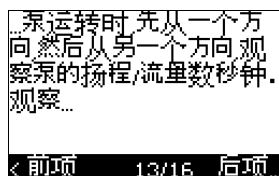
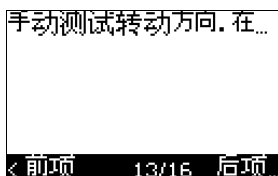


转动方向不正确。

- 按 [OK] 以相反转动方向重复测试。

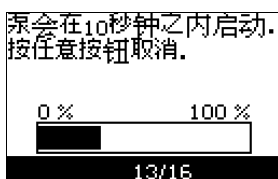
10.4.20 转动方向不可见时的手动设置 (13/16)

必须可以观察到扬程或流量。



信息显示。

- 按 [OK] 继续。

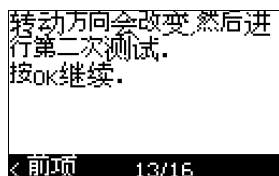
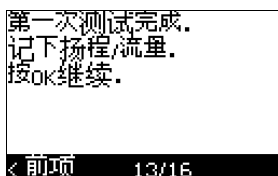


水泵在10秒钟后启动。

可以中断测试并回到以前显示。

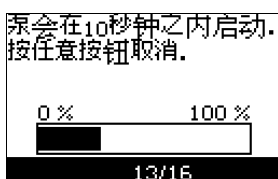


如果连接了压力传感器，则测试过程中会显示压力。电机电流在测试过程中始终显示。



第一次测试完成。

- 记录压力和/或流量，按OK以相反转动方向继续手动测试。

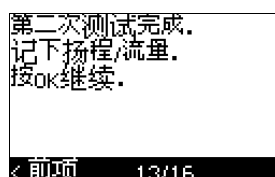


水泵在10秒钟后启动。

可以中断测试并回到以前显示。



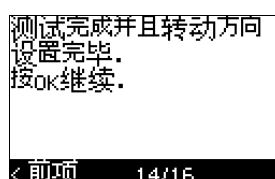
如果连接了压力传感器，则测试过程中会显示压力。电机电流在测试过程中始终显示。



第二次测试完成。

记录压力和/或流量，说明哪一次测试的水泵性能较高：

- 第一次测试
- 第二次测试
- 进行新的测试。



现在正确的转动方向已经被设置。

- 按 [OK] 设置设定值。见章节 10.4.17 设定值 (15/16)。

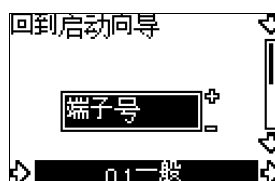
10.5 概述

注意 如果启动指南开始运行。所有既往设置会被清除!

注意 启动指南必须是在冷机状态时进行!
重复启动指南可以导致电机变热。

该菜单允许回到启动指南，启动指南通常仅在CUE首次启动时应用。

10.5.1 回到启动指南 (0.1)



说明用户选择：

- 是
- 序号

如果选择是，所有设置将会被清除，而且必须全程执行整个启动指南。CUE会返回启动指南，可以进行新的设置。章节 10. 通过控制板进行设置中以及其它设置无需重置。

恢复出厂设置

按[On/Off], [OK] 和[+] 完全恢复至出厂设置。

10.5.2 机型代码改变 (0.2)



此显示仅限于服务目的。

10.5.3 复制设置



可以从一个CUE中复制其设置并将该设置重新用于另一个CUE。

选项:

- 无复制。
- 向CUE (复制CUE的设置)。
- 向控制面板 (向另一个CUE复制设置)。

所有CUE单元的固件版本必须相同。见章节 10.7.16 固件版本 (2.16)。

10.6 运行

10.6.1 设定值 (1.1)



- ▶ 设定值设置
- ▶ 实际设定值
- 实际值

用和反馈传感器一致的单位设置设定值。

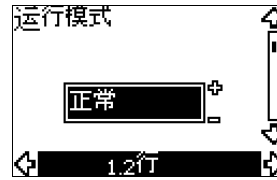
在开环控制模式中，设定值是以最大性能的%来设置。设置范围是在最小和最大曲线之间。见图55。

在除了比例压差之外的控制模式中，设定范围等同于传感器测量范围。见图56。

在比例压差控制模式中，设置范围等于最大扬程的 25 % 到 90 %。见图57。

如果水泵连接到一个外部设定值信号，则在本显示中出现的值为该外部设定值信号的最大值。见章节 13.2 外部设定值。

10.6.2 运行模式 (1.2)



设置以下运行模式之一:

- 正常 (工作)
- 停止
- 最小
- 最大

可以在不改变设定值的设定时设置运行模式。

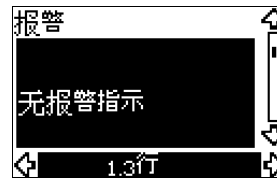
10.6.3 故障指示

故障可以引发两种指示: 报警或警告。

一次报警会激活CUE中的报警指示，并导致运行模式的改变，通常说来切换到停机。然而，对于某些引发报警的故障来说，水泵设置为即使是在报警存在时也继续运行。

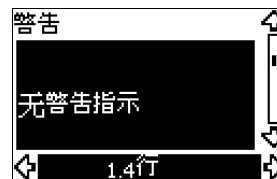
一次警告会激活CUE中的警告指示，但水泵的运行模式或控制模式不会发生改变。

报警 (1.3)



报警发生时，原因会出现在显示中。见章节 15.1 警告和报警清单。

警告 (1.4)

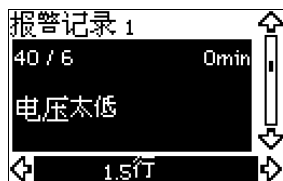


警告发生时，原因会出现在显示中。见章节 15.1 警告和报警清单。

10.6.4 故障记录

对两种故障类型，报警和警告，CUE都有记录功能。

报警记录 (1.5 - 1.9)



在报警情况下，报警记录中出现最近五次报警指示。"报警记录 1" 显示最近那次报警，"报警记录 2" 显示倒数最近第二次故障，以此类推。

本显示说明三块信息：

- 报警指示
- 报警代码
- 该次报警发生后水泵连接到电源的分钟数。

警告记录 (1.10 - 1.14)



在"警告"情况下，警告记录中出现最近五次警告指示。"警告记录 1" 显示最近一次故障，"警告记录 2" 显示倒数最近第二次故障，如此等等。

本显示说明三块信息：

- 警告指示
- 警告代码
- 该次警告发生后水泵连接到电源的分钟数。

10.7 状态

与该菜单相关的显示页仅为状态显示。不可以对数值进行改动或设置。

显示值的允许偏差在每一显示的下方说明。允许偏差作为指导是以所指参数最大值的 % 来表示。

10.7.1 实际设定值 (2.1)

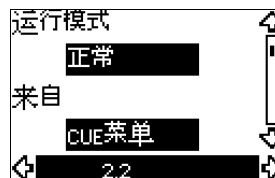


本显示说明实际设定值和外部设定值。

实际设定值是以反馈传感器中的单位显示。

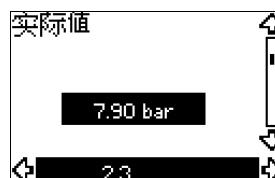
外部设定值是以 0-100 % 显示。如果外部设定值影响因素停用，显示值为 100 %。见章节 13.2 外部设定值。

10.7.2 运行模式 (2.2)



这屏显示说明实际运行模式(正常、停止、最小或最大)。这个显示还进一步说明该运行模式是从何处选择的 (CUE菜单、总线、外部或停止/启动按钮)。

10.7.3 实际值 (2.3)



该显示说明受控制的实际值。

如果没有传感器连接到CUE，"-" 会出现在该显示中。

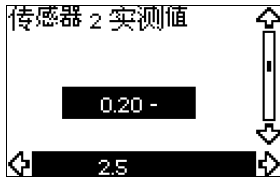
10.7.4 实测值，传感器 1 (2.4)



该显示说明连接到终端 54 上的传感器 1 所测得的实际值。

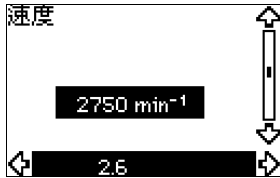
如果没有传感器连接到CUE，"-" 会出现在该显示中。

10.7.5 实测值，传感器 2 (2.5)



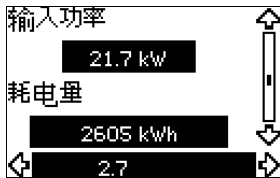
该显示只有在安装了 MCB 114 传感器输入模块时才会出现。
该显示说明连接到 MCB 114 的传感器 2 的实测值。
如果没有传感器连接到 CUE，"-" 会出现在该显示中。

10.7.6 速度 (2.6)



允许误差: $\pm 5\%$
该屏幕显示实际泵速度。

10.7.7 输入功率与电机电流 (2.7)



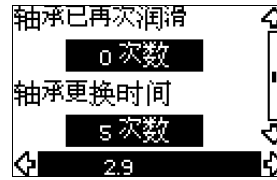
允许误差: $\pm 10\%$
该屏显示说明以 W 或 kW 为单位的泵的实际输入功率以及以安培 [A] 为单位的实际电机电流。

10.7.8 运行计时与功率消耗 (2.8)



允许误差: $\pm 2\%$
该屏显示说明运行小时计数以及功率消耗。运行小时数是一个累计值，不可以重置。功耗为从设备开始使用后的累计值，无法重置。

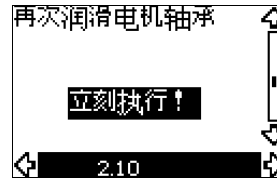
10.7.9 电机轴承的润滑状态 (2.9)



该显示说明用户已经进行了几次所规定的润滑以及何时应该替换电机轴承。

在电机轴承再次润滑完成之后，在"安装"菜单中确认此项。见章节 10.8.18 确认再次润滑/更换电机轴承 (3.20)。在再次润滑确认以后，以上画面中的数字会增加一次。

10.7.10 至再次润滑电机轴承的时间 (2.10)

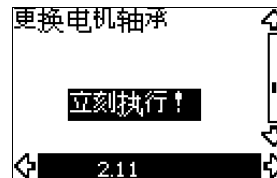


此显示只会在显示 2.11 不显示时才出现。

该画面显示何时再次润滑电机轴承。控制器监控水泵的运行规律并计算两次轴承润滑之间的时间。如果运行规律发生改变，至再次润滑的计算时间可能也会改变。

至再次润滑的估算时间考虑到水泵是否已经以削减速度运行。
见章节 10.8.18 确认再次润滑/更换电机轴承 (3.20)。

10.7.11 至更换电机轴承的时间 (2.11)



该显示只会在显示 2.10 不显示时才出现。

该画面显示何时应该更换电机轴承。控制器监控水泵的运行规律并计算两次更换轴承之间的时间。

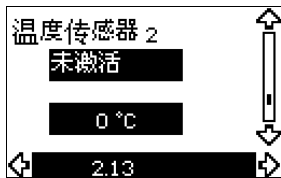
至电机轴承更换的估算时间考虑到水泵是否已经以削减速度运行。
见章节 10.8.18 确认再次润滑/更换电机轴承 (3.20)。

10.7.12 温度传感器 (2.12)



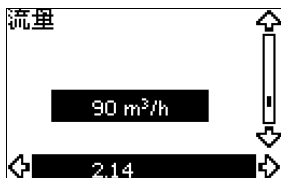
该显示只有在安装了 MCB 114 传感器输入模块时才会出现。
该显示说明连接到 MCB 114 的 Pt100/Pt1000 温度传感器 1 的测量点和实测值。测量点在显示 3.21 中选择。
如果没有传感器连接到 CUE, "-" 会出现在该显示中。

10.7.13 温度传感器 2 (2.13)



该显示只有在安装了 MCB 114 传感器输入模块时才会出现。
该显示说明连接到 MCB 114 的 Pt100/Pt1000 温度传感器 2 的测量点和实测值。测量点在显示 3.22 中选择。
如果没有传感器连接到 CUE, "-" 会出现在该显示中。

10.7.14 流量 (2.14)



该显示只有在配置流量计时才会出现。
该显示说明由一个连接到数字脉冲输入(终端 33)或模拟输入(终端54)上的流量计所测得的实际值。

10.7.15 累积流量 (2.15)



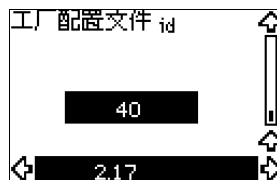
该显示只有在配置流量计时才会出现。
该显示说明流量的累计值以及传输泵送液体所使用的专用能量。
流量的测量可以连接到数字脉冲输入(终端 33)或模拟输入(终端54)。

10.7.16 固件版本 (2.16)



该显示说明软件的版本。

10.7.17 配置文件 (2.17)



该屏幕显示配置文件。

10.8 安装

10.8.1 控制模式 (3.1)



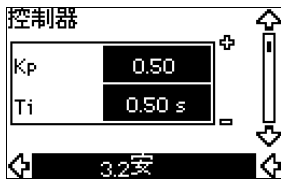
选择以下控制模式之一：

- 开环
- 恒定压力
- 恒定压差
- 比例压差
- 恒定流量
- 恒定温度
- 恒定液位
- 其它恒定值。

注意

如果水泵连接到总线，则不可以通过CUE选择控制模式。见章节 13.3 GENibus信号。

10.8.2 控制器 (3.2)



CUE有一个出厂默认设置的增益(K_p)和积分时间(T_i)。然而，如果各自工厂设置不是最优设置，可以在本项显示中修改增益和积分时间。

- 增益(K_p)的可设置范围是从 0.1 至 20。
- 积分时间(T_i)可在 0.1 至 3600 s之间设置。如果选择3600 s，则控制器作为P控制器使用。
- 可以进一步将控制器设置成逆向控制，也就是说如果设定值增加，速度会降低。在逆向控制情况下，增益(K_p)增益的设置范围必须是从-0.1至 -20。

下表说明建议的控制器设置：

系统/应用	K_p		T_i
	加热系统 ¹⁾	冷却系统 ²⁾	
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	- 2.5		100
	0.5	- 0.5	$10 + 5L_2$
	0.5		$10 + 5L_2$
	0.5	- 0.5	$30 + 5L_2^*$
	0.5		0.5^*
	0.5		$L_1 < 5 \text{ m}: 0.5^*$ $L_1 > 5 \text{ m}: 3^*$ $L_1 > 10 \text{ m}: 5^*$

* $T_i = 100$ 秒 (出厂设置)。

1. 加热系统是指在系统中水泵性能的增加会导致传感器上温度的上升。
2. 冷却系统是指系统中水泵性能的增加会导致传感器上温度的下降。

L_1 = 泵和传感器之间的距离[米]。

L_2 = 热交换器和传感器之间的距离[米]。

如何设置PI控制器

对于大多数应用，控制器恒量 K_p 和 T_i 的出厂设置可以确保的水泵优化运行。然而，在某些应用中可能需要对控制器作调整。

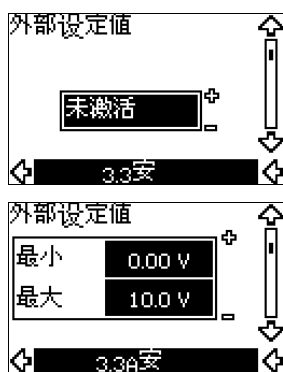
请按以下步骤操作。

1. 加大增益 (K_p) 直至电机出现不稳定。可以通过观察实测值是否开始出现波动而决定是否为不稳定。进一步来说，不稳定性可以在电机开始上下振荡时听见。
由于某些系统，如温度控制，为慢反应，因此观察电机的不稳定可能比较困难。
2. 将增益 (K_p) 设置成引起电机出现不稳定的那个值的一半。此值是增益的正确设置。
3. 减小积分时间 (T_i) 直至电机出现不稳定。
4. 将积分时间 (T_i) 设置到引起电机不稳定的那个值的两倍。此值是积分时间的正确设置。

经验总结:

- 如果控制器反应太慢，增加 K_p 。
- 如果控制器出现振荡或不稳定，通过减小 K_p 或增加 T_i 而抑制系统。

10.8.3 外部设定值 (3.3)



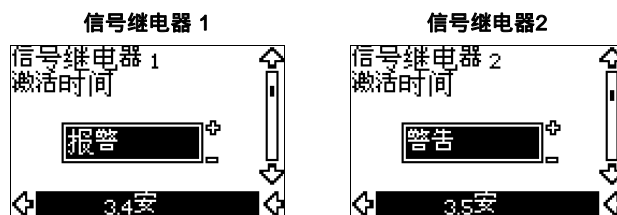
外部设定值信号的输入(终端 53) 可以被设置成以下状态之一:

- 激活
- 未激活。

如果选择了启用，当前设定值受到连接到外部设定值输入的的信号的影响。见章节 13.2 外部设定值。

10.8.4 信号继电器 1 和 2 (3.4和3.5)

CUE有两个信号继电器。在以下显示中，选择应该在何种影响状况中启用信号继电器。

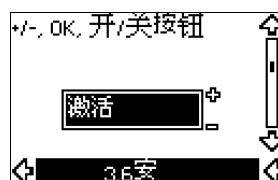


- 就绪
- 报警
- 运行
- 水泵工作中
- 未激活
- 警告
- 再次润滑。

注意

如需了解报警和警告之间的区别，参见章节 10.6.3 故障指示。

10.8.5 CUE上的按钮 (3.6)



位于控制板上的修改按钮 (+, -, On/Off, OK) 可以被设置成以下值之一:

- 激活
- 未激活。

如果设置为“未激活”(锁定)，则修改按钮不行使功能。如果水泵是由一个外部控制系统控制，则应将按钮设置到“未激活”。

通过同时按下箭头和下箭头按钮3秒时间可以启用或停用按钮。

10.8.6 协议 (3.7)

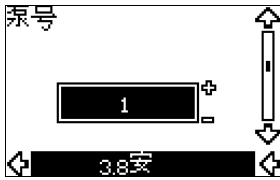


该显示说明CUE RS-485 端口的协议选择。可将协议设置成以下值:

- GENIbus
- FC
- FC MC.

