Motor standstill heater

Motor standstill heater, type MHG 35 and MHG 100
for canned motor pumps Etaseco
Secochem
Secochem-Ex
Multiseco-Ex

Works No.: _____

Type series: _____

Contents

Motor standstill heater for canned motor pumps

1 General

In buying the KSB standstill heater you have purchased a highly sophisticated piece of machinery.

The motor standstill heater serves to heat the rotor space. It can be connected to the following canned motor pumps (CMP) produced by KSB.

Explosion-proof CMPs	Non-explosion-proof CMPs
Secochem Ex	Etaseco
Multiseco Ex	Secochem

On explosion-proof CMPs, the temperature class (see pump name plate) must be observed.
On non-explosion-proof CMPs, the PTC resistors of the motor must be connected, to ensure thermal protection of the winding.

Make sure the unit is properly installed before first use. For this purpose, please refer to the information contained in these operating instructions.

The warranty is conditional on correct installation and compliance with the operating conditions.

2 Safety

These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel / operators prior to installation and commissioning, and it must always be kept close to the location of operation of the machine / unit for easy access.
Not only must the general safety instructions laid down in this chapter on "Safety" be complied with, but also the safety instructions outlined under specific headings.
Any work on the pump unit shall be performed in accordance with the instructions given in the relevant operating manual.

2.1 Marking of instructions in the manual

The safety instructions contained in this manual whose non-observance might cause hazards to persons are specially marked with the symbol

general hazard sign to ISO 7000-0434

the **electrical danger warning sign** is

safety sign to IEC 417 - 5036,
and special instructions concerning explosion protection are marked

The word

Caution

is used to introduce safety instructions whose non-observance may lead to damage to the machine and its functions.

2.2 Personnel qualification and training

All personnel involved in the operation, maintenance, inspection and installation of the unit must be fully qualified to carry out the work involved.
Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisite know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

2.3 Non-compliance with safety instructions

Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the machine / unit itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.

In particular, non-compliance can, for example, result in:

- hazard to persons by electrical, mechanical and chemical effects,
- hazard to the environment due to leakage of hazardous substances,
- failure of important unit functions,
- failure of prescribed monitoring methods.

2.4 Safety awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.


Ex symbol relates to additional requirements which must be adhered to when the pump is operated in hazardous areas.

2.5 Safety instructions for the operator / user

Electrical hazards must be eliminated. (In this respect refer to the relevant safety regulations applicable to different countries and/or the local energy supply companies.)

2.6 Safety instructions for maintenance, inspection and installation work

The operator is responsible for ensuring that all maintenance, inspection and installation work be performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

Any work on the unit shall only be performed with the unit de-energized.

Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and / or re-activated.

2.7 Unauthorized modification and manufacture of spare parts

Modifications or alterations of the equipment supplied are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety.

Caution It must be emphasized that spare parts not supplied by the manufacturer and unauthorized accessories have not been tested and approved by the manufacturers. Installation and/or use of such products may therefore have an adverse effect on the design-related properties of the equipment. The manufacturer cannot be held liable for damage resulting from the use of non-original spare parts and unauthorized accessories!

2.8 Unauthorized modes of operation

The warranty relating to the operating reliability and safety of the equipment supplied is only valid if the equipment is used in accordance with its designated use.

The limits stated in the sections on “Technical Data” and on the name plate, respectively, must not be exceeded under any circumstances.

3 Transport and interim storage

3.1 Transport

Transport of the equipment requires proper preparation and handling. Prior to dispatch, the equipment was tested and inspected to ensure full compliance with specifications. Consequently, the equipment should be in perfect electrical and mechanical condition upon arrival at its destination.

It is recommended that the equipment be inspected for in-transit damage immediately upon receipt. In case of any objections, the recipient and carrier must jointly draw up a damage report.

3.2 Interim storage

The equipment shall only be stored under dry and vibration-free conditions in its original packaging. Ambient temperature shall be within -20 °C to +40 °C.

4 Function of the standstill heater

The motor standstill heater is used for heating the rotor space of canned motor pumps when the pump is switched off.

It is installed in the control panel and can thus be retrofitted. Achievable rotor temperatures lie between 80 - 100 °C, depending on the motor size.

During pump operation, the driver is directly connected to the mains. For heating purposes, there is a switchover to the motor standstill heater by means of interlocked contactors.

When delivered together with a canned motor from KSB, the motor standstill heater is matched to the canned motor. The factory-set heating current and the max. permissible continuous current for the heater are indicated on the heater name plate (see fig. 11)

The motor standstill heater is designed in such a way that motor start-up during heating (pulsed direct current) is reliably prevented. During heating, voltage is applied to two phases of the motor.

The temperature in the rotor space can be determined with the help of a factory-installed PT 100 sensor in the canned motor and kept within a lower and an upper limit by switching the heater on and off.

If no PT 100 sensor is used for controlling the motor standstill heater, the temperature in the rotor space can also be set by reducing the heating current (see section 9).

