TOOLTEMP

Manual of instruction

Temperature control unit TT-388 48kW

with Temperature Controller MP-888

CE

12/2023
Version: 10

Tool-Temp AG | Industriestrasse 30 | CH-8583 Sulgen | Switzerland
T +41 71 644 77 77 | **W** tool-temp.ch

General information

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In case of inconsistencies in the English translation, the German version shall prevail.

Contents

Attachments:

- **Electrical diagram MP-888 EL-000116_V02**

1. General Safety Information

1.1. Safety Symbols

DANGER	
	**Denotes imminent danger.** **Failure to heed the information can result in death or grave personal injury (disability)!**

WARNING	
	**Denotes a dangerous situation.** **Failure to heed the information can result in death or grave personal injury (disability)!**

CAUTION	
	**Denotes a potentially dangerous situation.** **Failure to heed the information can result in property damage as well as minor or moderate personal injury!**

NOTE	
	**Denotes general information, useful advice to users and work recommendations, which, however, do not have any influence on the safety and health of personnel.**

1.2. Range of Application

This general safety information is generally valid for all temperature control units from TOOL-TEMP.

1.3. Intended Use

The TOOL-TEMP temperature control unit is built according to the current state of the art and the generally accepted principles of safety engineering. The temperature control unit is intended solely for the normal use for heating and/or cooling of injection and die casting moulds, extruders, calendars, mixers and other consumers in areas in which there is no risk of explosion.

Any use beyond this shall be deemed to constitute improper use. The manufacturer is not responsible for damage resulting from improper use; the user is solely responsible for such risks. The temperature control unit may not be used under other operating conditions and/or with other media, in deviation from our specifications, without the prior consent of TOOL-TEMP.

Use as intended also entails compliance with the operating, servicing and maintenance conditions stipulated by the manufacturer. The temperature control unit may only be operated, serviced and maintained by personnel who are familiar with these tasks and have been instructed as to the risks.

1.4. Safety Information

1.4.1. General Information

The TOOL-TEMP temperature control unit is safe to operate, but this device can pose danger to life and limb if it is used incorrectly or for a purpose other than that intended. It should be noted that this poses risks to the life and limb of the user or third parties, adverse effects on the equipment and other material assets belonging to the user, and risks to the efficient operation of the equipment.

Start-up (i.e., commencement of intended use) is prohibited until it has been determined that the temperature control unit has been set up and wired in accordance with the Machinery Directive (2006/42/EC). EN 60204-1 (Safety of Machinery) must also be observed.

These operating instructions must be read carefully before turning on and operating the temperature control unit. The information regarding the intended use and foreseeable misuse must be observed. Local safety regulations must also be obeyed.

If the temperature control unit is used in combination with products by other manufacturers, their notices and safety regulations must also be obeyed.

1.4.2. Process Monitoring

In plants in which a temperature control system malfunction leads to endangerment of the operating personnel or destruction of the plant, an independent process monitor that shuts down the plant reliably must be used.

1.4.3. Information for Operators and Personnel

The operator and all persons who are tasked with working on the temperature control unit must obey the fundamental regulations regarding work safety and accident prevention. The operator must ensure that only persons who have read and understood these operating instructions, particularly the chapter on safety, work on the temperature control unit.

WARNING	
	**People with pacemaker should not be allowed to demount or maintain the magnetically coupled pump!**

Any working methods that have a negative effect on the technical safety of the temperature control unit must not be used. The operator must ensure that the temperature control unit is operated only in flawless condition. If necessary, the company using the equipment must obligate the operating personnel to wear protective clothing.

For all tasks having to do with set-up, start-up, operating, modification of operating conditions and operational modes, maintenance, inspection and repair, any shut-down procedures stated to be necessary in the operating instructions must be followed.

1.4.4. Changing the Parameterisation

The parameterisation of the control system may only be carried out by personnel trained by TOOL-TEMP. In particular, no parameters in the device configuration may be changed without consulting TOOL-TEMP.

The relevant accident prevention regulations and the generally accepted principles of safety engineering, occupational medicine and structural engineering must be observed. The national safety regulations must also be obeyed.

1.4.5. Residual risks

Any unauthorised modifications and changes to the temperature control unit as well as unauthorised changes to the parameterisation of the control system are prohibited for reasons of safety.