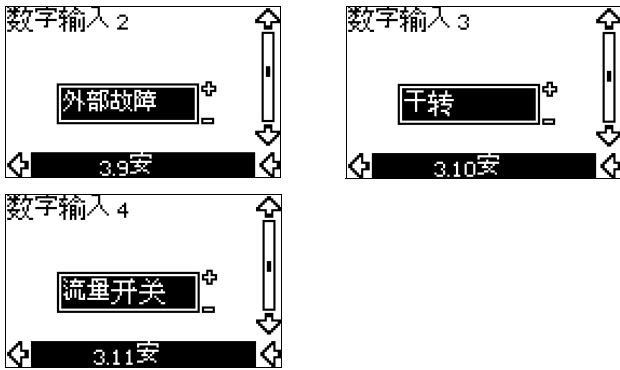
如果选择了GENIbus，通信协议是根据格兰富GENIbus标准进行设置。FC和FC MC仅适用于服务目的。

10.8.7 水泵数量 (3.8)



该显示说明 GENIbus号。可以对泵分配一个介于1和999之间的数字。在总线通信情况下，必须为每个泵指定一个编号。工厂设置为“-”。

10.8.8 数字输入2, 3 和 4 (3.9 至 3.11)



CUE的数字输入 (终端19, 32 和 33) 可以被独立设置到不同的功能。

选择以下功能之一：

- 最小 (最小曲线)
- 最大 (最大曲线)
- 外部故障
- 流量开关
- 报警复位
- 干转 (从外部传感器)
- 累计流量 (脉冲流量, 仅终端 33)
- 未激活。

选定的功能在数字输入启用时启用(闭环控制)。同见章节 13.1 数字输入。

最小

当该输入被激活时，水泵会按照最小曲线运行。

最大

当该输入被激活时，水泵会按照最大曲线运行。

外部故障

一旦该输入被激活，计时器将起动。如果该输入激活时间超过5秒，指示一次外部故障。如果该输入不被激活，故障状态会终止，水泵只能通过清除故障指示来手动重新启动。

流量开关

当选择该功能时，在流量开关探测到低流量时水泵会被停止。

只有在水泵连接到压力传感器或液位传感器，而且停机功能启用时才有可能使用该项功能。见章节 10.8.11 恒定压力带停机功能(3.14) 和 10.8.12 恒定液位带停机功能(3.14)。

报警复位

当该输入被激活时，报警会在引发报警的原因不复存在时清除。

干转

当此功能启用时，可以探测到是否缺乏入口压力或是否缺水。该功能需要使用附件，如：

- 一台格兰富 Liqtec® 干转开关
- 一个安装在水泵吸入侧的压力开关
- 一个安装在水泵吸入侧的浮子开关。

如果探测到入口压力缺乏或缺水(干转)，水泵会停止。只要该输入处于激活状态水泵就不能够重新启动。

取决于泵的家族，重新启动可以延迟到30分钟。

累计流量

当此项功能被设置用于数字输入 4 并且脉冲传感器连接到终端 33 时，累计流量可以被测量。

10.8.9 数字流量输入 (3.12)



该显示只有在显示 3.11 中已经完成流量计的配置后才会出现。

本显示用于对配置连接到终端 33 的脉冲传感器的累计流量功能中的每次脉冲容积进行设置。

设置范围：

- 0-1000升/脉冲。

可以在启动指南中选择该容积的设置单位。

10.8.10 模拟输出(3.13)



模拟输出可设置为显示以下内容：

- 反馈
- 输入功率
- 转速
- 输出频率
- 外部传感器
- 超出限值 1
- 超出限值 2
- 未激活。

10.8.11 恒定压力带停机功能(3.14)



设置

停机功能可以被设置成以下值:

- 激活
- 未激活。

可将启动/停止波段设置成以下值:

- ΔH的出厂设置为实际设定值的 10 %。
- ΔH的设置范围可以是实际设定值的5 %至30 %。

描述

停机功能用于低流量下的开/关运行和高流量下的连续运行之间的切换。

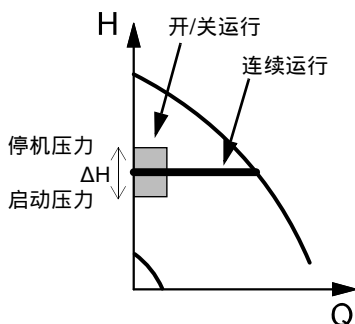


图 49 恒定压力带停机功能。启动压力和停机压力之间的差(ΔH)

低流量可以通过两种方式探测:

1. 一个内置的 "低流量探测功能", 在未对流量开关设置数字输入情况下发挥功能。
2. 一个连接到数字输入的流量开关。

1. 低流量探测功能

水泵会短时间降低速度以便定时检查流量。如果压力无改变或改变很小, 这意味着低流量存在。

速度会增加直至达到停机压力(实际设定值 + 0.5 x ΔH), 数秒钟后水泵停止。水泵最迟会在压力降低到启动压力(实际设定值 - 0.5 x ΔH) 时重新启动。

如果停止期间的流量高于低流量极限, 水泵会在压力降低到启动压力之前重新启动。

重新启动时, 水泵作出以下反应:

1. 如果流量高于低流量极限, 水泵会回到恒定压力下的连续运行。
2. 如果流量低于低流量极限, 水泵会继续以启动/停机运行。水泵在流量超过低流量极限之前会持续以启动/停机运行。在流量高于低流量极限时, 水泵会回到连续运行。

2. 配流量开关时低流量探测

在低流量激活数字输入时, 速度会增加直至达到停机压力(实际设定值 + 0.5 x ΔH), 然后水泵停机。当压力降低到启动压力时, 水泵再次启动。如果仍然没有流量, 则水泵会达到停机压力然后停止。如果有流量, 水泵会持续运行直至达到设定值。

停机功能的运行条件

只有在系统包含了一个压力传感器、一个单向阀和一个隔膜水箱时才可以使停机功能。

小心 止回阀必须安装在压力传感器之前。见图50和51。
如果使用一个流量开关来探测低流量, 该开关必须安装在系统侧隔膜水箱之后。

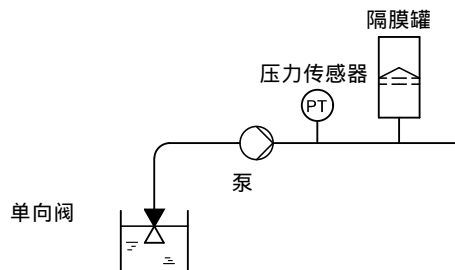


图 50 吸程运行中止回阀和压力传感器的位置

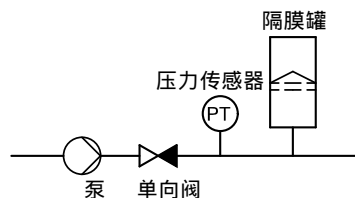


图 51 入口正压系统中止回阀和压力传感器的位置

隔膜罐

停机功能要求配置一个一定大小的隔膜水箱。该水箱的安装位置应该尽量靠近水泵, 水箱的预加压力必须是 0.7 x 实际设定值。

建议的隔膜水箱尺寸:

泵的额定流量 [m³/h]	标准隔膜水箱尺寸 [升]
0-6	8
7-24	18
25-40	50
41-70	120
71-100	180

如果系统中安装的隔膜水箱符合以上建议大小, ΔH的出厂设置即为正确设置。

如果安装的水箱太小, 水泵的启动和停机会过于频繁。这种情况可以通过增加ΔH来纠正。

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TM03 8583 1907

10.8.12 恒定液位带停机功能(3.14)

**设置**

停机功能可以被设置成以下值:

- 激活
- 未激活。

可将启动/停止波段设置成以下值:

- ΔH 的出厂设置为实际设定值的10%。
- ΔH 的设置范围可以是实际设定值的5%至30%。

一个内置的低流量探测功能会自动测量并储存大约50%和85%的额定速度时的功率消耗。

如果选择了启用,按以下步骤操作:

1. 关闭隔离阀以形成一个无流量条件。
2. 按 [OK] 开始自动调整。

描述

停机功能用于低流量下的开/关运行和高流量下的连续运行之间的切换。

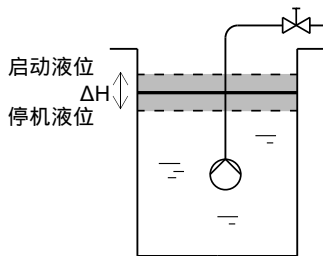


图 52 恒定液位带停机功能。启动液位和停机液位之间的差 (ΔH)

低流量可以通过两种方式探测:

1. 通过内置的低流量探测功能。
2. 通过一个连接到数字输入的流量开关。

1. 低流量探测功能

内置的低流量探测是基于对速度和功率的测量。

在探测到低流量时,水泵会停止。当液位达到启动液位时,水泵会再次启动。如果仍然无流量,水泵会达到停机液位而后停机。如果有流量,水泵会持续运行直至达到设定值。

2. 配流量开关时低流量探测

在因低流量使数字输入被激活时,水泵的转速会增加,直至到达停机液位(实际设定值 - $0.5 \times \Delta H$)后停机。当液位达到启动液位时,水泵会再次启动。如果仍然无流量,水泵会达到停机液位而后停机。如果有流量,水泵会持续运行直至达到设定值。

停机功能的运行条件

只有在系统包含一个液位传感器并且所有阀门均关闭时才能够使用恒定液位停机功能。

10.8.13 传感器 1 (3.15)



连接到终端 54 的传感器 1 的设置。该传感器为反馈传感器。

在以下值之间选择:

- 传感器输出信号:
0-20 mA
4-20 mA。
- 传感器测量单位:
bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F, %。
- 传感器测量范围。

10.8.14 传感器 2 (3.16)



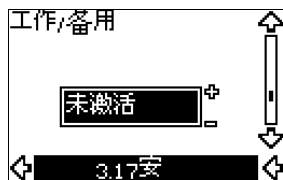
设置连接到 MCB 114 传感器输入模块的传感器 2

在以下值之间选择:

- 传感器输出信号:
0-20 mA
4-20 mA。
- 传感器测量单位:
bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F, %。
- 传感器测量范围:
0-100 %。

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10.8.15 工作/备用 (3.17)



设置

工作/备用功能可以设置到以下值:

- 激活
- **未激活。**

按以下步骤启用工作/备用功能:

1. 将其中一个泵与主电源连接。
将工作/备用功能设置到"未启用"。
在运行菜单和安装菜单中执行必要的设置。
2. 在运行菜单中将运行模式设置为"停止"。
3. 将其它泵连接到主电源。
在运行菜单和安装菜单中执行必要的设置。将工作/备用功能设置到"启用"。

运行中的那个泵会自动搜索另一个泵并自动将这个泵的工作/备用功能设置为"启用"。如果找不到另一个泵,一个故障会被指示。

注意

这两个泵必须通过 GENIbus 电气连接,而且 GENIbus 上必须没有其它任何连接。

工作/备用功能适用于两个并联泵并通过 GENIbus 控制。每个泵必须连接各自的 CUE 和传感器。

该功能的主要目的如下:

- 在工作泵由于报警而停止时启动备用泵。
- 至少每24小时一次轮换水泵。

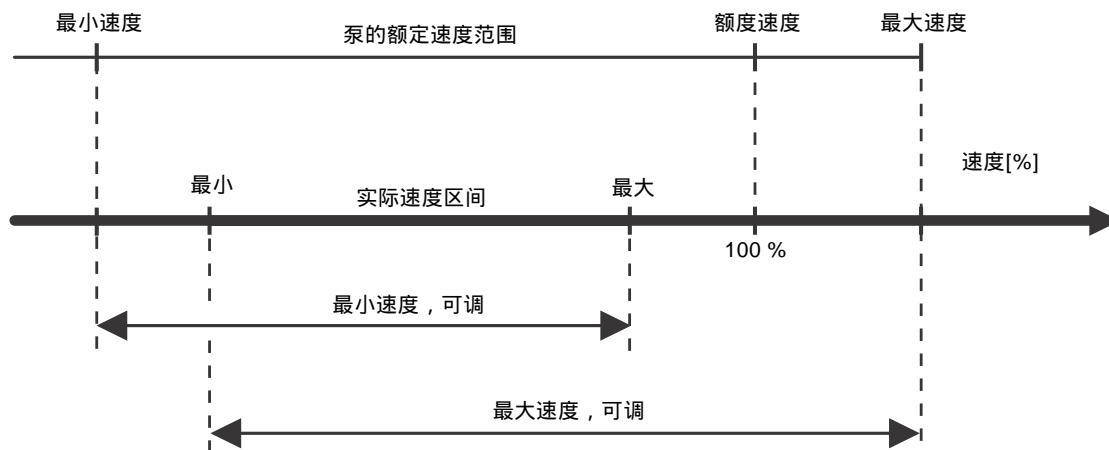
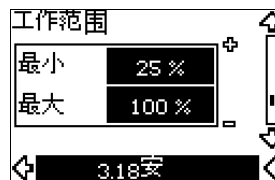


图 53 以最大性能的 % 来设置最小曲线和最大曲线

10.8.16 运行范围 (3.18)



如何设置运行范围:

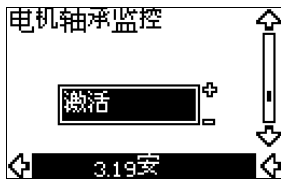
- 在视泵型而定的最小速度至可调节的最大速度范围之间设置最小速度。其工厂设置取决于泵型家族。
- 在可调节的最小速度至视泵型而定的最大速度范围之间设置最大速度。其工厂设置为100 %的等同值,即:在泵的铭牌所标示的速度。

最小速度与最大速度之间的区域即为泵的实际运行范围。

用户可在泵额定的速度区间之内改变泵的运行范围。

对于某些泵型来说,可以允许超同步运行(最高速度在100 %以上)。但此类运行需要配置一个超大型电机以提供超同步运行时泵所要求的轴功率。

10.8.17 电机轴承监控 (3.19)



电机轴承监控功能可以被设置成以下值:

- 激活
- 未激活。

当该功能设置到启用时, CUE会在应该再次润滑轴承或更换轴承时发出警告。

描述

电机轴承监控功能用于在应该重新润滑轴承或更换轴承的时间发出指示。见屏幕2.10和2.11。

警告指示和计算时间考虑到水泵是否以削减的速度运行过。如果安装了温度传感器并连接到一个MCB 114 传感器输入模块, 轴承温度会被包括在计算之内。

注意 如果该功能被切换为"未激活", 计数器会继续计时, 但不会在应该重新润滑轴承时给出警告。

10.8.18 确认再次润滑/更换电机轴承 (3.20)



该功能可以设置成以下值:

- 已再次润滑
- 已更换
- 工作未执行。

在完成轴承的润滑或更换工作之后, 通过按[OK] 在以上画面中确认此项工作。

注意 在确认润滑之后的一段时间内不可以选择已再次润滑。

已再次润滑

当警告"再次润滑电机轴承"得到确认之后,

- 计数器设置到0。
- 再次润滑的数字加 1。

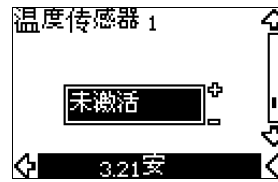
当再次润滑的数字达到允许数字时, 警告"更换电机轴承"会在显示中出现。

已更换

当警告"更换电机轴承"得到确认之后,

- 计数器设置到0。
- 再次润滑的数字设置到0。
- 更换轴承的数字加 1。

10.8.19 温度传感器 1 (3.21)

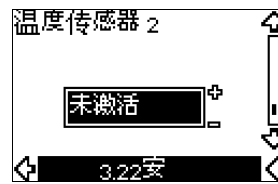


该显示只有在安装了MCB 114传感器输入模块时才会出现。

连接到MCB 114的温度传感器 1 的功能选择:

- 驱动端轴承
- 非驱动端轴承
- 其它液体温度 1
- 其它液体温度 2
- 电机绕组
- 泵送液体温度
- 环境温度
- 未激活。

10.8.20 温度传感器 2 (3.22)



该显示只有在安装了MCB 114传感器输入模块时才会出现。

连接到MCB 114的温度传感器 2 的功能选择:

- 驱动端轴承
- 非驱动端轴承
- 其它液体温度 1
- 其它液体温度 2
- 电机绕组
- 泵送液体温度
- 环境温度
- 未激活。

10.8.21 停止时加热 (3.23)



静止加热功能可以被设置为以下值:

- 激活
- 未激活。

当该功能设置到"启用"时水泵由一个停机指令停机, 电流输入到电机绕组。

停止时加热功能对电机预加热以避免冷凝。

10.8.22 加、减速时间 (3.24)

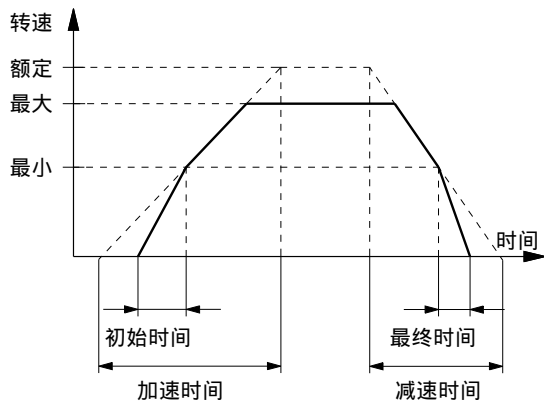


分别设置两个加、减速时间，即加速时间和减速时间：

- 工厂设置：
由功率大小决定。
- 变速时间参数的范围：
1-3600秒。

加速时间是指从 0 min^{-1} 到额定电机速度的时间。选择一个加速时间使得输出电流不会超过CUE的最大电流极限。

减速时间是指从额定电机速度到 0 min^{-1} 的时间。选择一个减速时间使得不会出现过压并且产生的电流不会超过CUE的最大电流极限。



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图 54 加速时间和减速时间，显示3.24

10.8.23 转换频率(3.25)



转换频率可以变更，菜单中的选项取决于CUE的功率大小。将转换频率调到更高的等级会增加损耗，并使CUE温度升高。如果环境温度较高，我们不建议增加转换频率。

11. 通过PC工具E-产品进行设置

不能通过CUE完成的特殊设置需要使用格兰富PC工具E-产品。使用格兰富PC工具E-产品需要格兰富服务技师或工程师的帮助。详细信息请与用户当地的格兰富公司联系。

12. 设置的优先级



开/关按钮有最高优先级。在 "off" 状态时，水泵运行不可能实现。

可以同时采用多种方式对CUE进行控制。如果两种或以上运行模式同时启用，具有最高优先级的那个运行模式生效。

12.1 无总线信号的控制，现场运行模式

优先级	CUE菜单	外部信号
1	停止	
2	最大	
3		停止
4		最大
5	最小	最小
6	正常	正常

举例：在通过一个外部信号启用"最大"运行模式后，只能停止水泵。

12.2 总线信号控制，远程控制运行模式

优先级	CUE菜单	外部信号	总线信号
1	停止		
2	最大		
3		停止	停止
4			最大
5			最小
6			正常

举例：在通过一个总线信号启用"最大"运行模式后，只能停止水泵。

13. 外部控制信号

13.1 数字输入

下表对与闭环控制关联的功能作出纵览。

端子	类型	功能
18	DI 1	<ul style="list-style-type: none"> 泵的启动/停止次数
19	DI 2	<ul style="list-style-type: none"> 最小 (最小曲线) 最大 (最大曲线) 外部故障 流量开关 报警复位 干转 (从外部传感器) 未激活。
32	DI 3	<ul style="list-style-type: none"> 最小 (最小曲线) 最大 (最大曲线) 外部故障 流量开关 报警复位 干转 (从外部传感器) 未激活。
33	DI 4	<ul style="list-style-type: none"> 最小 (最小曲线) 最大 (最大曲线) 外部故障 流量开关 报警复位 干转 (从外部传感器) 累计流量 (脉冲流量) 未激活。

不可以对同一功能选择一个以上的输入。

13.2 外部设定值

端子	类型	功能
53	AI 1	外部设定值 (0-10 V)

通过将一个模拟信号发送器连接到设定值输入(终端 53) 可以实现对设定值的远程设置。

开环

在开环控制模式中(恒定曲线), 可以在最小曲线到在CUE菜单中设置的设定值范围内对实际设定值实现外部设置。见图55。

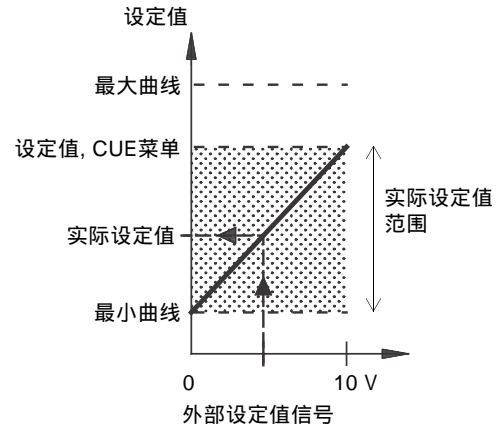


图 55 开环控制模式中实际设定值和外部设定值信号之间的关系

闭环

在除了比例压力以外的所有其它控制模式中, 可以在从传感器测量范围的低限到在CUE菜单中设置的设定值范围内对实际设定值实现外部设置。见图56。

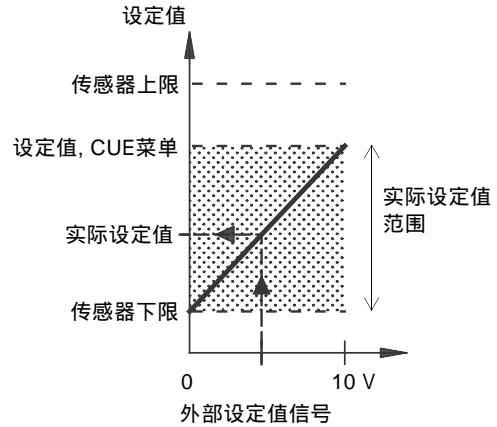


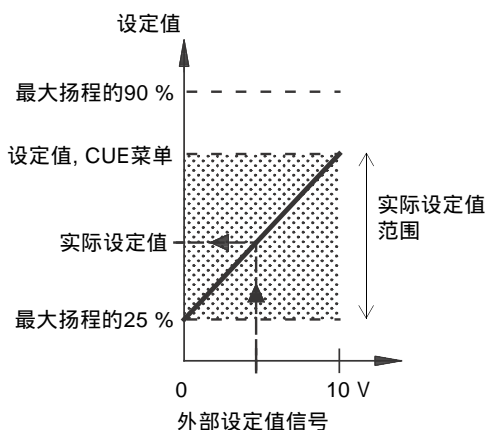
图 56 受控控制模式中实际设定值和外部设定值信号之间的关系

举例: 当传感器的下限为0巴, 在CUE菜单中设置的设定值为3巴, 以及外部设定值为80 %时, 实际设定值将为:

$$\begin{aligned}
 \text{实际设定值} &= (\text{经CUE菜单的设定值} - \text{传感器下限}) \times \% \text{外部设定值信号} + \text{传感器下限} \\
 &= (3 - 0) \times 80 \% + 0 \\
 &= 2.4 \text{巴}
 \end{aligned}$$