5 Technical data

5.1 Technical data for mains voltages from 220V to 500V

	MHG 35/220-500	**MHG 35/220-500KS**	**MHG 35/220-500MS**	**MHG 100/220-500**
Supply voltage	220 V ... 500 V ± 10%	220 V ... 500 V ± 10%	220 V ... 500 V ± 10%	220 V ... 500 V ± 10%
Control voltage	230 V ± 10%	230 V ± 10%	230 V ± 10%	230 V ± 10%
Frequency range	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Max. continuous current *)	**35 A**	**15 A**	**10 A**	**100 A**
Max. peak current	10 s 70 A	10 s 30 A	10 s 20 A	10 s 70 A
Short-circuit current	max. 10 ms 1000 A	max. 10 ms 1000 A	max. 10 ms 1000 A	max. 10 ms 1000 A
Jumper position	III	II	I	---
Ambient temp.	-25 °C ... +55 °C	-25 °C ... +55 °C	-25 °C ... +55 °C	-25 °C ... +55 °C
Humidity class	E as per DIN 40040	E as per DIN 40040	E as per DIN 40040	E as per DIN 40040
Enclosure	IP 00	IP 00	IP 00	IP 00

EMC directives as per 89/336/EWG, EN 29001, EN 55011, EN 50081-1

*) measured in the circuit between the motor standstill heater (terminal T2/V) and motor (terminal V)

5.2 Technical data for mains voltages up to 690V

	MHG 35/220-690	**MHG 35/220-690KS**	**MHG 35/220-690MS**
Supply voltage	220 V ... 690 V ± 10%	220 V ... 690 V ± 10%	220 V ... 690 V ± 10%
Control voltage	230 V ± 10%	230 V ± 10%	230 V ± 10%
Frequency range	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Max. continuous current *)	**35 A**	**15 A**	**10 A**
Max. peak current	10 s 70 A	10 s 30 A	10 s 20 A
Short-circuit current	max. 10 ms 1000 A	max. 10 ms 1000 A	max. 10 ms 1000 A
Jumper position	III	II	I
Ambient temp.	-25 °C ... +55 °C	-25 °C ... +55 °C	-25 °C ... +55 °C
Humidity class	E as per DIN 40040	E as per DIN 40040	E as per DIN 40040
Type of enclosure	IP 00	IP 00	IP 00

EMC directives as per 89/336/EWG, EN 29001, EN 55011, EN 50081-1

*) measured in the circuit between the motor standstill heater (terminal T2/V) and motor (terminal V)

5.3 Dimensions MHG 35/220-500, MHG 35/220-500KS, MHG 35/220-500MS

Installation
- for installation in control panel only
- the control panel must be ventilated
- for wall mounting only

Clearance
- above the heater: min. 150 mm
- below the heater: min. 100 mm

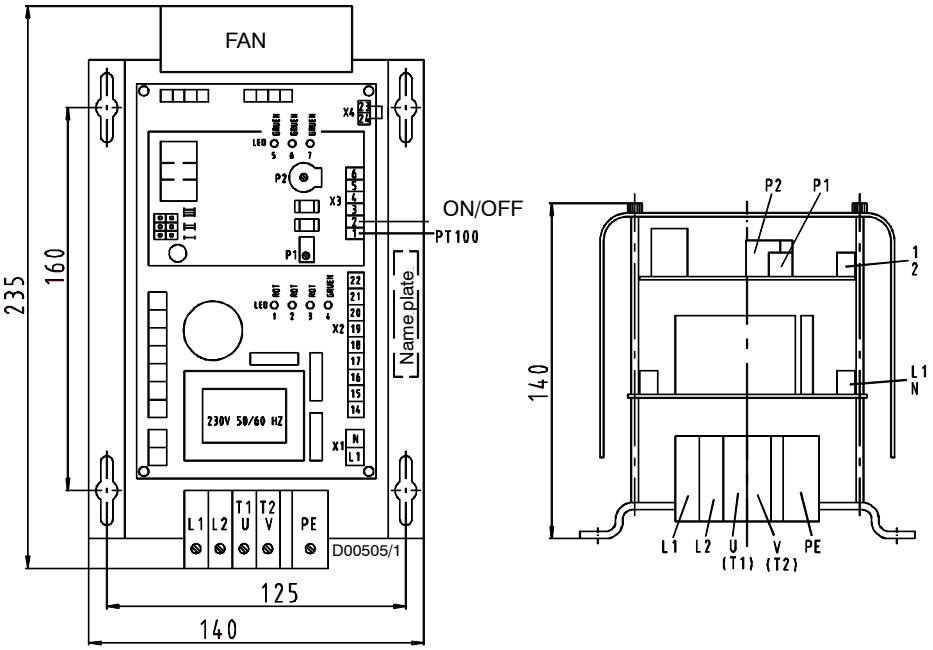


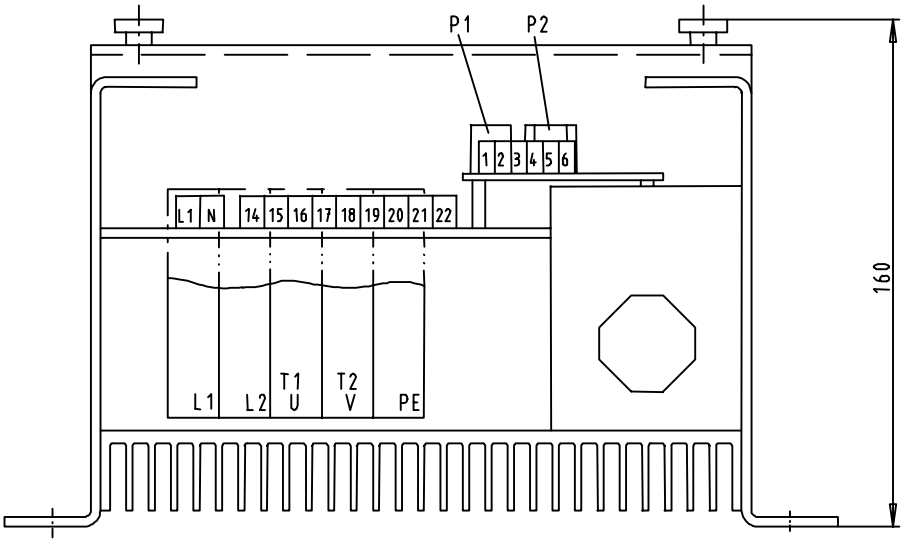
Fig. 1: Dimensions MHG 35/220-500, MHG 35/220-500KS, MHG 35/220-500MS