If the temperature control unit is damaged, it must not remain in use; the defective part must be replaced or repaired immediately. Only original TOOL-TEMP replacement parts may be used. Damage due to use of thirdparty parts voids any and all warranty claims.

DANGER	
	**The temperature control unit must be rendered currentless before it is opened! Press the main switch on the temperature control unit and unplug mains plug!** **Danger due to electrical shock!**

Repair leaks in the temperature control circuit (device, connecting lines, consumers, etc.) immediately.

In temperature control units that use oil as a heat transfer medium, it should be noted that oil is flammable under certain conditions. For this reason, the temperature control unit must not be located in the vicinity of heat sources. The thermal insulation in the device must always be kept clean. Insulation that is soaked with thermal oil poses an increased risk of fire.

Burning thermal oil can be extinguished using a spray foam fire extinguisher, a powder fire extinguisher (avoid with dust-sensitive plants, control systems, EDP, etc.) or a CO_2 fire extinguisher. The appropriate fire extinguisher must be provided by the operator, taking into account the equipment located in the room and the mandatory safety regulations.

The temperature control unit may only be operated when all safety systems are completely installed and intact. The temperature control unit must be protected against sprays and cleaning agents.

Before detaching connecting lines in the temperature control circuit and depending on the outlet temperature, allow the temperature control unit to cool down first and then turn it off. Check that the pump is no longer running.

WARNING	
	**Important - danger of injury in the event of escaping hot oil!**

1.5. Using this Documentation

This documentation contains important information for safe, economical operation and for proper maintenance of the device.

Compliance with this documentation helps to avoid danger, minimise repair costs and downtime, and increase the dependability and service life of the unit/system.

NOTE	
	**The operating instructions should be kept near the corresponding unit and always be accessible to operating and maintenance personnel.**

1.5.1. Additional Documentation

The included documentation is completely correct for the basic versions of units. Components that do not belong to the basic hardware are noted as extra equipment. The corresponding additional documents are included with special versions of devices. Any additional documents supplement and/or replace the descriptions contained in this documentation, which are then either invalid or only conditionally valid.

2. Overview temperature control unit

2.1. Front view

1	**Temperature Controller MP-888**
2	**ON/OFF-Switch unit (green)**
3	**ON/OFF-Switch heating (green)**
4	**ON/OFF-Switch heating (green)**
5	**ON/OFF-Switch heating (green)**

6	**ON/OFF-Switch horn (green)**
7	**Level control lamp Pre-warning (yellow)** lights + horn Unit switches off, level has to be corrected
8	**Leven control lamp (yellow)** lights + horn Unit switches off
9	**Control lamp cooling (green)**
10	**Control lamp thermal relay pump (red)** Thermal relay of the pump motor has responded. The unit switches off.
11	**Control lamp temperature monitoring t1 (red)** The maximum temperature of the unit is exceeded. The unit switches off. **Control lamp temperature monitoring t2 (red)** The maximum temperature of the unit is exceeded. The power to the heater is switched off, the unit works and the cooling can be activated.
12	**Control lamp temperature monitoring t3 (red)** Temperature deviation control; Difference between desired and actual temperature is too big.
13	**Control lamp flow control (red)**
14	**Working hour meter**
15	**Horn**
16	**Main switch** Emergency stop
17	**Name plate with following details:** 
18	**Manometer pump pressure**
19	**Switch cabinet – safety device**
20	**Side panel**
21	**Front panel**

2.2. Rear view

22	Service cover	
23	Rear panel	
24	To mould	1“ BSP female thread
25	From mould	1“ BSP female thread
26	Cooling water inlet with water filter	1“ BSP female thread
27	Cooling water outlet with non-return valve	1“ BSP female thread
28	Drainage with stop valve	½“ BSP female thread
29	Overflow	
30	Filler neck	1“ BSP male thread

2.3. Identification of residual risk on the unit

On the temperature control unit following pictograms are mounted to identify the residual risk.