比例压差

在比例压差控制模式中，可以在最大扬程的25%至在CUE菜单中设置的设定值范围内对实际设定值进行外部设置。见图57。



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图 57 比例压差控制模式中实际设定值与外部设定值信号之间的关系

举例: 当最大扬程为12米，在CUE菜单中设置的设定值为6米，以及外部设定值信号为40%时，实际设定值将为以下：

$$\begin{aligned} \text{实际设定值} &= (\text{设定值 CUE菜单} - 25\% \text{ 的最大扬程}) \times \% \text{ 外部} \\ &\quad \text{设定值信号} + 25\% \text{ 的最大扬程} \\ &= (6 - 12 \times 25\%) \times 40\% + 12/4 \\ &= 4.2 \text{ m} \end{aligned}$$

13.3 GENibus信号

CUE支持经RS-485的串联通信。通信是根据格兰富GENibus协议实现并允许与楼宇管理系统或外部控制系统的连接。

运行参数，如设定值和运行模式，可以通过总线信号实现远程设置。与此同时，水泵也可以提供有关重要参数的状态信息，比如说控制参数的实际值、输入功率、故障指示等。

如需了解详细信息，请与格兰富联系。

注意 如果使用总线信号，则可以通过CUE进行的设置项目会减少。

13.4 其它总线标准

格兰富提供根据其它总线标准实现的总线通信解决方案。

如需了解详细信息，请与格兰富联系。

14. 保养和服务

14.1 CUE的清洁

保持冷却风扇和风扇叶片清洁以确保CUE有足够的冷却。

14.2 服务零件和服务组件

有关服务零件和服务组件的详情，访问 www.grundfos.com > Grundfos Product Center。

15. 故障查找

15.1 警告和报警清单

代码和显示文字	状态			运行模式	清除
	报警	故障	报警清除		
1 泄漏电流过高		●		停止	手动
2 主电源断相		●		停止	自动
3 外部故障		●		停止	手动
16 其它故障		●		停止	自动
30 更换电机轴承	●			-	手动 ³⁾
32 过压	●			-	自动
40 低压	●			-	自动
48 过载		●		停止	自动
49 过载		●	●	停止	手动
55 过载	●			-	自动
57 干转	●			停止	自动
64 CUE温度过高	●			停止	自动
70 电机温度过高	●			停止	自动
77 通信故障, 工作/准备	●			-	自动
89 传感器 1 超出范围	●			1)	自动
91 温度传感器 1 超出范围	●			-	自动
93 传感器 2 超出范围	●			-	自动
96 设定值信号超出范围	●			1)	自动
148 轴承温度过高	●			-	自动
149 轴承温度过高	●			停止	自动
155 涌流故障	●			-	自动
175 温度传感器 2 超出范围	●			停止	自动
240 再次润滑电机轴承	●			-	手动 ³⁾
241 电机相位错误	●			-	自动
242 电机自动适配不成功。 ²⁾	●			停止	自动

1) 在出现报警时，CUE 会根据水泵的类型而改变运行模式。

2) AMA, 电机自适应。当前软件中不可用。

3) 在屏幕 3.20 重置警告。

15.2 复位报警

如果CUE出现故障，则核查运行菜单中的报警菜单。最近五次报警和最近五次警告可以在记录菜单中找到。

如果某一报警反复出现，联系格兰富。

15.2.1 警告

在警告激活的状态下CUE会继续工作。警告会一直处于激活状态直至警告原因不复存在。某些警告可能会转到报警状态。

15.2.2 报警

在报警情况下，CUE会停止水泵或是根据报警种类和泵型不同而改变运行模式。见章节 15.1 警告和报警清单。

当报警原因得到处理并且报警已经清除时，水泵恢复工作。

手动清除报警

- 在报警显示中按[OK]。
- 按[开/关]两次。
- 启用设置到“报警重置”的数字输入DI 2-DI 4或数字输入DI 1 (启动/停机)。

如果报警无法清除，可能是因为故障尚未排除，或报警被锁定。

15.2.3 锁定报警

在报警被锁定的情况下，CUE会停止水泵并且锁定。在锁定报警的原因被排除并且清除报警之前，水泵不会恢复运行。

清除锁定报警

- 切断CUE的电源供应大约30秒。打开电源，并在报警屏幕按OK，重置报警。

15.3 指示灯

下表说明指示灯的功能。

指示灯	功能
开 (绿色)	水泵在运行之中或已经通过停机功能被停止。 如果此灯闪烁，表示水泵已经通过以下途径被停止：用户(CUE菜单)、外部启动/停机或总线。
关 (橙色)	水泵已经通过开/关按钮被停止。
报警 (红色)	指示一次报警或警告。

15.4 信号继电器

下表说明信号继电器的功能。

类型	功能
继电器 1	<ul style="list-style-type: none"> • 就绪 水泵工作中 • 报警 警告 • 运行 再次润滑
继电器 2	<ul style="list-style-type: none"> • 就绪 水泵工作中 • 报警 警告 • 运行 再次润滑

同见图29。

16. 技术参数

16.1 封装

每个CUE柜的尺寸大小取决于它的封装等级。下表说明封装等级和封装种类的关系。

示例:

从铭牌上读出:

- 电源电压 = 3 x 380-500 V。
- 标准轴功率 = 1.5 kW。
- 封装等级 = IP20。

该表显示CUE的封装为 A2。

标准轴功率 P2		封装										
		1 x 200-240 V			3 x 200-240 V		3 x 380-500 V		3 x 525-600 V		3 x 525-690 V	
[kW]	[HP]	IP20	IP21	IP55	IP20	IP55	IP20	IP55	IP20	IP55	IP21	IP55
0.55	0.75											
0.75	1											
1.1	1.5	A3		A5								
1.5	2				A2	A4	A2	A4	A3	A5		
2.2	3											
3	4		B1	B1								
3.7	5				A3	A5						
4	5						A2	A4				
5.5	7.5		B1	B1								
7.5	10		B2	B2	B3	B1	A3	A5	A3	A5		
11	15											
15	20											
18.5	25				B4	B2	B3	B1			B2	B2
22	30											
30	40				C3	C1	B4	B2				
37	50											
45	60				C4	C2						
55	75						C3	C1				
75	100											
90	125						C4	C2				

16.2 电缆封套

为在美国和加拿大以外使用的CUE变频器选择标准电缆封套孔。

为在美国和加拿大使用的CUE变频器选择特等电缆封套孔。

封装	标准封套孔	特等封套孔
A3 IP20/21 / NEMA类型1	3 x 22.5 (1/2")	3 x 22.5 (1/2")
	3 x 28.4 (3/4")	3 x 28.4 (3/4")
A4 IP55 / NEMA类型12	1 x 22.5 (1/2")	1 x 22.5 (1/2")
	3 x 28.4 (3/4")	3 x 28.4 (3/4")
A5 IP55 / NEMA类型2	6 x 26.3	6 x 28.4 (3/4")
B1 IP21 / NEMA类型1	2 x 22.5 (1/2")	2 x 22.5 (1/2")
	3 x 37.2	3 x 34.7 (1")
B1 IP55 / NEMA类型12	2 x 21.5	2 x 22.5 (1/2")
	1 x 26.3	1 x 28.4 (3/4")
	3 x 33.1	3 x 34.7 (1")
	1 x 21.5	1 x 22.5 (1/2")
B2 IP21 / NEMA类型1和 B2 IP55 / NEMA类型12	1 x 26.3	1 x 28.4 (3/4")
	1 x 33.1	1 x 34.7 (1")
	2 x 42.9	2 x 44.2 (1 1/4")

16.3 主要尺寸和重量

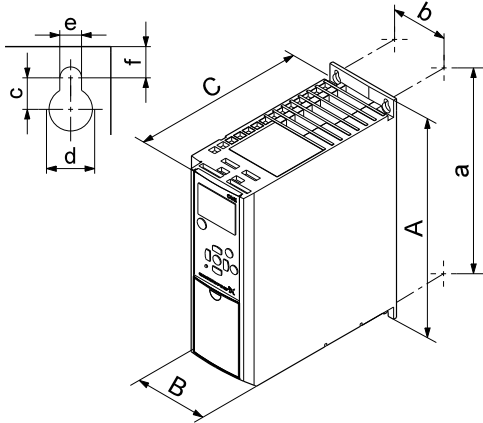


图 58 封装 A2 和 A3

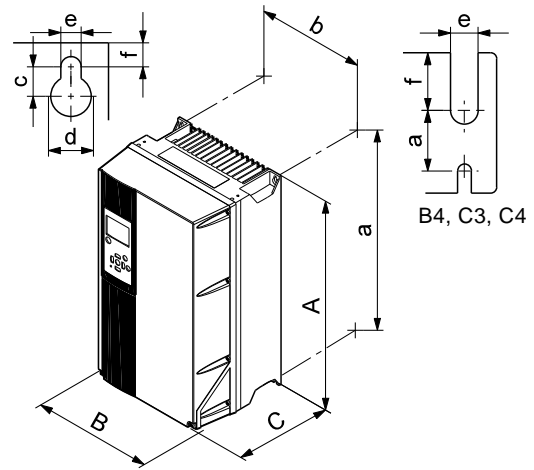


图 59 封装 A4, A5, B1, B2, B3, B4, C1, C2, C3 和 C4

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封装	高度 [mm]		宽度 [mm]		深度 [mm]	螺丝孔 [mm]					重量 [kg]
	A	a	B	b	C	C 1)	c	Ød	Øe		
A2	268	257	90	70	205	8	11	5,5	9	4,9	
A3	268	257	130	110	205	8	11	5,5	9	6,6	
A4	420	401	200	171	175	8,2	12	6,5	6	9,2	
A5	420	402	242	215	200	8,2	12	6,5	9	14	
B1	480	454	242	210	260	12	19	9	9	23	
B2	650	624	242	210	260	12	19	9	9	27	
B3	399	380	165	140	248	8	12	6,8	7,9	12	
B4	520	495	231	200	242	-	-	8,5	15	23,5	
C1	680	648	308	272	310	12	19	9	9,8	45	
C2	770	739	370	334	335	12	19	9	9,8	65	
C3	550	521	308	270	333	-	-	8,5	17	35	
C4	660	631	370	330	333	-	-	8,5	17	50	
D1h	1209	1154	420	304	380	20	11	11	25	104	
D2h	1589	1535	420	304	380	20	11	11	25	151	
装运体积											
D1h	650	-	1730	-	570	-	-	-	-	-	
D2h	650	-	1730	-	570	-	-	-	-	-	

1) 尺寸为最大高度，宽度和深度。

16.4 周围环境

相对湿度	5-95 % RH
环境温度	最高 50 °C
24 小时平均环境温度	最高 45 °C
全能工作时最低环境温度	0 °C
缩减工作时最低环境温度	-10 °C
存放和运输期间温度	-25 到 65 °C
存放时间	最长6个月
不会造成性能缩减的最高海拔高度	1000米
性能缩减下的最高海拔高度	3000米

注意 CUE交货时的包装不适用于室外存放。

16.5 终端扭矩

封装	力矩 (Nm)			
	主电源	电机	地线	继电器
A2	1.8	1.8	3	0.6
A3	1.8	1.8	3	0.6
A4	1.8	1.8	3	0.6
A5	1.8	1.8	3	0.6
B1	1.8	1.8	3	0.6
B2	4.5	4.5	3	0.6
B3	1.8	1.8	3	0.6
B4	4.5	4.5	3	0.6
C1	10	10	3	0.6
C2	14 ¹⁾ /24 ²⁾	14 ¹⁾ /24 ²⁾	3	0.6
C3	10	10	3	0.6
C4	14 ¹⁾ /24 ²⁾	14 ¹⁾ /24 ²⁾	3	0.6

1) 导线截面 ≤ 95 mm²2) 导线截面 ≥ 95 mm²。

16.6 电缆长度

最大长度, 屏蔽电机电缆	150米
最大长度, 非屏蔽电机电缆	300米
最大长度, 信号电缆	300米

16.7 保险丝和电缆截面



警告

必须符合国家和当地有关电缆截面的法规。

16.7.1 到信号终端的最大电缆截面

到信号终端的最大电缆截面, 刚性导线	1.5 mm ²
到信号终端的最大电缆截面, 软性导线	1.0 mm ²
到信号终端的最小电缆截面	0.5 mm ²

16.7.2 到主电源和电机的非UL保险丝和导线截面

标准轴功率 P2 [kW]	保险丝最大尺寸 [A]	保险丝种类	最大导线截面 ¹⁾
			[mm ²]
1 x 200-240 V			
1,1	20	gG	4
1,5	30	gG	10
2,2	40	gG	10
3	40	gG	10
3,7	60	gG	10
5,5	80	gG	10
7,5	100	gG	35
3 x 200-240 V			
0,75	10	gG	4
1,1	20	gG	4
1,5	20	gG	4
2,2	20	gG	4
3	32	gG	4
3,7	32	gG	4
5,5	63	gG	10
7,5	63	gG	10
11	63	gG	10
15	80	gG	35
18,5	125	gG	50
22	125	gG	50
30	160	gG	50
37	200	aR	95
45	250	aR	120
3 x 380-500 V			
0,55	10	gG	4
0,75	10	gG	4
1,1	10	gG	4
1,5	10	gG	4
2,2	20	gG	4
3	20	gG	4
4	20	gG	4
5,5	32	gG	4
7,5	32	gG	4
11	63	gG	10
15	63	gG	10
18,5	63	gG	10
22	63	gG	35
30	80	gG	35
37	100	gG	50
45	125	gG	50
55	160	gG	50
75	250	aR	95
90	250	aR	120
3 x 525-600 V			
0,75	10	gG	4
1,1	10	gG	4
1,5	10	gG	4
2,2	20	gG	4
3	20	gG	4
4	20	gG	4
5,5	32	gG	4
7,5	32	gG	4
3 x 525-690 V			
11	63	gG	35
15	63	gG	35
18,5	63	gG	35
22	63	gG	35
30	63	gG	35
37	80	gG	95
45	100	gG	95
55	125	gG	95
75	160	gG	95
90	160	gG	95

1) 屏蔽电机电缆, 非屏蔽电源电缆。AWG. 见章节 16.7.3 到主电源和电机的 UL 保险丝和导线截面。

16.7.3 到主电源和电机的UL保险丝和导线截面

标准轴功率 P2 [kW]	保险丝种类							最大导线截面 ¹⁾ [AWG] ²⁾
	Bussmann J	Bussmann T	SIBA RK1	Littel Fuse RK1	Ferraz-Shawmut CC	Ferraz-Shawmut RK1	Bussmann E1958 JFHR2	
1 x 200-240 V								
1,1	KTN-R20	-	-	-	-	-	-	10
1,5	KTN-R30	-	-	-	-	-	-	7
2,2	KTN-R40	-	-	-	-	-	-	7
3	KTN-R40	-	-	-	-	-	-	7
3,7	KTN-R60	-	-	-	-	-	-	7
5,5	-	-	-	-	-	-	-	7
7,5	-	-	-	-	-	-	-	2
3 x 200-240 V								
0,75	KTN-R10	JKS-10	JJN-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
1,5	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
2,2	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3,7	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
5,5	KTN-R50	JKS-50	JJN-50	5012406-050	KLN-R50	-	A2K-50R	7
7,5	KTN-R50	JKS-60	JJN-60	5012406-050	KLN-R60	-	A2K-50R	7
11	KTN-R60	JKS-60	JJN-60	5014006-063	KLN-R60	A2K-60R	A2K-60R	7
15	KTN-R80	JKS-80	JJN-80	5014006-080	KLN-R80	A2K-80R	A2K-80R	2
18,5	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
22	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
30	FWX-150	-	-	2028220-150	L25S-150	A25X-150	A25X-150	1/0
37	FWX-200	-	-	2028220-200	L25S-200	A25X-200	A25X-200	4/0
45	FWX-250	-	-	2028220-250	L25S-250	A25X-250	A25X-250	250 MCM
3 x 380-500 V								
0,55	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
0,75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2,2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
11	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
15	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
18,5	KTS-R50	JKS-50	JJS-50	5014006-050	KLS-R50	-	A6K-50R	7
22	KTS-R60	JKS-60	JJS-60	5014006-063	KLS-R60	-	A6K-60R	2
30	KTS-R80	JKS-80	JJS-80	2028220-100	KLS-R80	-	A6K-80R	2
37	KTS-R100	JKS-100	JJS-100	2028220-125	KLS-R100	-	A6K-100R	1/0
45	KTS-R125	JKS-150	JJS-150	2028220-125	KLS-R125	-	A6K-125R	1/0
55	KTS-R150	JKS-150	JJS-150	2028220-160	KLS-R150	-	A6K-150R	1/0
75	FWH-220	-	-	2028220-200	L50S-225	-	A50-P225	4/0
90	FWH-250	-	-	2028220-250	L50S-250	-	A50-P250	250 MCM
3 x 525-600 V								
0,75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2,2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3 x 525-690 V								
11	KTS-R-25	JKS-25	JJS-25	5017906-025	KLSR025	HST25	A6K-25R	1/0
15	KTS-R-30	JKS-30	JJS-30	5017906-030	KLSR030	HST30	A6K-30R	1/0
18,5	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
22	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
30	KTS-R-60	JKS-60	JJS-60	5014006-063	KLSR060	HST60	A6K-60R	1/0
37	KTS-R-80	JKS-80	JJS-80	5014006-080	KLSR075	HST80	A6K-80R	1/0
45	KTS-R-90	JKS-90	JJS-90	5014006-100	KLSR090	HST90	A6K-90R	1/0
55	KTS-R-100	JKS-100	JJS-100	5014006-100	KLSR100	HST100	A6K-100R	1/0
75	KTS-R125	JKS-125	JJS-125	2028220-125	KLS-125	HST125	A6K-125R	1/0
90	KTS-R150	JKS-150	JJS-150	2028220-150	KLS-150	HST150	A6K-150R	1/0

1) 屏蔽电机电缆，非屏蔽电源电缆。

2) 美国线规。

16.8 输入和输出

16.8.1 主电源供应 (L1, L2, L3)

电源电压	200-240 V ± 10 %
电源电压	380-500 V ± 10 %
电源电压	525-600 V ± 10 %
电源电压	525-690 V ± 10 %
电源频率	50/60 Hz
最大短暂相位失衡	额定值的3 %
对地漏电	> 3.5 mA
接通次数, 封装A	最多2次/分钟
接通次数, 封装B和C	最多1次/分钟