5.4 Dimensions MHG 100/220-500

Installation
- for installation in control panel only
- the control panel must be ventilated.
- for wall mounting only

Clearance
- above the heater: min. 150 mm
- below the heater: min. 100 mm

Dimensions



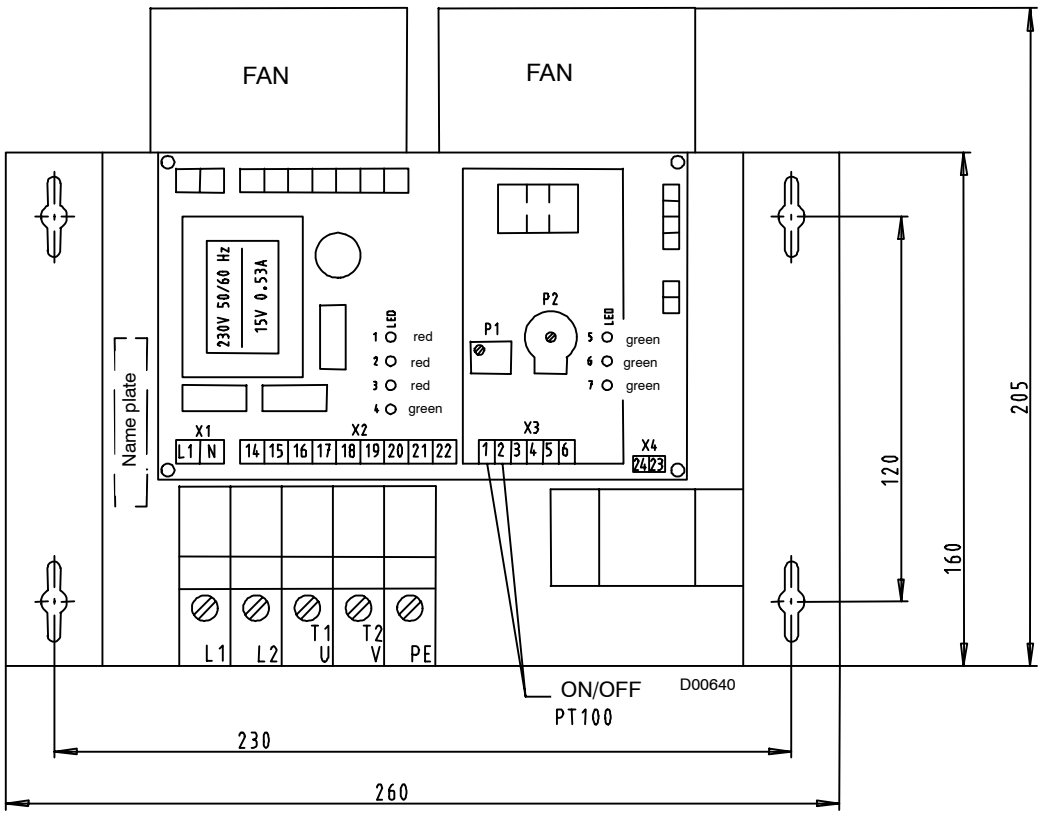


Fig. 2: Dimensions MHG 100/220-500

6 Installation

The motor standstill heater must be installed in a ventilated control panel in a non-hazardous area. It is fixed using four holes on the left and right hand side of the base.

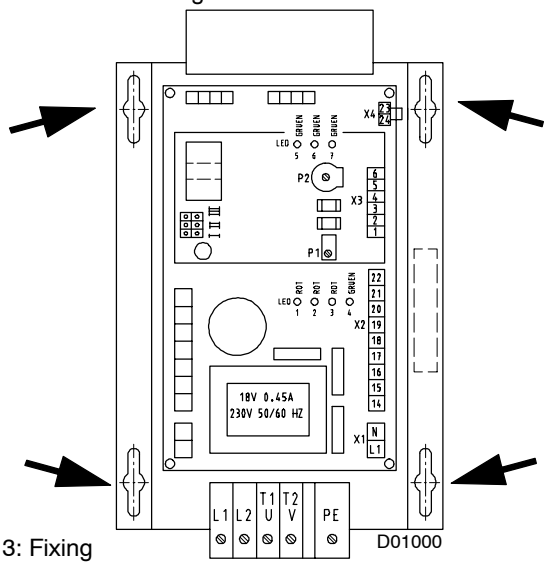


Fig. 3: Fixing

7 Connection of the power components

7.1 General instructions

Each unit is provided with a name plate indicating its design data. Also, inspection seals with production data are provided.

Removal of these labels will result in forfeiture of any and all warranty claims.

Before connecting the power components, check whether the mains data matches the data given on the name plate.

For safety reasons, the unit shall be earthed.

7.2 Mains connection

The terminals for the mains wires are marked L1 and L2 (see fig. 4).

The mains wires must be provided with the appropriate fusing or motor protection switches.

The unit shall be earthed at the PE terminal.

7.3 Motor connection

Connect the motor leads to terminals T1/U and T2/V (see fig. 4).

For safety reasons, it is essential that the motor be earthed.

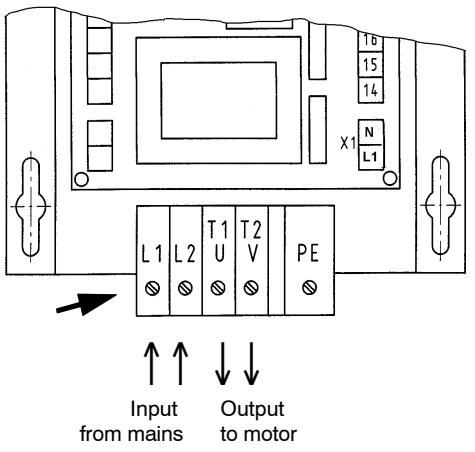


Fig. 4: Connecting the power components

8 Connection of the control components

8.1 Control voltage

The control voltage is generally **230V** (see section 5).