DANGER	
	**The temperature control unit must be rendered currentless before it is opened! Turn off the main switch on the temperature control unit and disconnect the power cord from the wall socket!** **Danger due to electrical shock!**

WARNING	
	**Prohibition for people with pacemaker!** **People with pacemaker should not be allowed to demount or maintain the magnetically coupled pump!** **There is a risk of injury to people with pacemaker.**

3. Technical Specifications

Temperature range	Up to 360°C with heat transfer oil TOOL-THERM SH-3	
Temperature control	self-optimizing, electronic microprocessor controller MP-888	
Heating capacity	with stage switching 8/8/16/16 kW	
Pump capacity	**Pump type Z** Motor 1,8 kW IE2 Motor 1.5 kW IE3 max. 5.5 bar / max. 100 l/min Vacuum max. 8 mWS	**Pump type A** Motor 1,8 kW IE2 Motor 1.5 kW IE3 max. 5.5 bar / max. 100 l/min Vacuum max. 8 mWS
Cooling capacity	230 kW at 360°C	
Filling amount	70 litres	
Expansion volume	36 litres	
Connections	to mould	1“ BSP female thread
	from mould	1“ BSP female thread
	cooling water inlet with water filter	1“ BSP female thread
	cooling water outlet with non-return valve	1“ BSP female thread
	Drainage with stop valve	½“ BSP female thread
Dimensions (L×W×H)	1240 × 720 × 1500 mm, incl. castors	
Weight	approx. 335 kg empty	
Category of protection	IP-44	
Electric	In separate switch cabinet, easily accessible from the front	
Colour	silver-grey RAL 7001	
Heat exchanger	low-maintenance	
Noise level (dBA)	< 70 dBA (distance 3 m)	

4. EU – Declaration of conformity

CE - Konformitätserklärung
CE - Declaration of conformity

TOOLTEMP

Hersteller / *manufacturer*

Tool-Temp AG
Industriestrasse 30
CH-8583 Sulgen - Switzerland

Hiermit erklären wir, dass die nachfolgend bezeichneten Maschinen
Herewith we declare that the following listed machines

Produktbezeichnung *Designation of the machine*	**Typenbezeichnung** *model or type of machine*	**ab Baujahr** *since year of manufacture*
Temperiergerät *temperature control unit*	TT-22, TT-30/160, TT-44, TT-71, TT-100, TT-108, TT-118, TT-137, TT-138, TT-142, TT-DW160, TT-168, TT-170, TT-180, TT-181, TT-188, TT-248, TT-AC250, TT-288, TT-288/2, TT-OIL300, TT-388, TT-388/2, TT-390, TT-390/2, TT-407, TT-409, TT-410, TT-430, TT-508, TT-510, TT-608, TT-708, TT-725, TT-1000, TT-1358, TT-1368, TT-1398, TT-1500, TT-1548, TT-SB2C, TT-13502	2023
Wasserkühlgerät *water chiller*	TT-5500, TT-14500, TT-28500, TT-29000, TT-29800, TT-54500, TT-108000, TT-108500, TT-216000, TT-300000	2023

den grundlegenden Anforderungen der Richtlinie 2006/42/EG entsprechen.
meet the basic requirements of the guideline 2006/42/EC.

Richtlinien *directives*

2014/30/EU **(Elektromagnetische Verträglichkeit)** *(Electromagnetic compatibility directive)*

2014/35/EU **(Niederspannungsrichtlinie)** *(Low voltage directive)*

Europäische Normen *European Standards*
EN ISO 12100:2010, EN 60204-1:2018, EN 61439-1:2021, EN 61439-2:2021, EN 61000-6-2:2019, EN 61000-6-4:2019

Ferner erklären wir, dass die speziellen technischen Unterlagen gemäss Anhang VII Teil B der Richtlinie 2006/42/EG erstellt wurden und verpflichten uns diese auf Verlangen den Marktaufsichts-behörden in schriftlicher oder elektronischer Form zu übermitteln.
Furthermore we declare that the relevant technical documentation according to 2006/42/EC, Appendix VII, Part B has been issued and we commit ourselves to forward the documents on request to the market regulators as written documents or electronically.

Name des Dokumentenbevollmächtigten: *Name of the person which is responsible for the documentation:* Jasmine Koller

Adresse der benannten Person: *Address of the nominated person:* Tool-Temp AG, Industriestrasse 30, 8583 Sulgen

S. Koller

Sulgen, 02.11.2023 — Serge Koller

Ort und Datum *Place and date* — **Technischer Leiter** *Technical Director*

Anmerkung: Diese Erklärung entspricht einer Herstellererklärung im Sinne der EG-Maschinenrichtlinie 2006/42/EG, Anhang II B. Etwaige Änderungen an dem oben beschriebenen Erzeugnis lassen die Gültigkeit dieser Erklärung erlöschen.
Remark: This declaration is made in the sense of the EC-General Instruction for the Machinery 2006/42/EC, Appendix II B. After changings at the above described equipment this declaration will expire.