注意 不要用电源电压来接通和断开CUE。

16.8.2 电机输出 (U, V, W)

输出电压	0-100 % ¹⁾
输出频率	0-100 Hz ²⁾
接通输出	不倡议

¹⁾ 输出电压为电源电压的 %。

²⁾ 取决于所选泵的系列。

16.8.3 RS-485 GENIbus 连接

终端号	68 (A), 69 (B), 61 GND (Y)
-----	----------------------------

RS-485 电路在功能上与其它中央电路分隔, 并且在电流学上与电源电压分隔(PELV)。

16.8.4 数字输入

终端号	18, 19, 32, 33
电压水平	0-24 VDC
电压水平, 开放触点	> 19 VDC
电压水平, 闭合触点	< 14 VDC
最大输入电压	28 VDC
输入电阻, R _i	约4 kΩ

所有数值输入在电流学上与电源电压(PELV)以及其它高电压终端分隔。

16.8.5 信号继电器

继电器01, 终端号	1 (C), 2 (NO), 3 (NC)
继电器 02, 终端号	4 (C), 5 (NO), 6 (NC)
最大终端负荷 (AC-1) ¹⁾	240 VAC, 2 A
最大终端负荷 (AC-15) ¹⁾	240 VAC, 0.2 A
最大终端负荷 (DC-1) ¹⁾	50 VDC, 1 A
最小终端负荷	24 VDC 10 mA 24 VAC 20 mA

¹⁾ IEC 60947, 第 4 和第 5 部分。

C 公共端

NO 常开

NC 常闭

继电器触点通过加强绝缘与其它电路在电流学上相互分隔(PELV)。

16.8.6 模拟输入

模拟输入 1, 终端号	53
电压信号	A53 = "U" ¹⁾
电压范围	0-10 V
输入电阻, R _i	约 10 kΩ
最大电压	± 20 V
电流信号	A53 = "I" ¹⁾
电流范围	0-20, 4-20 mA
输入电阻, R _i	约 200 Ω
最大电流	30 mA
最大损失, 终端 53, 54	满标值的 0.5 %
模拟输入 2, 终端号	54
电流信号	A54 = "I" ¹⁾
电流范围	0-20, 4-20 mA
输入电阻, R _i	约 200 Ω
最大电流	30 mA
最大损失, 终端 53, 54	满标值的0.5 %

¹⁾ 工厂设置为电压信号 "U"。

所有模拟输入在电流学上与电源电压(PELV)以及其它高电压终端分隔。

16.8.7 模拟量输出

模拟输入 1, 终端号	42
电流范围	0-20 mA
到框架的最大负荷	500 Ω
最大损失	满标值的0.8 %

模拟输出在电流学上与电源电压(PELV)以及其它高电压终端分隔。

16.8.8 MCB 114 传感器输入模块

模拟输入 3, 终端号	2
电流范围	0/4-20 mA
输入电阻	< 200 Ω
模拟输入4和5, 终端号	4, 5和7, 8
信号类型, 2-线 或 3-线	Pt100/Pt1000

注意 当使用三线制PT100热敏电阻时, 电阻不能超过30欧姆 (Ω)。

16.9 声压级

CUE的声压水平在70 dB(A)以下。

受变频器控制的电机的声压水平可能高于相同电机未受变频器控制时的声压水平。见章节6.7 RFI滤波器。

17. 回收处理

必须以环境友好的方式对本产品或产品的部件进行回收处理。

1. 使用公立或私立废品回收服务设施。
2. 如果以上无法做到, 与附近的格兰富公司或服务站联系。

内容可有变动。

		16.6	130
		16.7	130
		16.8	132
		16.9	132
		17.	132
1.	90		
2.	90		
2.1	90		
2.2	90		
2.3	91		
3.	91		
3.1	91		
3.2	91		
3.3	91		
3.4	91		
4.	92		
4.1	92		
4.2	92		
5.	92		
5.1	92		
5.2	92		
5.3	92		
5.4	93		
6.	93		
6.1	93		
6.2	94		
6.3	97		
6.4	100		
6.5 MCB 114	101		
6.6 EMC	102		
6.7 RFI	102		
6.8	103		
6.9	103		
7.	104		
8.	104		
8.1 ()	104		
8.2 ()	104		
9.	105		
10.	107		
10.1	107		
10.2	108		
10.3 CUE	108		
10.4 가	108		
10.5	112		
10.6	113		
10.7	114		
10.8	117		
11. PC E-product	124		
12.	124		
12.1 가	124		
12.2 가	124		
13.	125		
13.1	125		
13.2	125		
13.3 GENibus	126		
13.4	126		
14.	126		
14.1 CUE	126		
14.2	126		
15.	126		
15.1	126		
15.2	127		
15.3	127		
15.4	127		
16.	128		
16.1	128		
16.2	128		
16.3	129		
16.4	129		
16.5	130		



1.



주의

참고

2.

0.55 - 90 kW Grundfos CUE
CUE 가

2.1

CUE
CUE 가
CUE 가
CUE

주의

2.2

CUE Grundfos
Grundfos E-pump
CUE E-pump
: E-pump 가
• E-pump 가

2.3

Grundfos CUE :

- CUE 가 가
- CUE 가
-

www.grundfos.com > Grundfos Product Center

가 Grundfos

3.

3.1



가



가 CUE CUE

	4	15	20
200-240 V	0.75 - 3.7 kW	5.5 - 45 kW	
380-500 V	0.55 - 7.5 kW	11-90 kW	
525-600 V	0.75 - 7.5 kW		
525-690 V			11-90 kW

CUE

3.2

- On/Off CUE
- CUE 가
- 3.5mA
- IP20/21 가
- IP54/55 가
- 가

3.3

가

- (, ,)
- (IT, TN,)
- (PELV).

3.3.1 IT



380-500 V CUE
440 V

IT
440 V

3.3.2

CUE
주의 가 가

CUE

3.4

- CUE ()
- 가

3.4.1



가 2000 m PELV

PELV =

CUE

CUE

3.4.2

- CUE 150 m 가 300 m,
- Grundfos
- CUE 16.7

4.

4.1

CUE 가 가

GRUNDFOS 	
T/C: CUE202P1M2T5E20H1BXCXXSXXXXAXBXCXXXXDX Prod. no: 12345678 S/N: 123456G234	
1.5 kW (400V)	
IN: 3x380-500 V 50/60Hz 3.7A	
OUT: 3x0-Vin 0-100Hz 4.1 A 2.8 kVA	
CHASSIS/IP20 Tamb. 45C/122F	
BAR CODE	MADE IN DENMARK
	Listed 76X1 E134261 Ind. Contr. Eq. See manual for prefuse
	CAUTION: SEE MANUAL / VOIR MANUEL
	WARNING: STORED CHARGE DO NOT TOUCH UNTIL 4 MIN AFTER DISCONNECTION CHARGE RESIDUELLE, ATTENDRE 4 MIN APRES DECONNEXION

TM04 3272 3808

1

T/C:	CUE()
	202P1M2... ()
Prod. no:	: 12345678
S/N:	: 123456G234
	23 4 2004
1.5 kW	
IN:	
OUT:	
CHASSIS/ IP20	
Tamb.	

4.2

CUE 가

5.

CUE

16.1

5.1

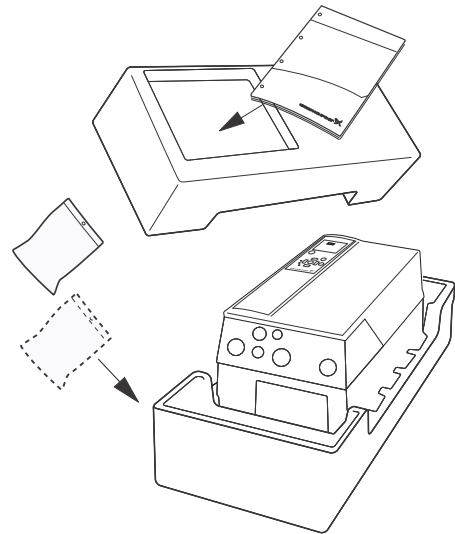
가

CUE

5.2

CUE

2



TM03 8857 2607

2 CUE

5.3

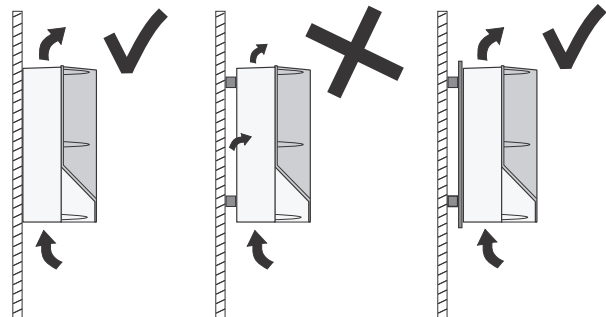
CUE

• CUE

• 50 °C

• CUE

3



TM03 8859 2607

3 CUE

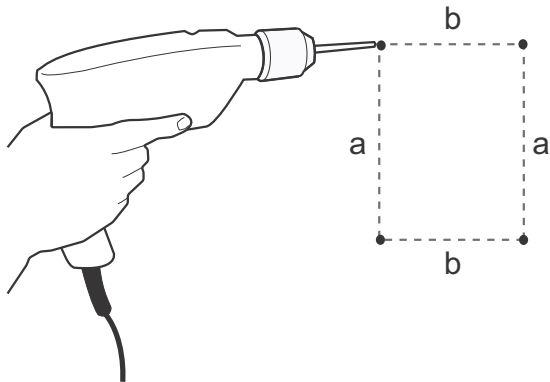
CUE

	[mm]
A2, A3, A4, A5	100
B1, B2, B3, B4, C1, C3	200
C2, C4	225
(enclosure)	16.1

5.4

주의 CUE

1. 16.3
2. CUE



4

6.

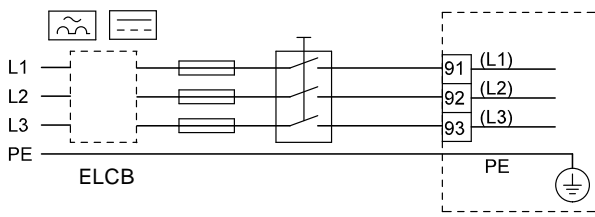


가



CUE

3.



5

3

가

CUE

TM03 8860 2607

TM03 8525 1807

6.1

6.1.1



CUE

가

주의

3.5mA

(PEN) 가 / (PE) / /
 EN IEC 61800-5-1
 • CUE

2

6.1.2

CUE

16.7

CUE

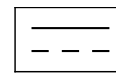
6.1.3 가

주의

3.5mA

CUE가

(ELCB) 가



ELCB

B

가

CUE

(L1, L2, L3)

16.8.1

ELCB

(trip)

6.1.4

CUE

6.1.5

CUE

6.1.6

CUE EN 61800-3, 2

6.2

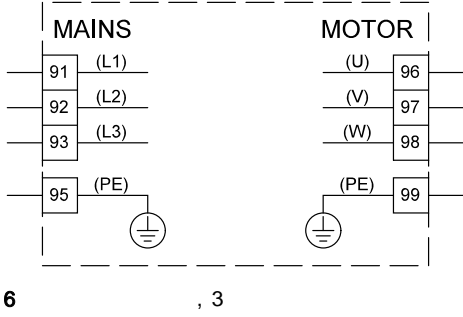
CUE
CUE

6.2.1

CUE
5

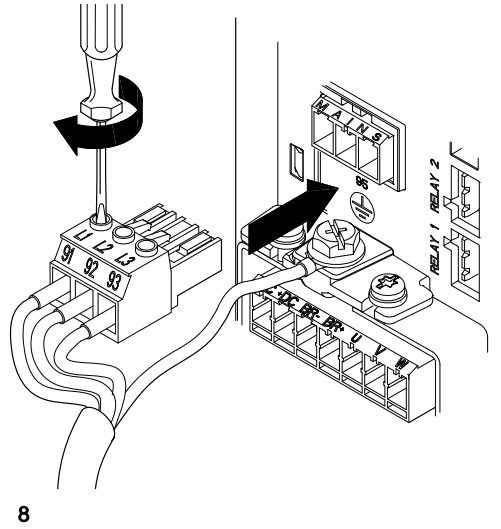
6.2.2

가



TM03 8799 2507

2. 95(PE)
91(L1), 92(L2), 93(L3)
MAINS



TM03 9011 2807

참고

L1 L2

91	(L1)		
92	(L2)	3	
93	(L3)		
95/99	(PE)		
96	(U)		
97	(V)	3	0-100 %
98	(W)		

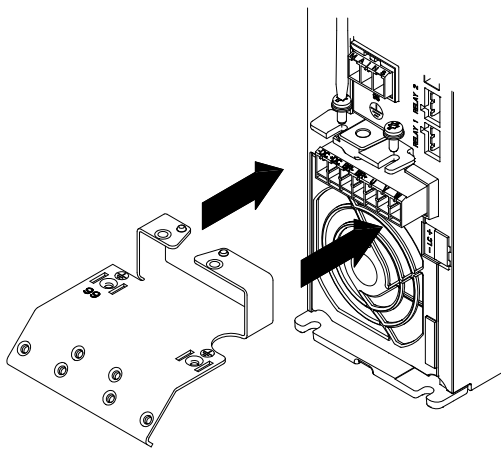
참고

L1 L2

6.2.3 , A2 A3
(enclosure) 16.1

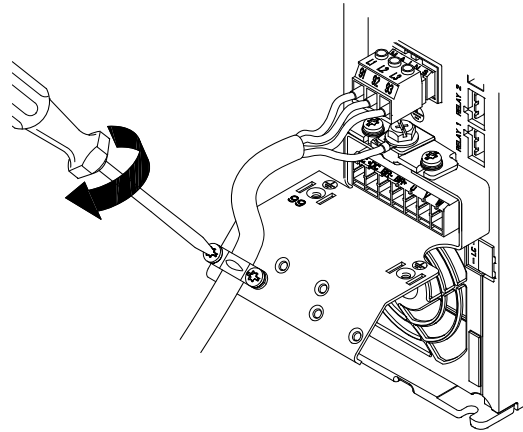
주의 CUE

1.



TM03 9010 2807

3.



TM03 9014 2807

9

6.2.4 (enclosure)

A2 A3

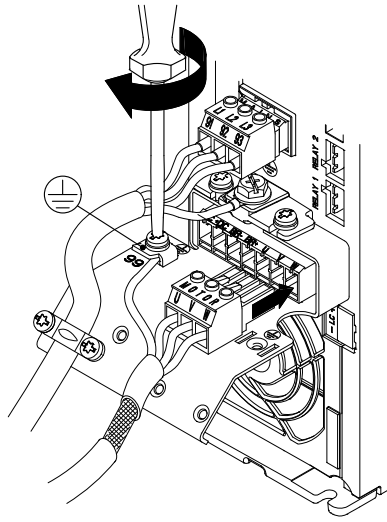
16.1

주의

EMC

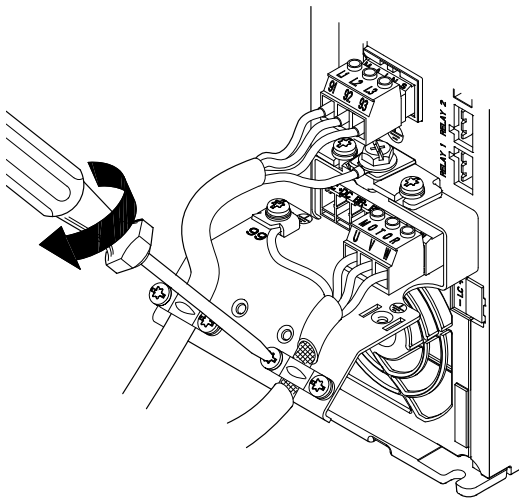
CUE

1. 99(PE)
96(U), 97(V), 98(W)



10

2. MOTOR



11

TM03 9013 2807

6.2.5 (Enclosures) A4 A5 (enclosure)

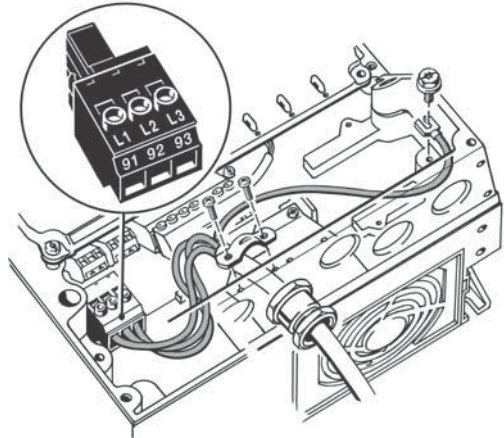
16.1

주의

CUE

1. 95(PE) 12
2. 91(L1), 92(L2), 93(L3)

3. MAINS
- 4.



12 , A4 A5

참고

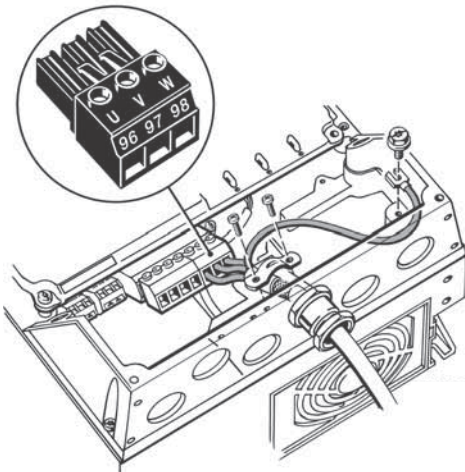
L1 L2

주의

EMC

CUE

1. 99(PE) 13
2. 96(U), 97(V), 98(W)
3. MOTOR
- 4.



13 , A5

TM03 9012 2807

TM03 9017 2807

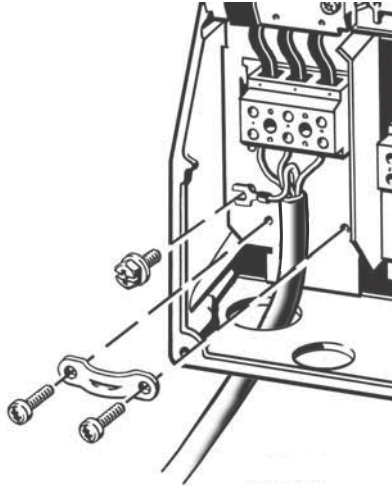
TM03 9018 2807

6.2.6 B1 B2
(enclosure)

16.1

주의 CUE

- 1. 95(PE) 14
- 2. 91(L1), 92(L2), 93(L3)
- 3.

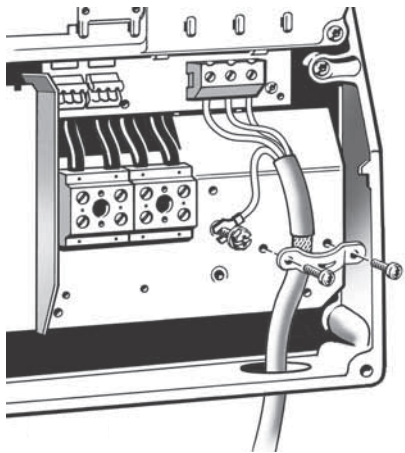


14 , B1 B2

참고 L1 L2

주의 EMC CUE

- 1. 99(PE) 15
- 2. 96(U), 97(V), 98(W)
- 3.