Control voltage is connected at terminals L1 and N of terminal strip X1 (see fig. 5 and 6, resp.)

Remove the transparent cover to connect the control components.

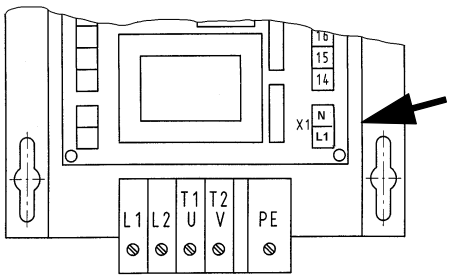


Fig. 5: Connecting control components MHG 35/220-500, MHG 35/220-500KS, MHG 35/220-500MS

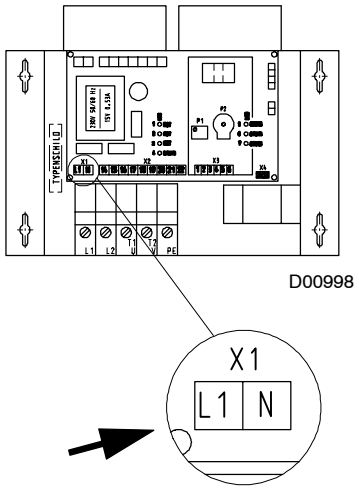


Fig. 6: Connecting control components MHG 100/220-500

8.2 Heater control

The heater is controlled via terminals 1 and 2 of terminal strip X3 (see fig. 7 and 8, resp.)

Heater ON: Terminals 1 and 2 connected

Heater OFF: Terminals 1 and 2 open

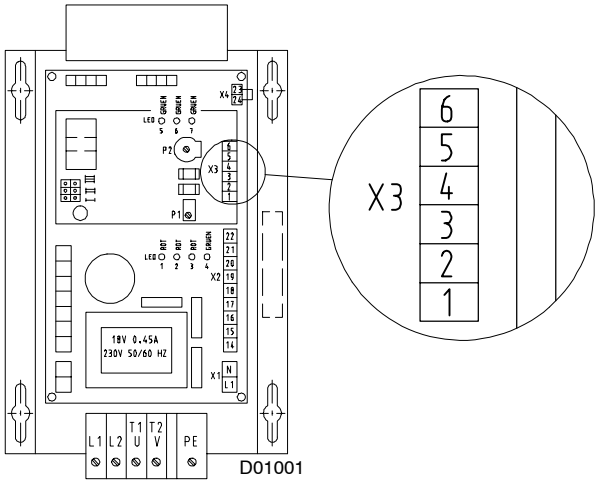


Fig. 7: Heater ON/OFF MHG 35/220-500, MHG 35/220-500KS, MHG 35/220-500MS

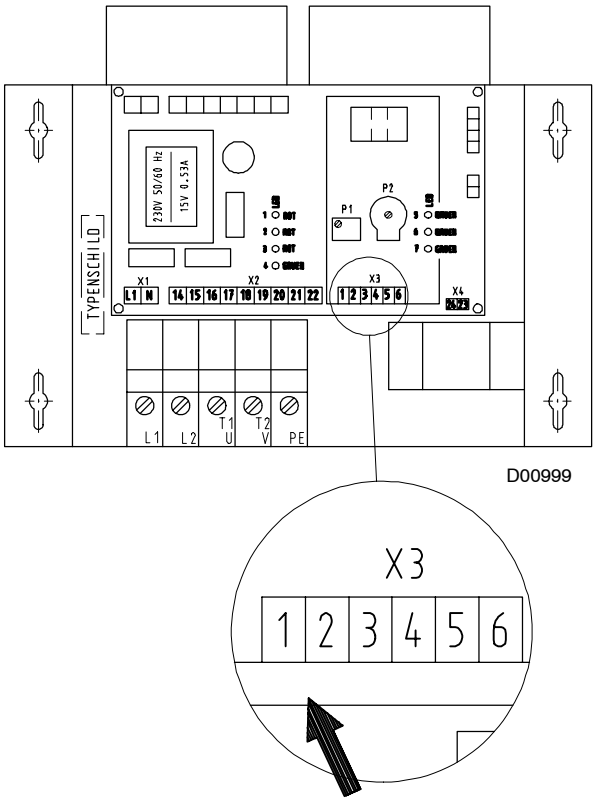


Fig. 8: Heater ON/OFF MHG 100/220-500

9 Settings and displays

9.1 Potentiometer function :

P1:	I =	Current adjustment (10turn potentiometer)
P2:	I_N =	Integral percentage of the control (set to right-hand stop)

See figs. 9 and 10: Potentiometers and LEDs

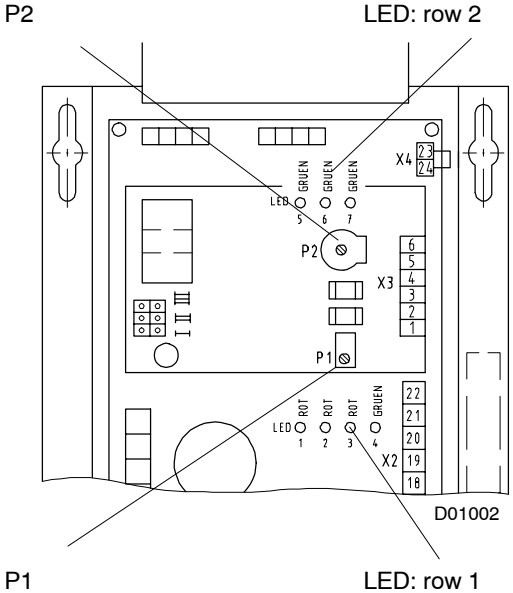


Fig. 9: Potentiometers and LEDs MHG 35/220-500, MHG 35/220-500KS, MHG 35/220-500MS

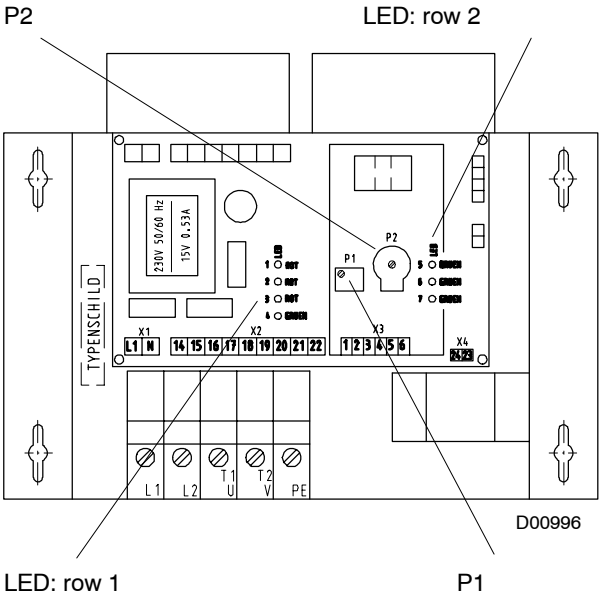


Fig. 10: Potentiometers and LEDs MHG 100/220-500

9.2 Setting the heating current

9.2.1 Factory-setting of heating current

When the motor standstill heater is supplied together with a complete pump set or single motor, the heating current is factory-set.

The **"Setting (cold)"** indicated on the heater name plate (see fig. 11) is selected so that temperature class T4 is complied with at permanent heater operation.

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Motorstillstandsheizung			**MHG 35/220-500**
Motor standstill heater			
Chauffage à l'arrêt			**Ident-No. 19 144 889**
Motorspannung:	**220-500 V**	**Einstellwert** (kalt)	**27,6 A**
Motor voltage		**Setting** (cold)	
Tension de moteur		**Valeur de réglage** (froid)	
Steuerspannung:	**230 V**	**max. Heizstrom**	**35 A**
Control voltage		**Max. heating current**	
Tension de contrôle		**Courant de chauffage, maxi**	

Ident-No. 01 054 932 ZN 3828 - M3

Fig. 11: Example of heater name plate

Caution The correct combination of heater and motor must be observed. Please refer to the "motor allocation plate" (fig. 12) on the motor standstill heater.

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☐	DS/DE 90.2-1,1	☐	DS/DE 90.2-2,2	☒	50Hz	☐	60Hz
☐	DS/DE 112.2-4	☐	DS/DE 112.2-5,5	☐	230V	☐	
☐	DS/DE 132.2-7,5	☐	DS/DE 132.2-11	☒	400V	☐	480V
☒	DS/DE 132.2-15	☐	DS/DE 160.2-22	☐	500V	☐	600V
☐	DS/DE 160.2-30	☐	DS/DE 200.2-40	☐	690V	☐	
☐	DS/DE 200.2-55	☐		☐		☐	

Ident-No. 01 234 567 ZN 3828 - D60

Fig. 12: Example of motor allocation plate

9.2.2 Customer-setting of heating current

The heating current is set to maximum heating power. The operator may adjust (i.e. reduce) the heating current to the requirements of the unit in question.

If the standstill heater is supplied as a spare part, the heater will not be factory-set (unless KSB has been informed about the motor to be heated by way of the works No.). In this case, the heating current will have to be set by the operator at the site.

The heating current must be set with the motor in cold condition.

Caution The **"max. heating current"** indicated on the name plate must not be exceeded (see fig. 11).

The max. heating current which can be set is defined by the following conditions:

a) Max. permissible heating current of the standstill heater (see fig. 11)

b) Thermal load capacity of the winding. PTC resistors in the winding must be connected.

c) Compliance with the temperature class of the motor, if the unit is used in a hazardous area.

Information on KSB's default settings is available on request.

The heating current "I" is set at the potentiometer P1. Remove the transparent cover on the heater to do so.
It is not normally necessary to change the integral percentage at the potentiometer P2. Default setting: Right-hand stop.

Default setting
Right-hand stop
(= integral percentage of heating current)

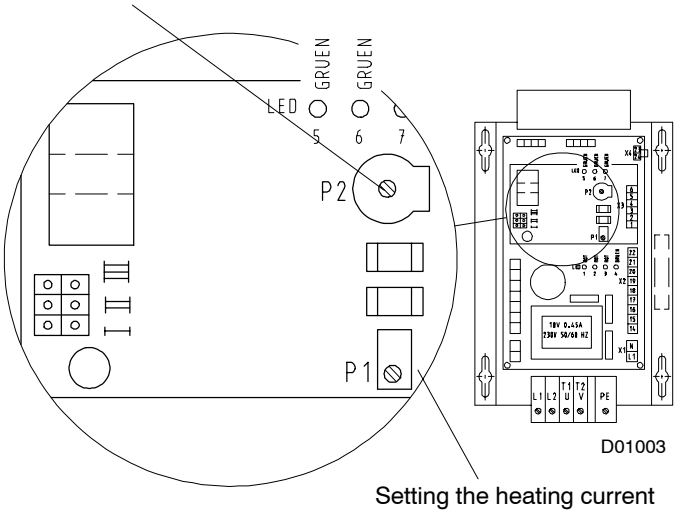


Fig. 13: Adjusting the heating current, MHG 35/220-500
MHG 35/220-500KS, MHG 35/220-500MS