15 , B1 B2

6.2.7 B3 B4
(enclosure)

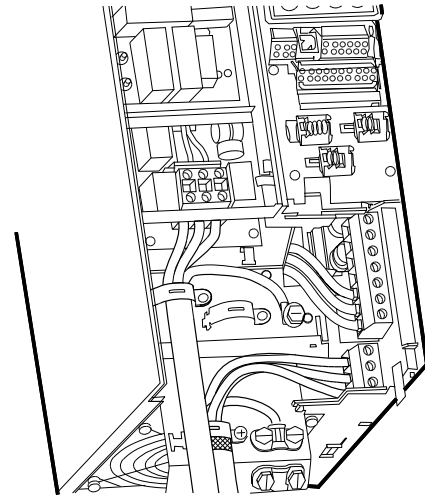
16.1

주의 CUE

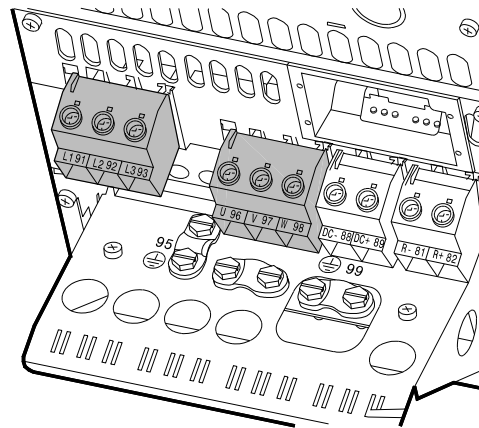
- 1. 95(PE) 16 17
- 2. 91(L1), 92(L2), 93(L3)
- 3.

주의 EMC CUE

- 1. 99(PE) 16 17
- 2. 96(U), 97(V), 98(W)
- 3.



16 , B3



17 , B4

TM03 9019 2807

TM03 9020 2807

TM03 9446 4007

TM03 9449 4007

6.2.8 (Enclosure) C1 C2

(enclosure)

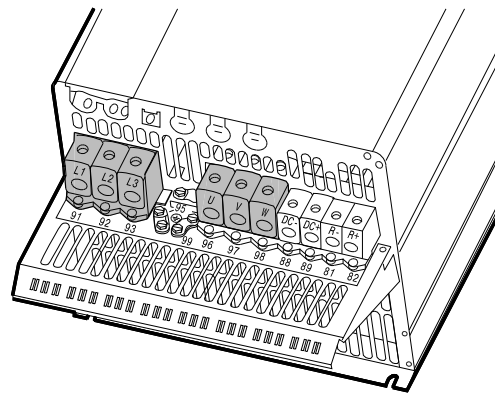
16.1

주의 CUE

- 1. 95(PE) 18
- 2. 91(L1), 92(L2), 93(L3)

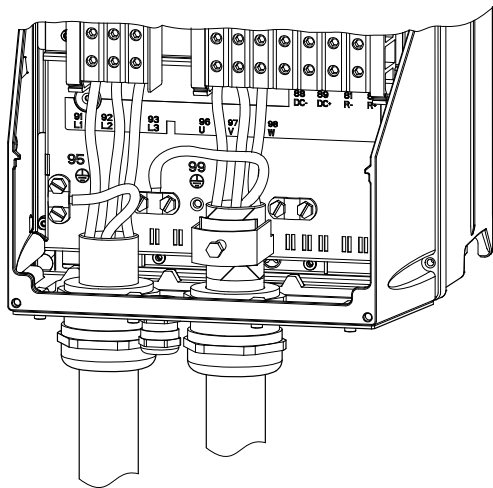
주의 EMC CUE

- 1. 99(PE) 18
- 2. 96(U), 97(V), 98(W)
- 3.



20 , C4

TM03 9447 4007



18 , C1 C2

6.2.9 C3 C4

(enclosure)

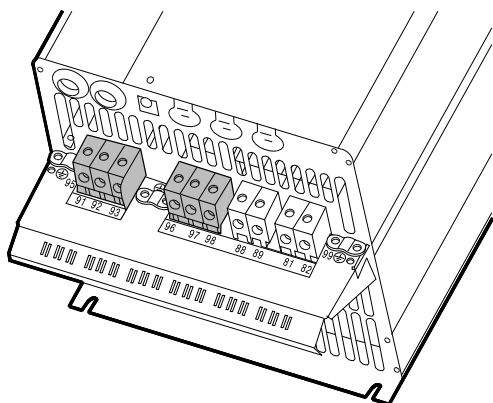
16.1

주의 CUE

- 1. 19 20 95(PE)
- 2. 91(L1), 92(L2), 93(L3)

주의 EMC CUE

- 1. 19 20 99(PE)
- 2. 96(U), 97(V), 98(W)
- 3.



19 , C3

TM03 9016 2807

TM03 9448 4007

6.3

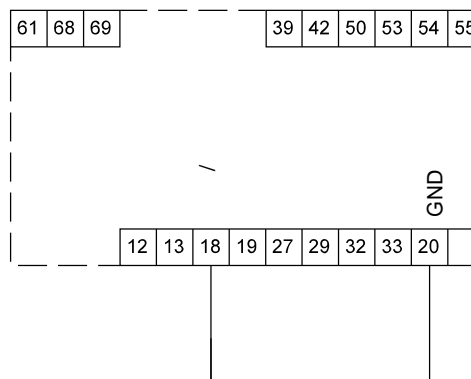
주의

참고

On/Off 가 18 20
 가 EMC
 6.6 EMC
 • 0.5 mm² () 1.5 mm² ()
 • 3

6.3.1

18 20 On/Off 가

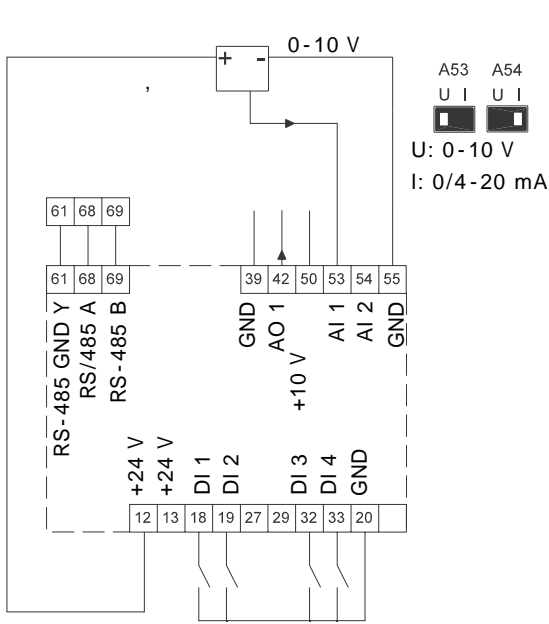


21 가

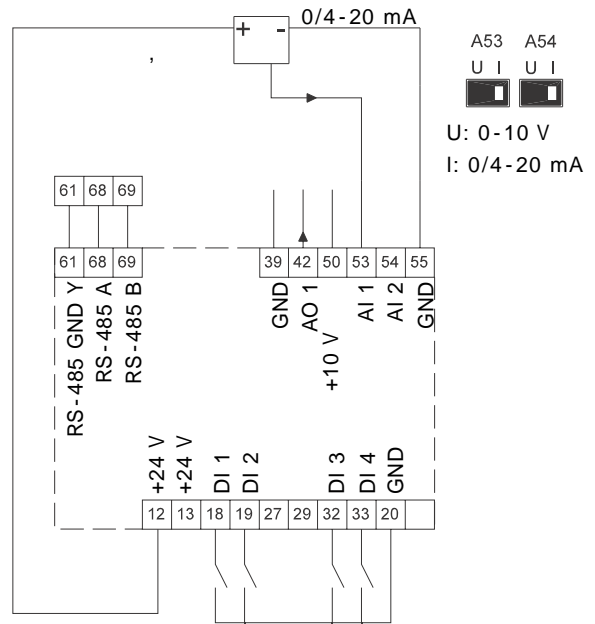
TM03 9057 3207

6.3.2

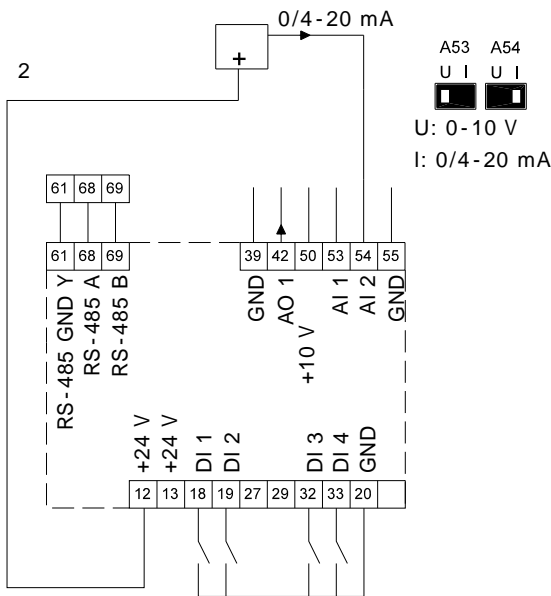
(OK)



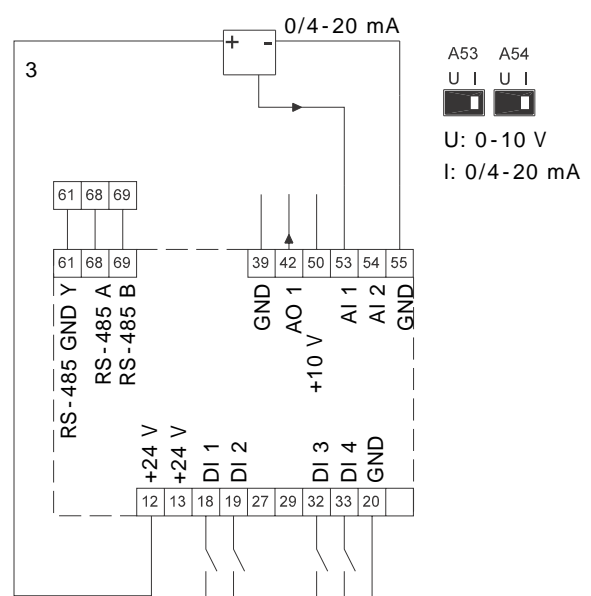
TM05 1506 2811



TM05 1508 2811



TM05 1508 2811



TM05 1505 2811

12	+24 V		42	AO 1	, 0-20 mA
13	+24 V	가	50	+10 V	
18	DI 1	, /	53	AI 1	, 0-10 V, 0/4-20 mA
19	DI 2	, 가	54	AI 2	, 1, 0/4-20 mA
20	GND		55	GND	
32	DI 3	, 가	61	RS-485 GND Y	GENIbus,
33	DI 4	, 가	68	RS-485 A	GENIbus, A (+)
39	GND		69	RS-485 B	GENIbus, B (-)

27 29
가
EMC

6.6 EMC
• 0.5 mm² () 1.5 mm² ()

3

참고 RS-485

6.3.3 (PTC) CUE (PTC) CUE

PTC

가

CUE 2 PELV

EN 61800-5-1 PELV

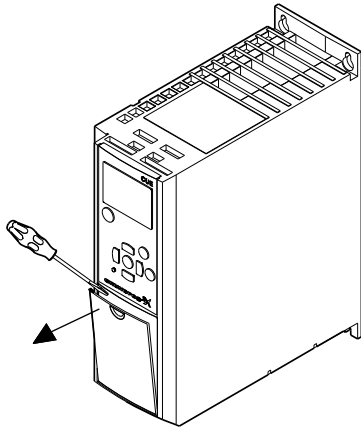
, PELV

PELV

6.3.4

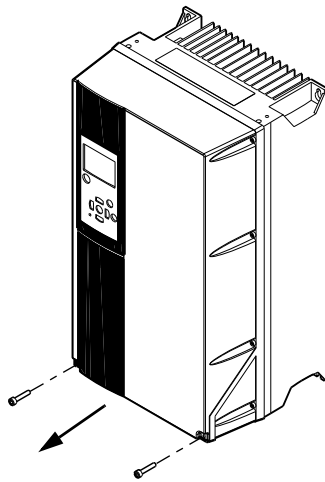
22 23

CUE



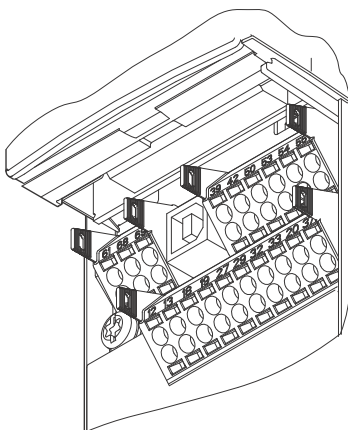
22

, A2 A3



23

C2, C3 C4 , A4, A5, B1, B2, B3, B4, C1,



24

()

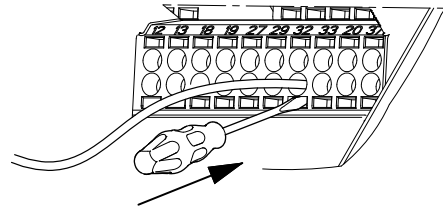
TM03 9003 2807

TM03 9004 2807

TM03 9025 2807

6.3.5

- 1. 9-10 mm
- 2. 0.4 x 2.5 mm
- 3. 가



25

6.3.6

A53 A54

53 54

가

"U"

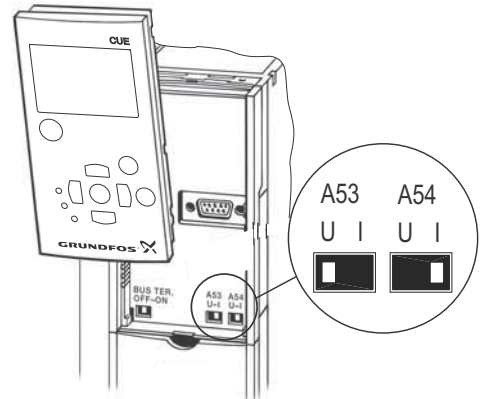
54 0/4-20 mA 가

"I"

참고

A54

26



26

A54

"I"

TM03 9026 2807

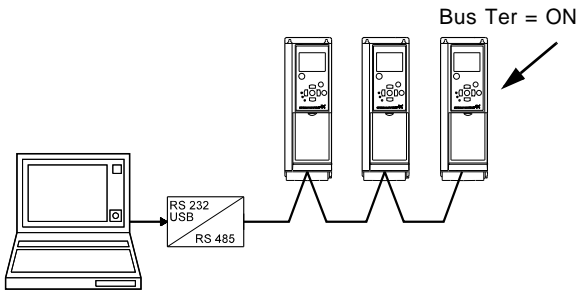
TM03 9104 3407

6.3.7 RS-485 GENibus

GENibus

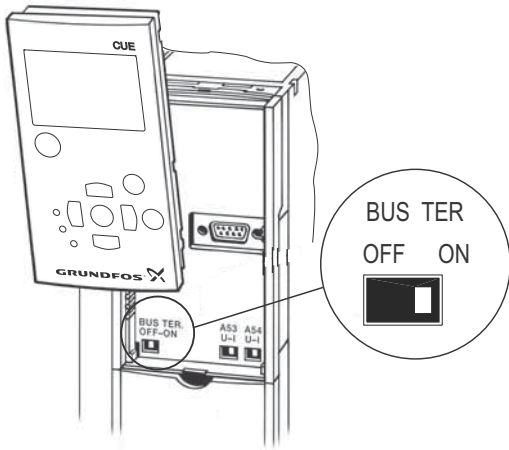
CUE

27



27 RS-485 GENibus

, GND, RS-485 (Y) 61
 CUE GENibus
 CUE "ON" (RS-485
 "OFF" ()
 28

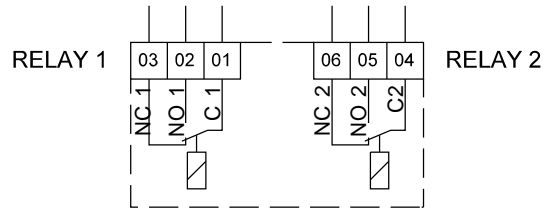


28 "ON"

TM03 9005 2807

6.4

주의

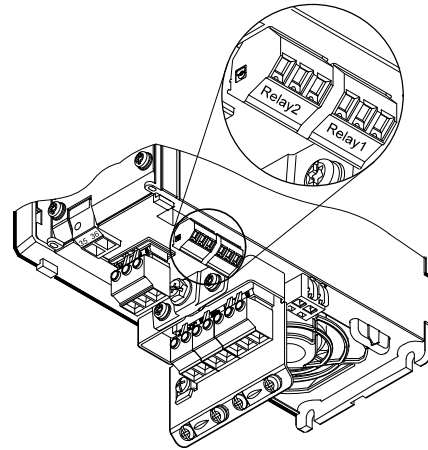


29

TM03 8801 2507

C 1	C 2
NO 1	NO 2
NC 1	NC 2

30-35

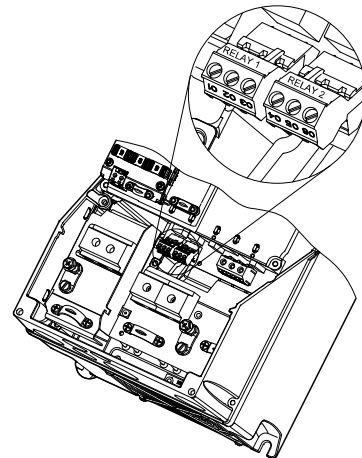


30

, A2 A3

TM03 9006 2807

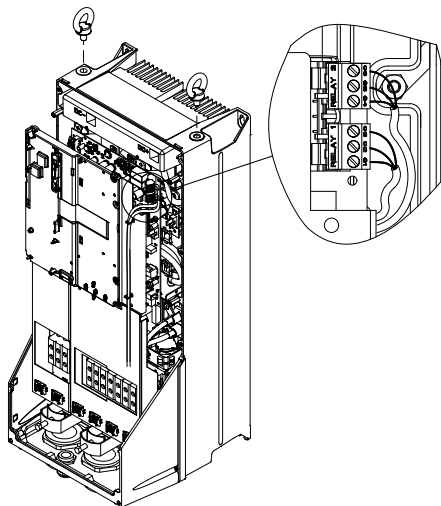
TM03 9007 2807



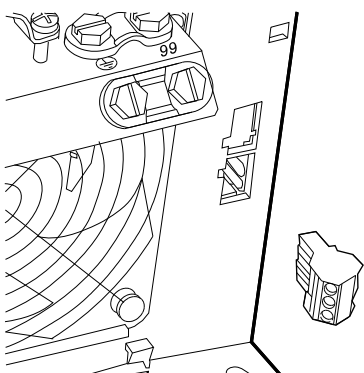
31

, A4, A5, B1 B2

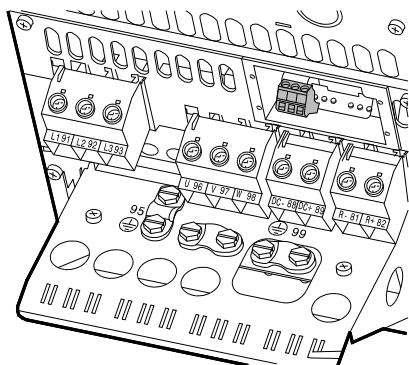
TM03 9008 2807



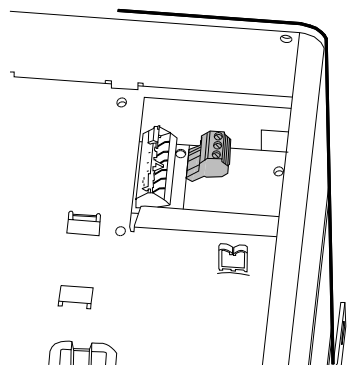
32 , C1 C2



33 , B3



34 , B4



35 , C3 C4,CUE

6.5 MCB 114

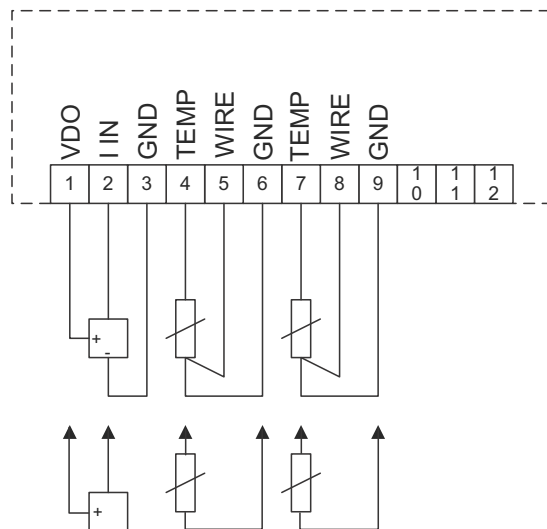
MCB 114 CUE 가

6.5.1 MCB 114

MCB 114 가

- 가 0/4-20 mA. 10.8.14 2(3.16)
- Pt100/Pt1000 10.8.19 1(3.21)
- 10.8.20 2(3.22)
- MCB 114가 CUE가 가
- Pt100 Pt1000

6.5.2 , MCB 114



36 , MCB 114

1 (VDO)	+24 V	
2 (I IN)	AI 3	2, 0/4-20 mA
3 (GND)	GND	
4 (TEMP)	AI 4	1, Pt100/Pt1000
5 (WIRE)		
6 (GND)	GND	1
7 (TEMP)	AI 5	2, Pt100/Pt1000
8 (WIRE)		
9 (GND)	GND	2
10, 11		12

TM03 9009 2807

TM03 9442 4007

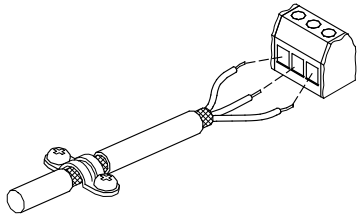
TM03 9441 4007

TM03 9440 4007

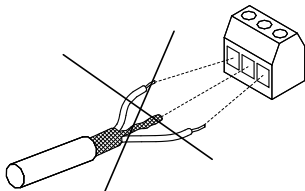
TM04 3273 3908

6.6 EMC

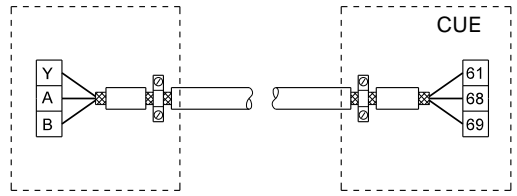
CUE
EN 61800-3, 1
가
(braided)
가
37
38
EMC
39
CUE
가
40
가
가
EMC
가
가



37 가



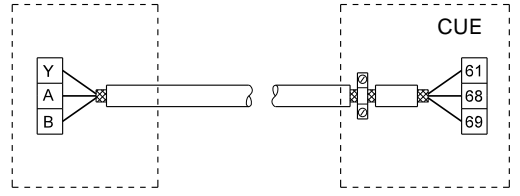
38



39

3

TM03 8732 2407



40

CUE

3

()

TM03 8731 2407

6.7 RFI

EMC
()
CUE
RFI

	P2	RFI
1 x 200-240 V*	1.1 - 7.5 kW	C1
3 x 200-240 V	0.75 - 45 kW	C1
3 x 380-500 V	0.55 - 90 kW	C1
3 x 525-600 V	0.75 - 7.5 kW	C3
3 x 525-690 V	11-90 kW	C3

* - 3

RFI

C1: 가

C3: ()

RFI EN 61800-3

6.7.1 C3

- PDS(Power Drive System)

TM02 1325 0901

TM03 8812 2507

6.8

가

CUE 가

- dU/dt
- (sine-wave)

			CUE	dU/dt
380 V	SP, BM, BMB			0-300 m*
1.5 kW	MG71	MG80	1.5 kW	0-300 m*
dU/dt				0-150 m*
dU/dt				0-300 m*
500 V				0-300 m*

*

6.9

EN 61800-3

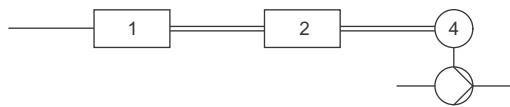
참고

41, 42, 43, 44



TM04 4289 1109

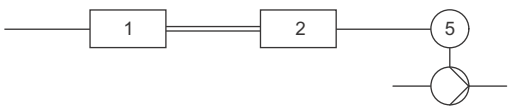
41



TM04 4290 1109

42

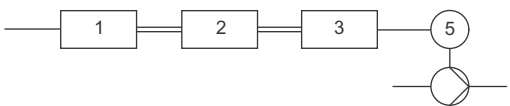
. CUE



TM04 4291 1109

43

가 가



TM04 4292 1109

44

가

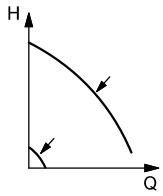
1	CUE
2	
3	
4	
5	

7.

10.6.2 (1.2)

1.2

가	가
가	(가)
가	가
가	가



TM03 8813 2507

:	:
:	:

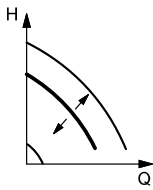
8.

10.8.1 (3.1)

3.1

- 가 ()
- 가 ()
- 8.1 () 8.2 ()

8.1 ()

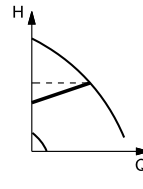


TM03 8479 1607

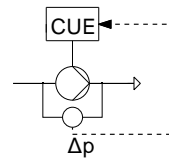
%

:	가
:	MPC

8.2 ()

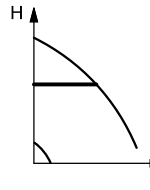


TM03 8475 1607

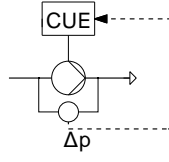


TM03 8804 2507

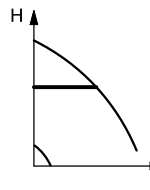
가



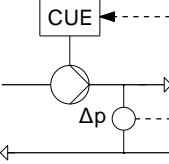
TM03 8476 1607



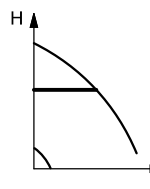
TM03 8804 2507



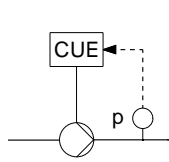
TM03 8476 1607



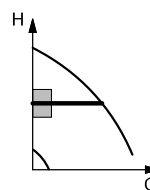
TM03 8806 2507



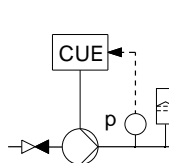
TM03 8476 1607



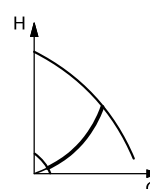
TM03 8805 2507



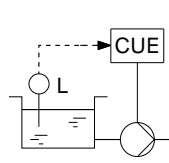
TM03 8477 1607



TM03 8807 2507

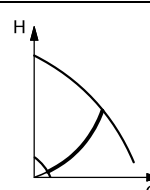


TM03 8482 1607

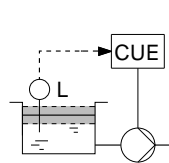


TM03 8808 2607

가

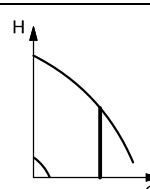


TM03 8482 1607

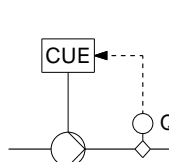


TM03 8809 2607

가

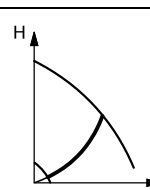


TM03 8478 1607

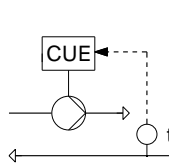


TM03 8810 2507

(head)

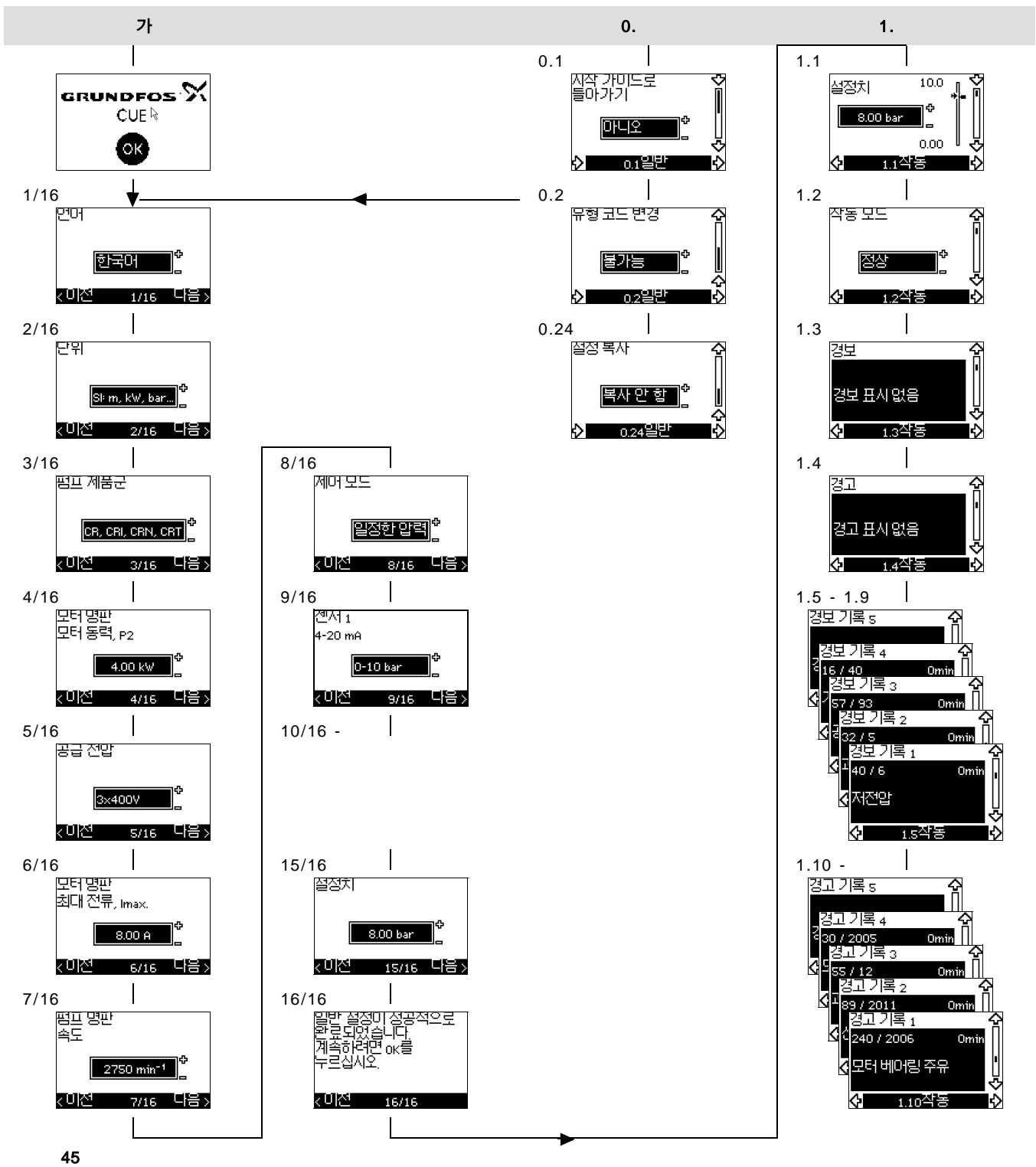


TM03 8482 1607



TM03 8811 2507

9.



45

CUE

4가

가 가

3. STATUS() - CUE

1. GENERAL() - CUE

가

4. INSTALLATION() - CUE

2. OPERATION() -

5

2.

2.1
설계 설정치
8.00 bar
외부 설정치
100 %
2.1상태

2.2
작동 모드
정상
시작
CUE 메뉴
2.2상태

2.3
설계값
7.90 bar
2.3상태

2.4
특정값 센서 1
7.90 bar
2.4상태

2.5
특정값 센서 2
0.20 -
2.5상태

2.6
속도
2750 min⁻¹
2.6상태

2.7
입력 전류
21.7 kW
모터 전류
0.00 A
2.7상태

2.8
작동 시간
0 h
소비 전력
2605 kWh
2.8상태

2.9
주유된 베어링
0 시기
베어링 교체 위치
5 시기
2.9상태

3.

2.10
모터 베어링 주유
지금 바로 실행
2.10상태

2.11
모터 베어링 교체
지금 바로 실행
2.11상태

2.12
온도 센서 1
비활성
0 °C
2.12상태

2.13
온도 센서 2
비활성
0 °C
2.13상태

2.14
유량
90 m³/h
2.14상태

2.15
누적 유량
12000 m³
에너지/m³
0.22 kWh/m³
2.15상태

2.16
펌웨어 버전
99.56
2.16상태

2.17
초기 구성 파일 ID
40
2.17상태

3.1
제어 모드
일정한 입력
3.1상태

3.2
컨트롤러
Kp 0.50
Ti 0.50 s
3.2상태

3.3
External setpoint
Not active
3.3 INSTALLATION

3.3A
External setpoint
Min. 0.00 V
Max. 10.0 V
3.3A INSTALLATION

3.4
신호 계전기 1
활성화됨
경보
3.4상태

3.5
신호 계전기 2
활성화됨
경고
3.5상태

3.6
*/-, OK, On/Off 단추
활성
3.6상태

3.7
프로토콜
GENbus
3.7상태

3.8
펌프 번호
1
3.8상태

3.9
디지털 입력 2
외부 오류
3.9상태

3.10
디지털 입력 3
공회전
3.10상태

3.11
디지털 입력 4
유량 스위치
3.11상태

3.12
디지털 유량 입력
100 l/펄스
3.12상태

3.13
마달로그 출력
비활성화
3.13상태

3.14
정지 기능
활성
ΔH 10 %
3.14상태

3.15
센서 1
4-20 mA bar
0.00 10.0
3.15상태

3.16
센서 2
4-20 mA %
0.00 100
3.16상태

3.17
뉴티대기
비활성
3.17상태

3.18
작동 범위
최소 25 %
최대 100 %
3.18상태

3.19
모터 베어링 모니터링
활성
3.19상태

3.20
모터 베어링
주유됨
3.20상태

3.21
온도 센서 1
비활성
3.21상태

3.22
온도 센서 2
비활성
3.22상태

3.23
정지 상태 가열
비활성
3.23상태

3.24
램프(Ramp)
위로 1.00 s
아래로 3.00 s
3.24상태

3.25
스위칭 주파수
5.0 kHz
3.25상태

10.

10.1



On/Off CUE



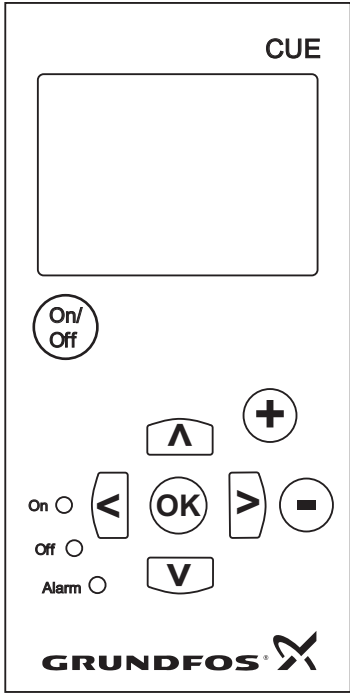
On/Off

가 가 . "Off"

CUE

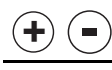
가

CUE



46 CUE

TM03 8719 2507



가 가



()

가

3

[OK] [+]
[OK] [+]

46

가 가

()

가

(CUE , /)

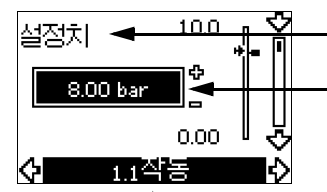
() On/Off

()

47 48



47 가



48

10.2

- 1. CUE
- 2. CUE가

[On/Off], [OK] [+]

가

10.3 CUE



TM04 7313 1810

가

, CUE

가PC

PC

10.4

가

가, CUE가

참고

CUE

가

CUE

가

가

CUE가
가

가

10.4.1



- [OK]

가 가

10.4.2 (1/16)



- English UK()
- English US()
-
-
-
-
-
-
-
-

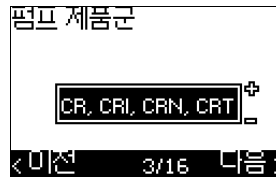
- Hungarian(가)
-
-
-
- Korean()

10.4.3 (2/16)



- : m, kW, bar...
- US: ft, HP, psi...

10.4.4 (3/16)



- CR, CRI, CRN, CRT
- SP, SP-G, SP-NE
- ...

"Other"

10.4.5 (4/16)

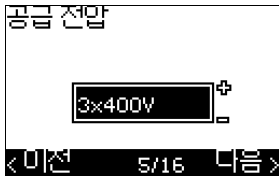


- 0.55 - 90 kW.

, P2

CUE

10.4.6 (5/16)



- 1 x 200-240 V:*
 - 1 x 200 V
 - 1 x 208 V
 - 1 x 220 V
 - 1 x 230 V
 - 1 x 240 V.
- 3 x 200-240 V:
 - 3 x 200 V
 - 3 x 208 V
 - 3 x 220 V
 - 3 x 230 V
 - 3 x 240 V.
- 3 x 380-500 V:
 - 3 x 380 V
 - 3 x 400 V
 - 3 x 415 V
 - 3 x 440 V
 - 3 x 460 V
 - 3 x 500 V.
- 3 x 525-600 V:
 - 3 x 575 V.
- 3 x 525-690 V:
 - 3 x 575 V
 - 3 x 690 V.

* - 3 CUE CUE

10.4.7 (6/16)



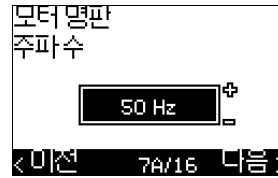
- 0-999 A. CUE

10.4.8 (7/16)



- 0-9999 min⁻¹. CUE

10.4.9 (7A/16)



- 40-200 Hz

10.4.10 (8/16)



10.8.1 (3.1)

- -
 -
 -
 -
 -
 -
 -
 - 가
 - 가
 - 가
- CUE가 "Open loop" INSTALLATION

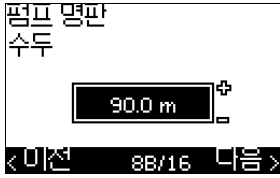
10.4.11 (8A/16)



- 1-6550 m³/h.

가

10.4.12 (8B/16)



- 1-999 m.

10.4.13 54



4-20 mA

- 0-0.6 bar
- 0-1 bar
- 0-1.6 bar
- 0-2.5 bar
- **0-4 bar**
- 0-6 bar
- 0-10 bar

- 0-2.5 bar
- 0-4 bar
- 0-6 bar
- **0-10 bar**
- 0-16 bar
- 0-25 bar

- **-25-25 °C**
- 0-25 °C
- 50-100 °C
- 0-150 °C

가

(9/16)

- 0-0.6 bar
- 0-1.6 bar
- 0-2.5 bar
- **0-4 bar**
- 0-6 bar
- 0-10 bar

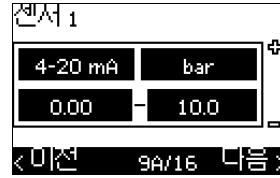
- 1-5 m³/h
- **2-10 m³/h**
- 6-30 m³/h
- 15-75 m³/h

- 0-0.1 bar
- 0-1 bar
- 0-2.5 bar
- 0-6 bar
- 0-10 bar

" " 가 "

" " 9A/16" 가

10.4.14 54(9A/16)

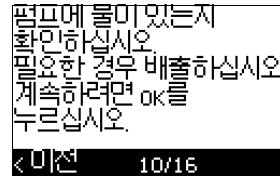


" " 9/16' 가 "

- 0-20 mA
- **4-20 mA.**

- bar, mbar, m, kPa, psi, ft, m³/h, m³/min, m³/s, l/h, l/min, l/s, gal/h, gal/m, gal/s, ft³/min, ft³/s, °C, °F, %.

10.4.15 (priming) (10/16)



CUE 가

- [OK]

10.4.16 (11/16)



가 가 !