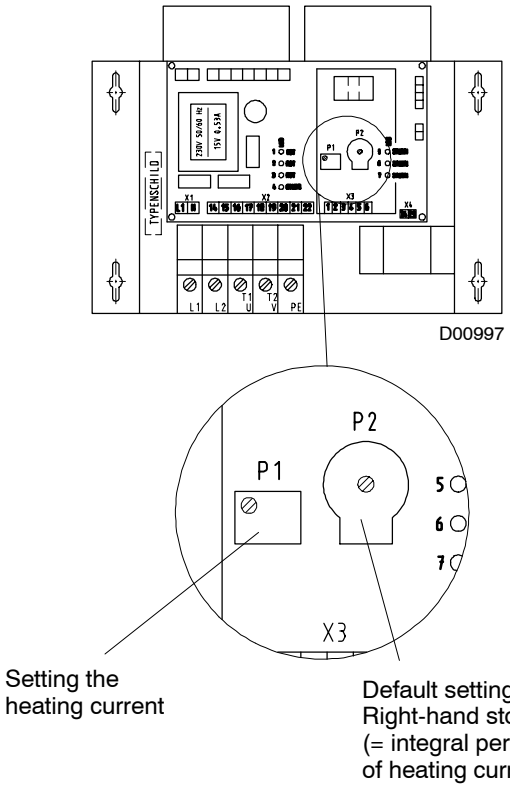


Fig. 14: Adjusting the heating current, MHG 100/220-500

Use a (TRMS) snap-on ammeter to check the heating current. The heating current is measured between the motor terminal V and terminal T2/V of the standstill heater.

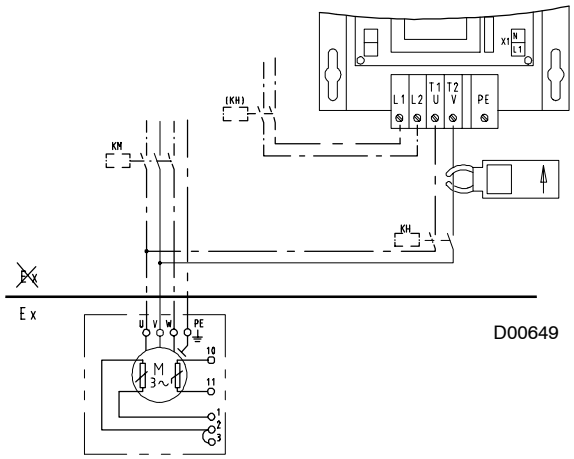


Fig. 15: Measuring the heating current

9.3 LED function

LED row 1

LED1	red	no function
LED2	red	no function
LED3	red	Bridge at terminal 23/24 missing (terminal strip X4)
LED4	green	Unit operational: Control voltage applied, heater OFF

LED row 2

LED5	green	Heater ON
LED6	green	Heater ON (lights up immediately after B/LED5)
LED7	green	no function

See fig. 9 + 10, potentiometers and LEDs

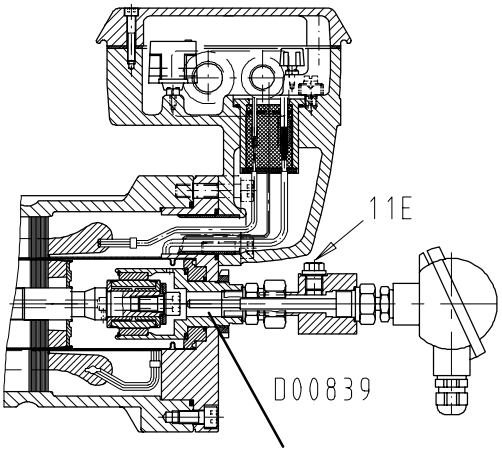
10 Suggested wiring for hazardous areas

10.1 General

When canned motor pumps are operated in hazardous areas, make sure that the temperature class of the canned motor pump (see pump name plate) is not exceeded during heater operation.

The motor standstill heater is factory-set in combination with the canned motor pump so that temperature class T4 is complied with at permanent heater operation.

Temperature classes T5 and T6 can only be realized with pumps models fitted with a temperature sensor in the rotor space (see fig. 16).



Temperature sensor in rotor space

Fig. 16: Temperature sensor in rotor space

In this case, the device for monitoring the rotor space temperature of the canned motor must be used for safety tripping.

10.2 Description of wiring

Heater operation:

The wiring is designed in such a way that the heater is automatically switched on when the pump has been switched off (actuate S0). The motor winding is heated up and thus heats up the medium in the rotor space.

The heater continues to operate until pump operation resumes (actuate S1).

Control:

During the heating phase, the heater is controlled by means of a resistance thermometer which measures the temperature in the rotor space, in combination with limit switch 0A6.

For this purpose, an upper and lower limit for the required rotor space temperature is set at the limit switch 0A6.

As soon as the rotor space temperature reaches this set upper limit (e.g. 10 °C higher than the lower limit), the heater is switched off via contact 0A6/Rel2. After a cooling-down period and after the lower limit has been reached, the heater is switched on again via contact 0A6/Rel2.

Caution The lower limit should be chosen in such a way that there is a sufficient margin to the critical product temperature, e.g. the product's crystallization point.

Monitoring:

Automatic re-start protection:

To protect the pump, a second temperature range can be set at the limit switch 0A6 (0A6/Rel1 – upper and lower limits set to the same value). This value is below the lower limit of the required rotor space temperature (heater operation), but above a critical product temperature such as the product's crystallization point. This setting prevents the pump from starting up in the event of a heater fault resulting in a "frozen" medium.

Winding protection:

To ensure thermal protection of the winding, the PTC resistors in the motor should be connected.