CUE

참고

CUE

CUE 가

CUE에서 모터 매개 변수 테스트를 수행하고 펌프가 오른쪽...

<미션 11/16 다음>

방향으로 움직이지 확인합니다. 그렇지 않은 경우 회전 방향이 자동으로 변경됩니다. 시스템이 유량에 대해

<미션 11/16 다음>

10.4.18 (16/16)

일부 설정이 성공적으로 완료되었습니다. 계속하려면 OK를 누르십시오.

<미션 16/16>

Normal

가 [OK]
1.1

확인하십시오. 테스트 동안 펌프가 가동될 것입니다. 계속하려면 OK를 누르십시오.

<미션 11/16>

10.4.19 (13/16)

수동 회전 방향 테스트 펌프가 몇 초 간 가동되는 동안...

<미션 13/16 다음>

회전 방향을 관찰하십시오. 계속하려면 OK를 누르십시오.

<미션 13/16>

가 [OK]

10초 내에 펌프가 시작됩니다. 취소하려면 아무 단추나 누르십시오.

0% 100%

12/16

가 [OK]

10초 내에 펌프가 시작됩니다. 취소하려면 아무 단추나 누르십시오.

0% 100%

13/16

10 가 가

10 가 가

회전 방향 테스트 중단하려면 아무 단추나 누르십시오.

0% 100%

13/16

피드백
0.00 bar
모터 전류
0.00 A
13/16

테스트가 완료되고 올바른 회전 방향이 설정되었습니다. 계속하려면 OK를 누르십시오.

<미션 14/16>

회전 방향이 올바르지 않으면 자동으로 결정될 수 없습니다. 수동 테스트를 진행하려면 OK를 누릅니다.

<미션 13/16>

회전 방향이 올바릅니까?
예

<미션 13/16 다음>

[OK]
10.4.17 (15/16)

[OK]

10.4.17 (15/16)

설정지
8.00 bar

<미션 15/16 다음>

테스트가 완료되고 올바른 회전 방향이 설정되었습니다. 계속하려면 OK를 누르십시오.

<미션 14/16>

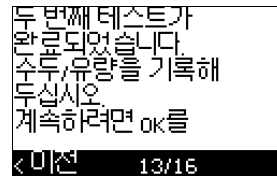
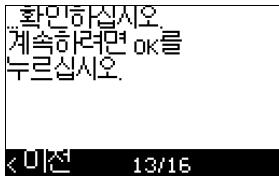
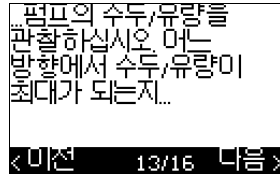
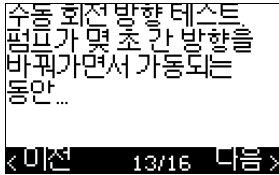
회전 방향이 변경되고 새로운 테스트가 시작됩니다. 계속하려면 OK를 누르십시오.

<미션 13/16>

[OK]

10.4.17 (15/16)

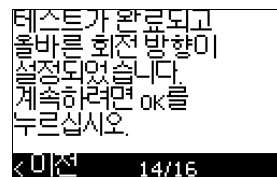
OK



가 [OK]



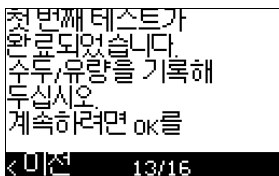
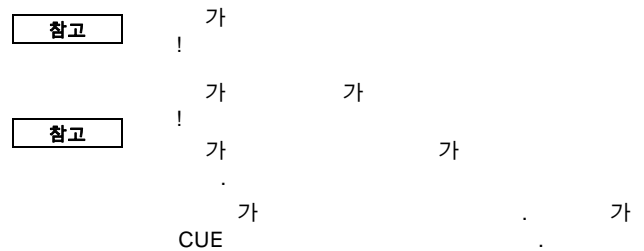
10 가 가



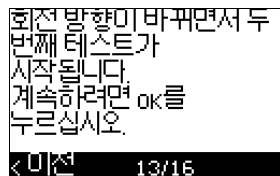
[OK] (15/16)

10.4.17

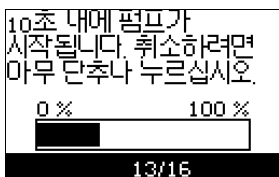
10.5



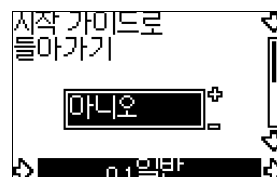
가



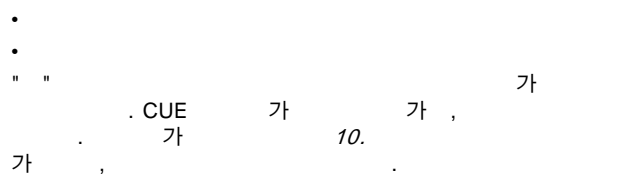
OK



10 가 가



10.5.1 가 가 (0.1)



[On/Off], [OK], [+]

10.5.2 (0.2)



10.5.3



CUE

.

.

- CUE (CUE)
- (CUE)

CUE

(2.16)

10.7.16

10.6

10.6.1 (1.1)



▶
↑
■

%
55

56

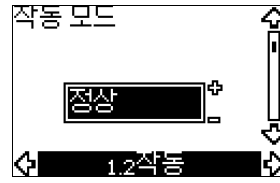
25 %

90 % 57

가

13.2

10.6.2 (1.2)



- Normal (duty)
-
-
-

10.6.3

가

" " CUE

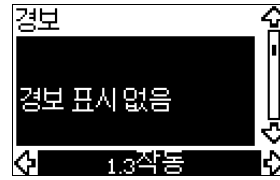
가

(')

가 CUE

" " CUE

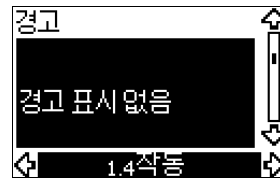
(1.3)



가

15.1

(1.4)



가

15.1

10.6.4

CUE

가

(1.5 - 1.9)



" " . " 1" 5 , " 가 2"

3가

가

(1.10 - 1.14)



" "가 " 1" 5 , " 가 2"

3가

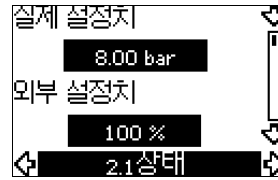
가

10.7

%

10.7.1

(2.1)



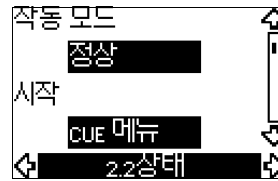
0-100 % , 100 %

13.2

가

10.7.2

(2.2)

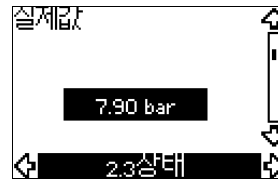


(, , ,)

(CUE , , /)

10.7.3

(2.3)

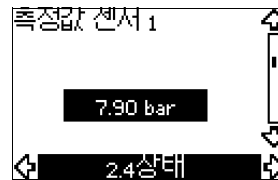


CUE

"-"가

10.7.4

1(2.4)



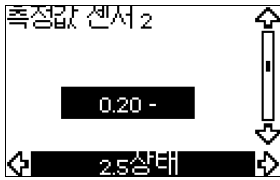
54

1

CUE

"-"가

10.7.5 (2.5)



MCB 114

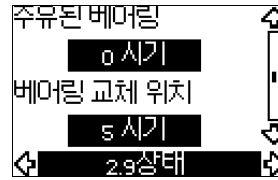
MCB 114

2

CUE

"-"가

10.7.9 (2.9)



(3.20) 가

10.8.18

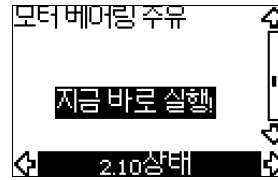
가 1

10.7.6 (2.6)



: ± 5 %

10.7.10 (2.10)



2.11

10.7.7 (2.7)

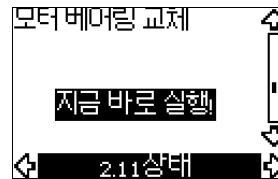


: ± 10 %

(W kW)

(A)

10.7.11 (2.11)



2.10

10.7.8 (2.8)



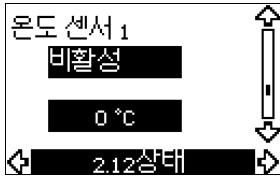
: ± 2 %

가 가

10.8.18

/ (3.20)

10.7.12 1(2.12)



MCB 114

MCB 114

3.21

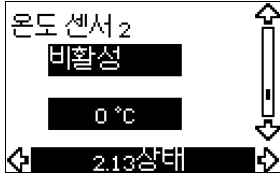
CUE

Pt100/Pt1000

1

"-"가

10.7.13 2(2.13)



MCB 114

MCB 114

3.22

CUE

Pt100/Pt1000

2

"-"가

10.7.14 (2.14)



가

(54)

(33)

10.7.15 (2.15)

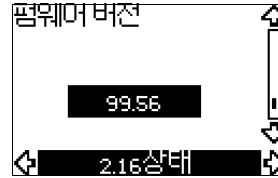


가

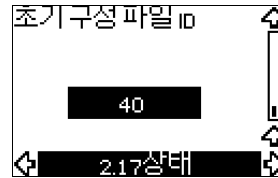
54)

(33)

10.7.16 (2.16)



10.7.17 (2.17)



10.8

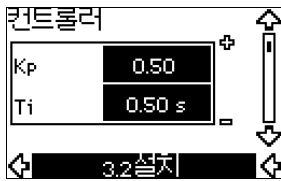
10.8.1 (3.1)



-
-
-
-
-
-
-

참고 가 CUE 13.3 GENibus

10.8.2 (3.2)



CUE (Kp) (Ti)

- (Kp) 0.1 ~ 20
- (Ti) 0.1 ~ 3600
- 가 가 (Kp)
- -0.1 -20

I	K _p		T _i
	1)	2)	
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	SP, SP-G, SP-NE: 0.5		0.5
	0.2		0.5
	- 2.5		100
	0.5	- 0.5	10 + 5L ₂
	0.5		10 + 5L ₂
	0.5	- 0.5	30 + 5L ₂ *
	0.5		0.5*
	0.5		L ₁ < 5 m: 0.5* L ₁ > 5 m: 3* L ₁ > 10 m: 5*

* T_i = 100 ().

1. 가 가 가 가

2. 가 가

L₁ = [m].

L₂ = [m]

PI

K_p T_i

- 1. 가 (K_p) 가
- 가 (K_p) 가
- 3. 가 (T_i) (T_i)
- 4. (T_i)
- 가 K_p 가
- 가 K_p T_i 가

10.8.3 (3.3)

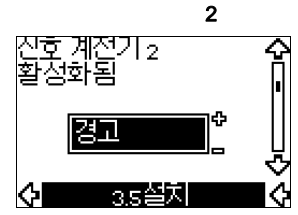
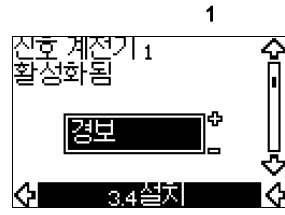


(53)

가 13.2

10.8.4 1 2(3.4 3.5)

CUE 가 가



- 가
- 가
- 가
- 가
- 가
- 가

참고

10.6.3

10.8.5 CUE (3.6)



(+, -, On/Off, OK)

- 가
- () 가

3

10.8.6 (3.7)

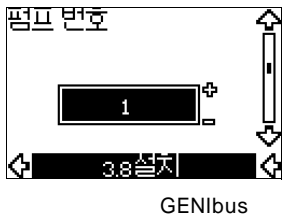


CUE RS-485

- GENibus
- FC
- FC MC.

GENibus Grundfos GENibus
FC FC MC

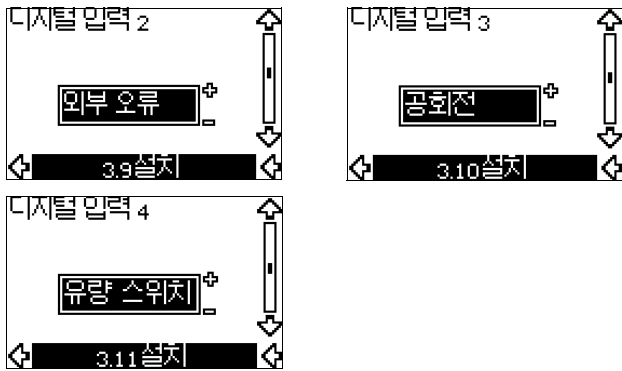
10.8.7 (3.8)



가
Dry running()

- Grundfos Liqtec®
-
-

10.8.8 2, 3 4(3.9 - 3.11)



CUE (19, 32 33)

- ()
- ()
- ()
-
-
- ()
- (, 33)
-

13.1

가

가

가 가 5 가

가
가

(3.14) 10.8.12 10.8.11
(3.14)

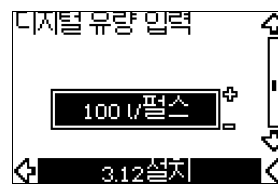
() 가

30

4

가 33

10.8.9 (3.12)

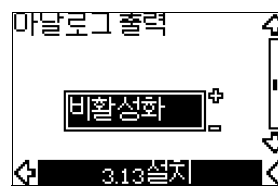


3.11 가

33

- 0-1000 litres/pulse.
- 가

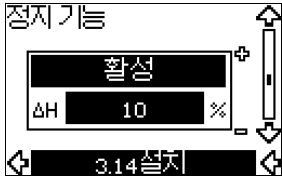
10.8.10 (3.13)



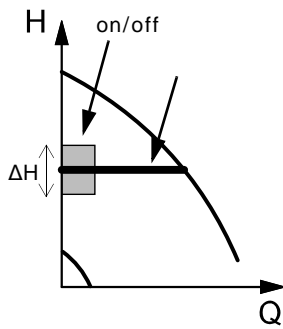
-
-
-
-
-
- 1
- 2
-

10.8.11

(3.14)



- ΔH 10 %
- ΔH 5 % - 30 %



49

(ΔH)

가

1.

"

2.

1.

가

가

(+0.5 x ΔH)

가

(

가

- 0.5 x ΔH)

1.

2.

2.

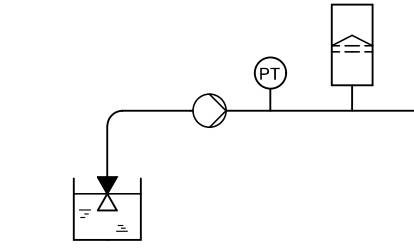
+ 0.5 x ΔH)

가
가
가

(diaphragm)

50 51

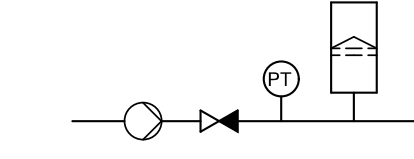
주의



50

TM03 8477 1607

TM03 8582 1907



51

TM03 8583 1907

가

0.7 가

가

[m ³ /h]	[lit.]
0-6	8
7-24	18
25-40	50
41-70	120
71-100	180

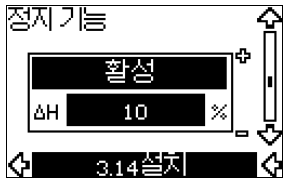
가
ΔH

가

ΔH

10.8.12

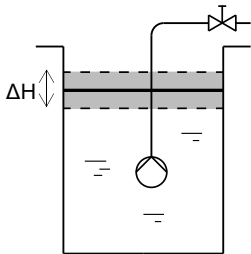
(3.14)



- ΔH 10 %
- ΔH 5 % - 30 %

85 %

- 1.
2. OK



52

(ΔH)

가

- 1.
- 2.
- 1.

가 가 가
가 가 가

2.

- 0.5 x ΔH)

가 가 가
가 가 가

가

10.8.13

1(3.15)

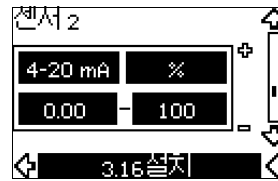


54 1

- 0-20 mA
- 4-20 mA.
- bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F, %.

10.8.14

2(3.16)



MCB 114 2

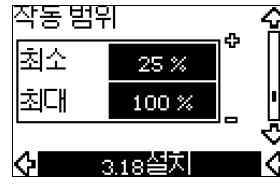
- 0-20 mA
- 4-20 mA.
- bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F, %.
- 0-100 %.

TM03 9099 3307

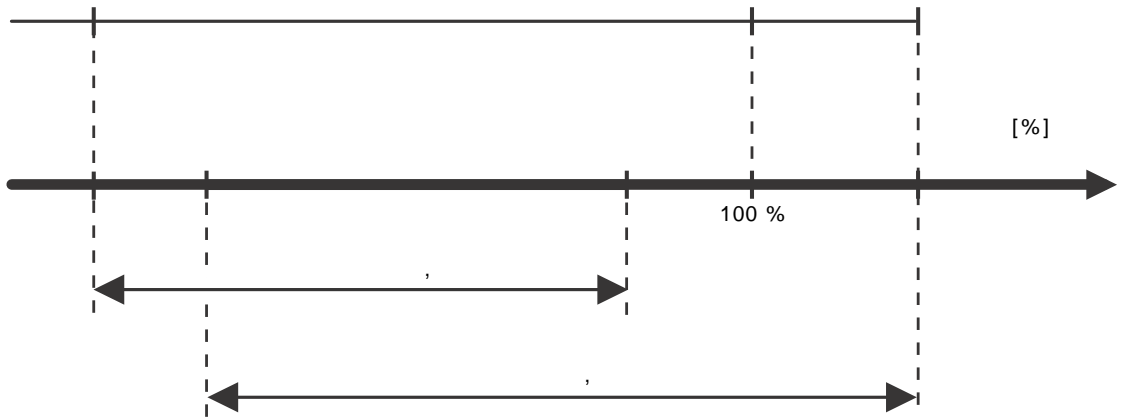
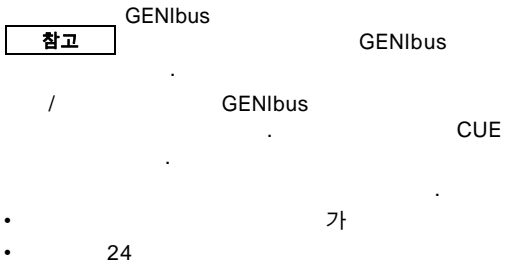
10.8.15 / (3.17)



10.8.16 (3.18)



1. 100 %, 가
2. 가
3. (100 % 가
가 가 / 가 가
가



53

%

TM04 3581 4608

10.8.17 (3.19)



가 CUE

2.11 가

가 가 MCB 114

참고

10.8.18 / (3.20)



가

, "OK"

참고

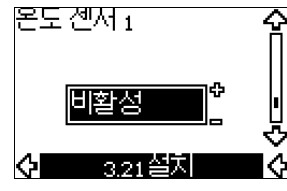
가

- 가 0
- 가 1 가
- 가 가

가

- 가 0
- 0
- 1 가

10.8.19 1(3.21)

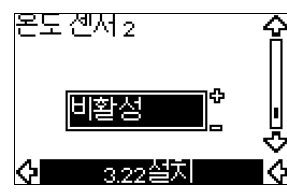


MCB 114

MCB 114 Pt100/Pt1000 1

- D-
- ND-
- 1
- 2

10.8.20 2(3.22)

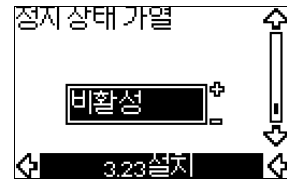


MCB 114

MCB 114 Pt100/Pt1000 2

- D-
- ND-
- 1
- 2

10.8.21 가 (3.23)

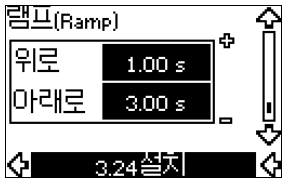


가

가

가

10.8.22 (Ramp)(3.24)



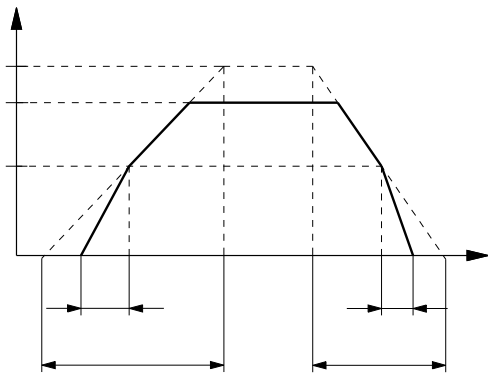
1-3600

0 min⁻¹
가 CUE

0 min⁻¹

가

가 CUE



TIM03 9439 0908

54

(3.24)

10.8.23 (3.25)



, CUE

CUE 가

가

11. PC E-product

CUE
PC Tool E-
Grundfos

Grundfos

Grundfos

12.