Explosion protection

The pump shall only be heated when filled.

The temperature class of the pump must not be exceeded during heater operation.

If the factory-set heating current is applied, temperature class T4 will be complied with at permanent heater operation. For T5 and T6, a control failure would therefore result in the respective temperature classes being exceeded. For motors fitted with a temperature sensor (see fig. 16), the device for monitoring the rotor space temperature of the canned motor (e.g. PT100) must be used as safety tripping device for T5 and T6. This is also recommended for temperature classes T3 and T4**.**

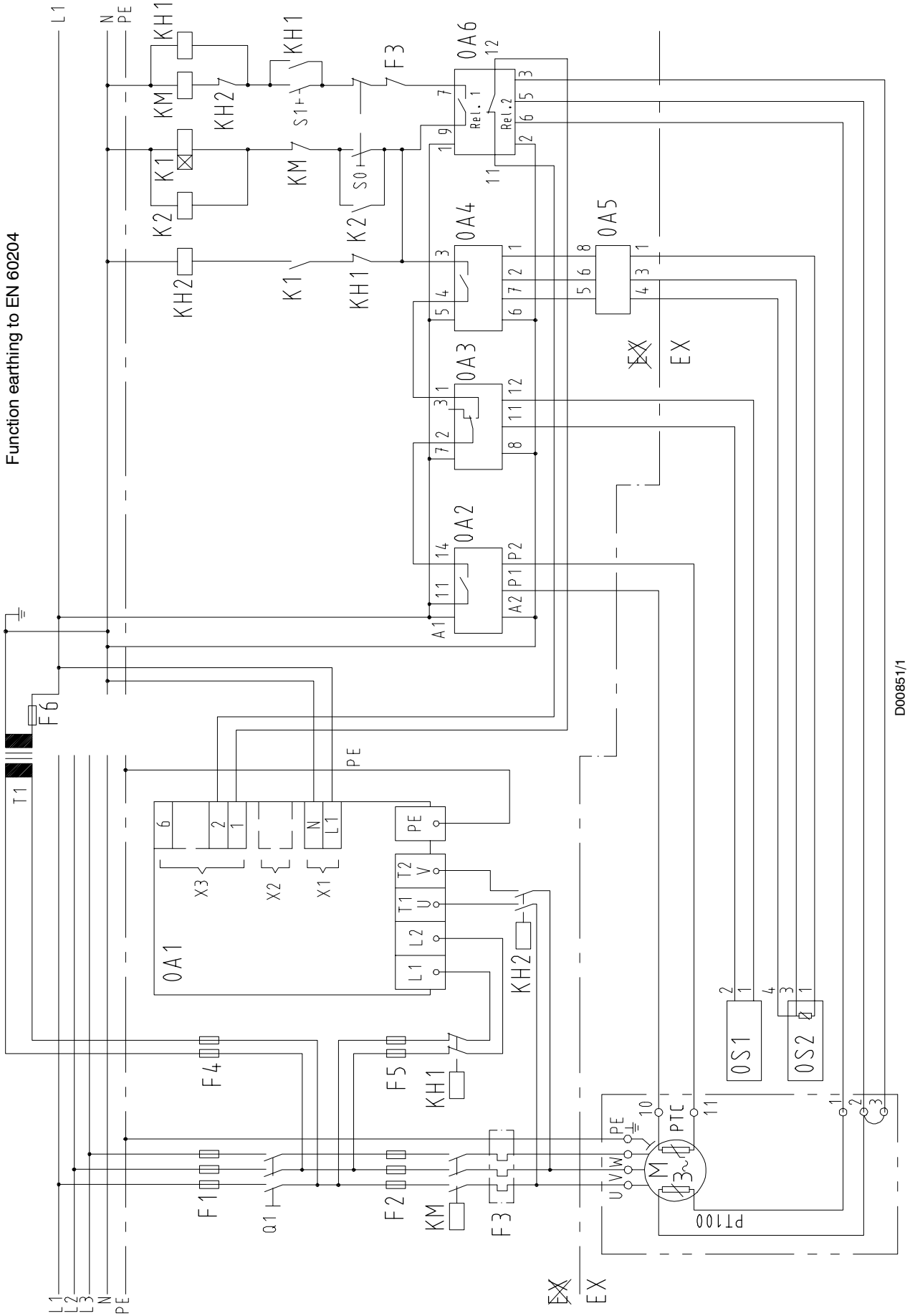
10.3 Description of suggested components

		Description	Type
•	0A1	Motor standstill heater	MHG 35
•	0A2	PTC tripping unit	MK 9163.12/100
•	0A3	Isolating amplifier	FXN 421 (FTL325N)
•	0A4	Limit switch	CF1M
•	0A5	Barrier	Z954
•	0A6	Limit switch (2 separate switching ranges)	DGW2.01
•	0S1	Level transmitter	Liquiphant
•	0S2	Resistance thermometer	TR201
	K1	Auxiliary contactor (time-lag)	
	K2	Auxiliary contactor	
	KH1	Contactor, heater - mains	
	KH2	Contactor, heater - motor	
	KM	Contactor, motor - mains	
	T1	Control transformer	

• = possible scope of delivery

10.4 Logic diagram

The wiring diagram suggests a possible installation mode of the motor standstill heater. The diagram does not take into account any plant-specific requirements or other pump monitoring elements.



11 Suggested wiring for non-hazardous areas

11.1 General

Caution When the canned motor pump is operated in non-hazardous areas, the PTC resistors in the winding must be connected, to ensure thermal motor protection.

11.2 Description of wiring

Heater operation:

The wiring is designed in such a way that the heater is automatically switched on when the pump has been switched off (actuate S0). The motor winding is heated up and thus heats up the medium in the rotor space.

The heater continues to operate until pump operation resumes (actuate S1).

Control:

During the heating phase, the heater is controlled by means of a resistance thermometer which measures the temperature in the rotor space, in combination with limit switch 0A3.

For this purpose, an upper and lower limit for the required rotor space temperature is set at the limit switch 0A3.

As soon as the rotor space temperature reaches this set upper limit (e.g. 10 °C higher than the lower limit), the heater is switched off via contact 0A3/Rel2. After a cooling-down period and after the lower limit has been reached, the heater is switched on again via contact 0A3/Rel2.

Caution The lower limit should be chosen in such a way that there is a sufficient margin to the critical product temperature, e.g. the product's crystallization point.

Monitoring:

Automatic re-start protection:

To protect the pump, a second temperature range can be set at the limit switch 0A3 (0A3/Rel1 – upper and lower limits set to the same value). This value is below the lower limit of the required rotor space temperature (heater operation), but above a critical product temperature such as the product's crystallization point. This setting prevents the pump from starting up in the event of a heater fault resulting in a "frozen" medium.

Winding protection:

To ensure thermal protection of the winding, the PTC resistors in the motor must be connected.

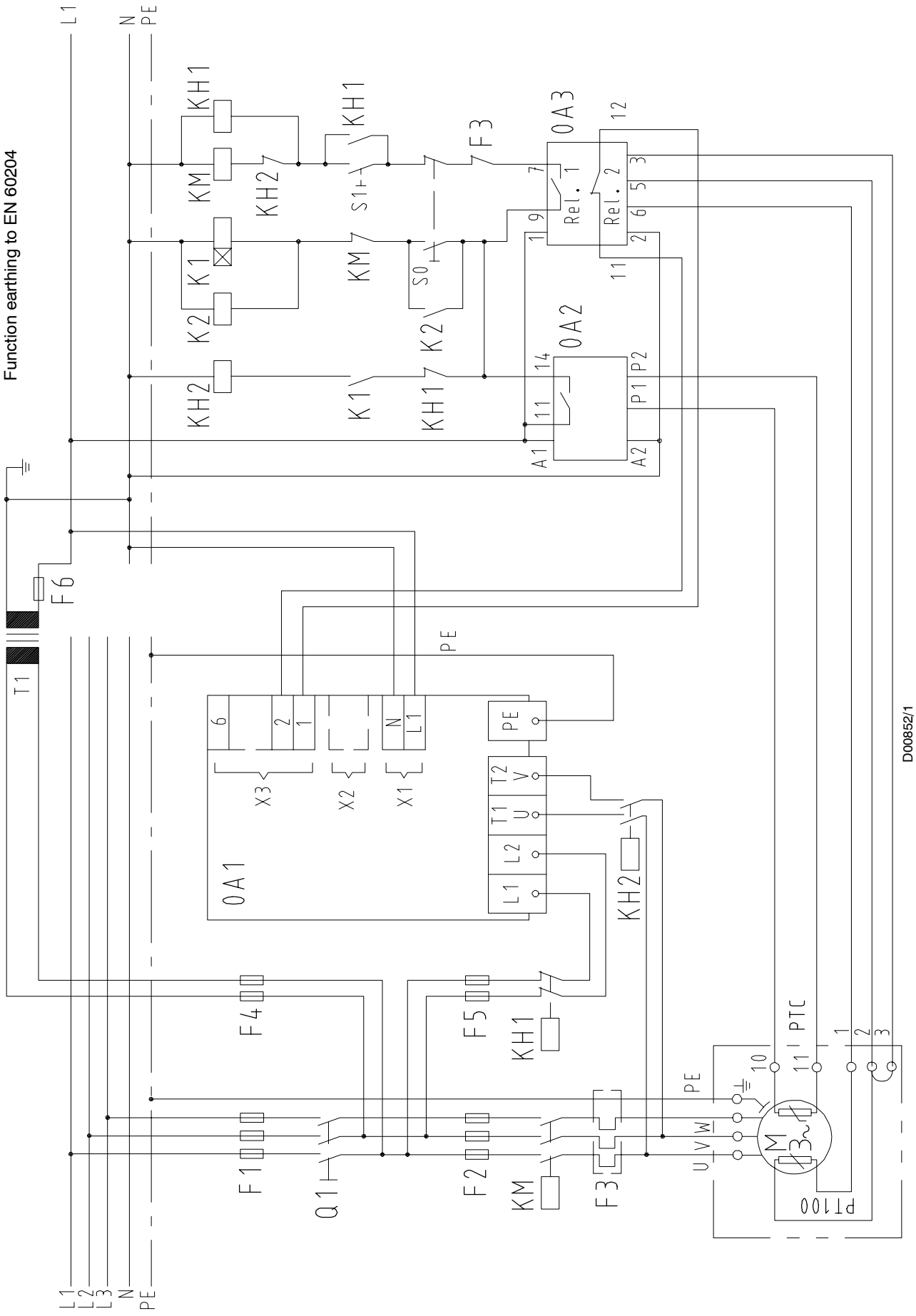
11.3 Description of suggested components

		Description	Type
•	0A1	Motor standstill heater	MHG 35
•	0A2	PTC tripping unit	MK 9163.12/100
•	0A3	Limit switch (2 separate switching ranges)	DGW2.01
	K1	Auxiliary contactor (time-lag)	
	K2	Auxiliary contactor	
	KH1	Contactor, heater - mains	
	KH2	Contactor, heater - motor	
	KM	Contactor, motor - mains	
	T1	Control transformer	

• = possible scope of delivery

11.4 Logic diagram

The wiring diagram suggests a possible installation mode of the motor standstill heater. The diagram does not take into account any plant-specific requirements or other pump monitoring elements.



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