On/Off

가 가
가

"Off"

CUE

가

가

가

가

12.1

가

,

CUE

1	
2	
3	
4	
5	
6	

: 가

12.2

가

,

CUE

1	
2	
3	
4	
5	
6	

: 가

13.

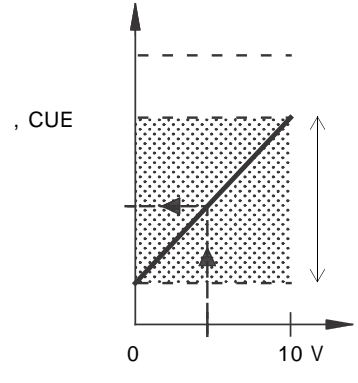
13.1

18	DI 1	•	/
		•	()
		•	()
19	DI 2	•	()
		•	()
		•	()
32	DI 3	•	()
		•	()
		•	()
33	DI 4	•	()
		•	()
		•	()

13.2

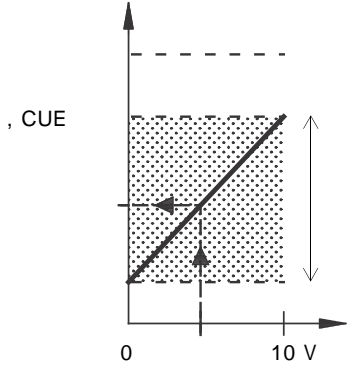
53	AI 1	•	(0-10 V)
			(53)

CUE () ,
 55 .



55 " "

() CUE 56 .



56 " "

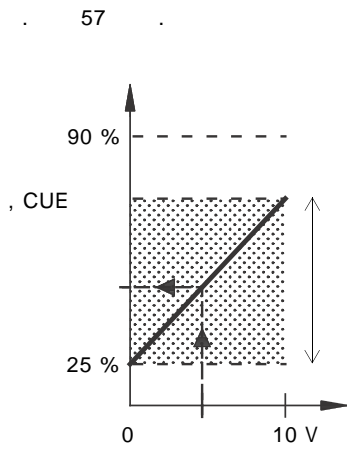
: 0 bar, CUE 3
 bar, 가 80 %
 = (CUE - 0) x 80 % + 0
 = (3 - 0) x 80 % + 0
 = 2.4 bar

TM03 8856 2607

TM03 8856 2607

CUE

25 %



57

가 12 m, CUE 가 6 m,
 가 40 %

$$= (\text{CUE} - 25 \%) \times 25 \% + 25 \%$$

$$= (6 - 12 \times 25 \%) \times 40 \% + 12/4$$

$$= 4.2 \text{ m}$$

13.3 GENibus

CUE RS-485
 Grundfos GENibus

Grundfos

참고

가 , CUE

13.4

Grundfos

Grundfos

14.

14.1 CUE

CUE

14.2

www.grundfos.com > Grundfos Product Center

15.

15.1

TM03 8856 2607

1			
2			
3			
16			
30			3)
32	Overvoltage()		
40			
48			
49			
55			
57	Dry running()		
64	CUE		
70			
77		/	
89	1		1)
91	1		
93	2		
96			1)
148			
149			
155			
175	2		
240			3)
241			
242	AMA	2)	

1) CUE

2) AMA,

3) 가 3.20

15.2

CUE 가 , " " 5

가 Grundfos

15.2.1

가 CUE

15.2.2

가 , CUE 가 15.1
가 가

- OK
- [ON/OFF]
- DI1(/) DI2-DI4
가 가

15.2.3

CUE 가
가

- CUE OK 30

15.3

가	가
()	가
()	(CUE , /).
()	On/Off
()	

15.4

1	• 가
	•
	•
2	• 가
	•
	•

16.

16.1

CUE

- = 3 x 380-500 V.
 - = 1.5 kW.
 - = IP20.
- CUE 가 A2

일반 축 동력 P2		인클로저										
		1 x 200-240 V			3 x 200-240 V		3 x 380-500 V		3 x 525-600 V		3 x 525-690 V	
[kW]	[HP]	IP20	IP21	IP55	IP20	IP55	IP20	IP55	IP20	IP55	IP21	IP55
0.55	0.75											
0.75	1											
1.1	1.5	A3		A5								
1.5	2				A2	A4	A2	A4	A3	A5		
2.2	3											
3	4		B1	B1								
3.7	5				A3	A5						
4	5						A2	A4				
5.5	7.5		B1	B1					A3	A5		
7.5	10		B2	B2	B3	B1	A3	A5				
11	15											
15	20				B4	B2	B3	B1			B2	B2
18.5	25											
22	30											
30	40				C3	C1	B4	B2				
37	50											
45	60				C4	C2						
55	75						C3	C1			C2	C2
75	100											
90	125						C4	C2				

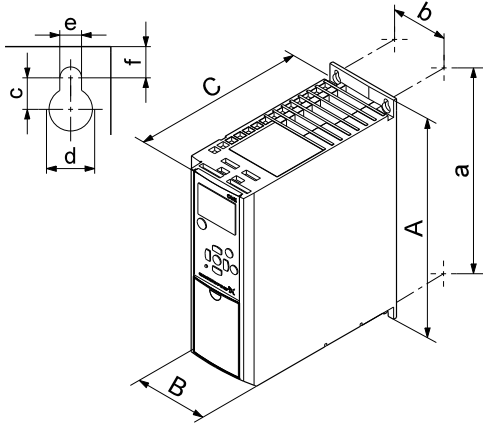
16.2

CUE

CUE

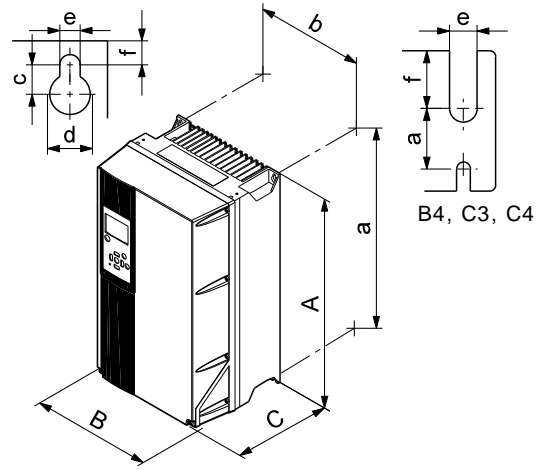
A3 IP20/21 / NEMA type 1	3 x 22.5 (1/2") 3 x 28.4 (3/4")	3 x 22.5 (1/2") 3 x 28.4 (3/4")
A4 IP55 / NEMA type 12	1 x 22.5 (1/2") 3 x 28.4 (3/4")	1 x 22.5 (1/2") 3 x 28.4 (3/4")
A5 IP55 / NEMA type 12	6 x 26.3	6 x 28.4 (3/4")
B1 IP21 / NEMA type 1	2 x 22.5 (1/2") 3 x 37.2	2 x 22.5 (1/2") 3 x 34.7 (1")
B1 IP55 / NEMA type 12	2 x 21.5 1 x 26.3 3 x 33.1	2 x 22.5 (1/2") 1 x 28.4 (3/4") 3 x 34.7 (1")
B2 IP21 / NEMA type 1	1 x 21.5 1 x 26.3	1 x 22.5 (1/2") 1 x 28.4 (3/4")
B2 IP55 / NEMA type 12	1 x 33.1 2 x 42.9	1 x 34.7 (1") 2 x 44.2 (1 1/4")

16.3



58 Enclosures A2 A3

TM03 9000 2807



59 A4, A5, B1, B2, B3, B4, C1, C2, C3 and C4

TM03 9002 2807

엔클로저	가로 [mm]		세로 [mm]		높이 [mm]	나사 구멍 [mm]				무게 [kg]
	A	a	B	b	C	C ¹⁾	c	Ød	Øe	
A2	268	257	90	70	205	8	11	5,5	9	4,9
A3	268	257	130	110	205	8	11	5,5	9	6,6
A4	420	401	200	171	175	8,2	12	6,5	6	9,2
A5	420	402	242	215	200	8,2	12	6,5	9	14
B1	480	454	242	210	260	12	19	9	9	23
B2	650	624	242	210	260	12	19	9	9	27
B3	399	380	165	140	248	8	12	6,8	7,9	12
B4	520	495	231	200	242	-	-	8,5	15	23,5
C1	680	648	308	272	310	12	19	9	9,8	45
C2	770	739	370	334	335	12	19	9	9,8	65
C3	550	521	308	270	333	-	-	8,5	17	35
C4	660	631	370	330	333	-	-	8,5	17	50
D1h	1209	1154	420	304	380	20	11	11	25	104
D2h	1589	1535	420	304	380	20	11	11	25	151
포장 규격										
D1h	650	-	1730	-	570	-	-	-	-	-
D2h	650	-	1730	-	570	-	-	-	-	-

1) , 가 .

16.4

	5-95 % RH
	50 °C
24	45 °C
가	0 °C
가	-10 °C
	-25 - 65 °C
	6
가	1000 m
가	3000 m

참고 CUE

16.5

[Nm]				
A2	1.8	1.8	3	0.6
A3	1.8	1.8	3	0.6
A4	1.8	1.8	3	0.6
A5	1.8	1.8	3	0.6
B1	1.8	1.8	3	0.6
B2	4.5	4.5	3	0.6
B3	1.8	1.8	3	0.6
B4	4.5	4.5	3	0.6
C1	10	10	3	0.6
C2	14 ^{1)/24²⁾}	14 ^{1)/24²⁾}	3	0.6
C3	10	10	3	0.6
C4	14 ^{1)/24²⁾}	14 ^{1)/24²⁾}	3	0.6

- 1) ≤ 95 mm²
- 2) ≥ 95 mm².

16.6

, ,	150 m
, ,	300 m
, ,	300 m

16.7



가

16.7.1

, ,	1.5 mm ²
, ,	1.0 mm ²
, ,	0.5 mm ²

16.7.2 UL

일반 축 동력 P2	최대 퓨즈 크기	퓨즈 유형	도체 최대 단면 ¹⁾
[kW]	[A]		[mm ²]
1 x 200-240 V			
1,1	20	gG	4
1,5	30	gG	10
2,2	40	gG	10
3	40	gG	10
3,7	60	gG	10
5,5	80	gG	10
7,5	100	gG	35
3 x 200-240 V			
0,75	10	gG	4
1,1	20	gG	4
1,5	20	gG	4
2,2	20	gG	4
3	32	gG	4
3,7	32	gG	4
5,5	63	gG	10
7,5	63	gG	10
11	63	gG	10
15	80	gG	35
18,5	125	gG	50
22	125	gG	50
30	160	gG	50
37	200	aR	95
45	250	aR	120
3 x 380-500 V			
0,55	10	gG	4
0,75	10	gG	4
1,1	10	gG	4
1,5	10	gG	4
2,2	20	gG	4
3	20	gG	4
4	20	gG	4
5,5	32	gG	4
7,5	32	gG	4
11	63	gG	10
15	63	gG	10
18,5	63	gG	10
22	63	gG	35
30	80	gG	35
37	100	gG	50
45	125	gG	50
55	160	gG	50
75	250	aR	95
90	250	aR	120
3 x 525-600 V			
0,75	10	gG	4
1,1	10	gG	4
1,5	10	gG	4
2,2	20	gG	4
3	20	gG	4
4	20	gG	4
5,5	32	gG	4
7,5	32	gG	4
3 x 525-690 V			
11	63	gG	35
15	63	gG	35
18,5	63	gG	35
22	63	gG	35
30	63	gG	35
37	80	gG	95
45	100	gG	95
55	125	gG	95
75	160	gG	95
90	160	gG	95

1) , AWG.

16.7.3 UL

[kW]	퓨즈 유형							도체 최대 단면 ¹⁾ [AWG] ²⁾
	Bussmann J	Bussmann T	SIBA RK1	Littel Fuse RK1	Ferraz-Shawmut CC	Ferraz-Shawmut RK1	Bussmann E1958 JFHR2	
1 x 200-240 V								
1,1	KTN-R20	-	-	-	-	-	-	10
1,5	KTN-R30	-	-	-	-	-	-	7
2,2	KTN-R40	-	-	-	-	-	-	7
3	KTN-R40	-	-	-	-	-	-	7
3,7	KTN-R60	-	-	-	-	-	-	7
5,5	-	-	-	-	-	-	-	7
7,5	-	-	-	-	-	-	-	2
3 x 200-240 V								
0,75	KTN-R10	JKS-10	JJN-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
1,5	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
2,2	KTN-R20	JKS-20	JJN-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3,7	KTN-R30	JKS-30	JJN-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
5,5	KTN-R50	JKS-50	JJN-50	5012406-050	KLN-R50	-	A2K-50R	7
7,5	KTN-R50	JKS-60	JJN-60	5012406-050	KLN-R60	-	A2K-50R	7
11	KTN-R60	JKS-60	JJN-60	5014006-063	KLN-R60	A2K-60R	A2K-60R	7
15	KTN-R80	JKS-80	JJN-80	5014006-080	KLN-R80	A2K-80R	A2K-80R	2
18,5	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
22	KTN-R125	JKS-150	JJN-125	2028220-125	KLN-R125	A2K-125R	A2K-125R	1/0
30	FWX-150	-	-	2028220-150	L25S-150	A25X-150	A25X-150	1/0
37	FWX-200	-	-	2028220-200	L25S-200	A25X-200	A25X-200	4/0
45	FWX-250	-	-	2028220-250	L25S-250	A25X-250	A25X-250	250 MCM
3 x 380-500 V								
0,55	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
0,75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2,2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
11	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
15	KTS-R40	JKS-40	JJS-40	5014006-040	KLS-R40	-	A6K-40R	7
18,5	KTS-R50	JKS-50	JJS-50	5014006-050	KLS-R50	-	A6K-50R	7
22	KTS-R60	JKS-60	JJS-60	5014006-063	KLS-R60	-	A6K-60R	2
30	KTS-R80	JKS-80	JJS-80	2028220-100	KLS-R80	-	A6K-80R	2
37	KTS-R100	JKS-100	JJS-100	2028220-125	KLS-R100	-	A6K-100R	1/0
45	KTS-R125	JKS-150	JJS-150	2028220-125	KLS-R125	-	A6K-125R	1/0
55	KTS-R150	JKS-150	JJS-150	2028220-160	KLS-R150	-	A6K-150R	1/0
75	FWH-220	-	-	2028220-200	L50S-225	-	A50-P225	4/0
90	FWH-250	-	-	2028220-250	L50S-250	-	A50-P250	250 MCM
3 x 525-600 V								
0,75	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,1	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
1,5	KTS-R10	JKS-10	JJS-10	5017906-010	KTN-R10	ATM-R10	A2K-10R	10
2,2	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
3	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
4	KTS-R20	JKS-20	JJS-20	5017906-020	KTN-R20	ATM-R20	A2K-20R	10
5,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
7,5	KTS-R30	JKS-30	JJS-30	5012406-032	KTN-R30	ATM-R30	A2K-30R	10
3 x 525-690 V								
11	KTS-R-25	JKS-25	JJS-25	5017906-025	KLSR025	HST25	A6K-25R	1/0
15	KTS-R-30	JKS-30	JJS-30	5017906-030	KLSR030	HST30	A6K-30R	1/0
18,5	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
22	KTS-R-45	JKS-45	JJS-45	5014006-050	KLSR045	HST45	A6K-45R	1/0
30	KTS-R-60	JKS-60	JJS-60	5014006-063	KLSR060	HST60	A6K-60R	1/0
37	KTS-R-80	JKS-80	JJS-80	5014006-080	KLSR075	HST80	A6K-80R	1/0
45	KTS-R-90	JKS-90	JJS-90	5014006-100	KLSR090	HST90	A6K-90R	1/0
55	KTS-R-100	JKS-100	JJS-100	5014006-100	KLSR100	HST100	A6K-100R	1/0
75	KTS-R125	JKS-125	JJS-125	2028220-125	KLS-125	HST125	A6K-125R	1/0
90	KTS-R150	JKS-150	JJS-150	2028220-150	KLS-150	HST150	A6K-150R	1/0

1)
2)

16.8

16.8.1 (L1, L2, L3)

200-240 V ± 10 %
380-500 V ± 10 %
525-600 V ± 10 %
525-690 V ± 10 %
50/60 Hz
3 %
> 3.5 mA
(cut-in) , A 2
, B C 1

참고 CUE

16.8.2 (U, V, W)

0-100 % ¹⁾
0-100 Hz ²⁾

1) %
2)

16.8.3 RS-485 GENibus

68 (A), 69 (B), 61 GND (Y)
RS-485 (galvanic) (PELV)

16.8.4

18, 19, 32, 33
0-24 VDC
> 19 VDC
< 14 VDC
28 VDC
, R _i 4 kΩ
(PELV)

16.8.5

01, 1 (C), 2 (NO), 3 (NC)
02, 4 (C), 5 (NO), 6 (NC)
(AC-1) ¹⁾ 240 VAC, 2 A
(AC-15) ¹⁾ 240 VAC, 0.2 A
(DC-1) ¹⁾ 50 VDC, 1 A
24 VDC 10 mA
24 VAC 20 mA

1) IEC 60947, 4 5.

C
NO
NC

(PELV)

16.8.6

1, 53
A53 = "U" ¹⁾
0-10 V
, R _i 10 kΩ
± 20 V
A53 = "I" ¹⁾
0-20, 4-20 mA
, R _i 200 Ω
30 mA
, 53, 54 ± 0.5 %
2, 54
A54 = "I" ¹⁾
0-20, 4-20 mA
, R _i 200 Ω
30 mA
, 53, 54 ± 0.5 %

1) "U" (PELV)

16.8.7

1, 42
0-20 mA
500 Ω
± 0.8 %
(PELV)

16.8.8 MCB 114

3, 2
0/4-20 mA
< 200 Ω
4 5, 4, 5 7, 8
, 2 3 Pt100/Pt1000

참고 30 Ω 3 Pt100 ,

16.9

CUE 70 dB(A) 6.7 RFI

17.

- 1.
2. 가 가 Grundfos

Declaration of conformity

GB: EU declaration of conformity

We, Grundfos, declare under our sole responsibility that the product CUE, to which the declaration below relates, is in conformity with the Council Directives listed below on the approximation of the laws of the EU member states.

CN: 欧盟符合性声明

我们，格兰富，在我们的全权责任下声明，产品 CUE，即该合格证所指之产品，欧盟使其成员国法律趋于一致的以下理事会指令。

KO: EU

Grundfos

CUE

EU

- Low Voltage Directive (2014/35/EU).
Standards used:
EN 61800-5-1:2007.
 - EMC Directive (2014/30/EU).
Standards used:
EN 61800-3:2004/A1:2012.
-

This EU declaration of conformity is only valid when published as part of the Grundfos safety instructions (publication number 96706951).

Bjerringbro, 25/02/2016



Svend Aage Kaae
Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile the technical file and empowered to sign the EU declaration of conformity.

96806766 1116

ECM: 1187342