5. Installation

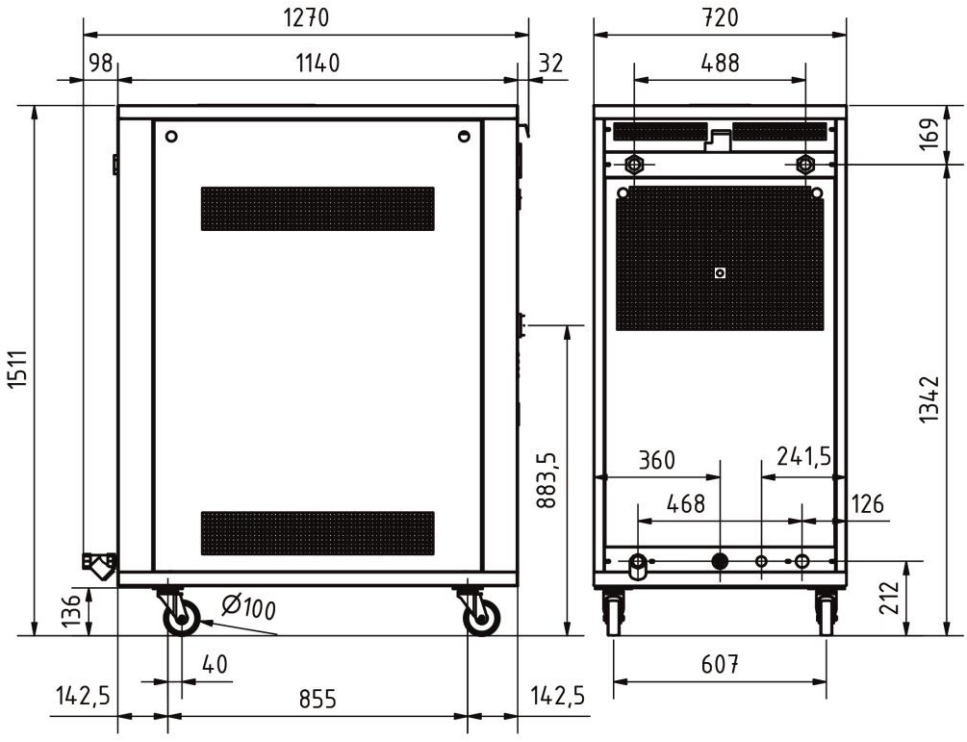
Before starting the unit the electrical and hydraulic connections have to be installed. The installation of the unit has to be done in the order of the following chapters. After the proper installation the unit is ready to use.

DANGER	
	**The temperature control unit must only be operated with heat transfer oil. Do not use solvents or other explosive substance such as petrol, toluene, etc. in the heat transfer oil circuit.**

CAUTION	
	**When starting the unit without the prescribed connections the unit can be damaged.** **Water quality (cooling circuit) – do not use water with chlorine addition.**

NOTE	
	**Observe the General Safety Information!** **Before installing corresponding chapter of the manual should be read!**

5.1. Installing and dimensions of the temperature control unit



The temperature control unit is designed for an ambient temperature of +10 up to 40°C. Sufficient ventilation must be ensured during set-up. The distance between the temperature control unit and other facilities must be at least 10cm. The ventilation opening must be free.

- Check the unit of completeness and possible damages.
- The unit has to be installed in a suitable location on even ground. It must be stand on castors.
- The unit is not protected against splash water and is not suitable for use in hazardous location. The unit must not be used in the open air.
- The unit must not be transported lying. Lying transport destroy the unit.

WARNING	
	**The temperature control unit can release excess pressure. Danger of injury in the event of escaping hot oil!** **Never start up the unit without the protection cover!** **Never use the unit in hazardous location!** **Repair leaks immediately!** **Observe local laws during set-up!**

CAUTION	
	**The temperature control unit may be pressurised!** **Only when the pressure gauge shows 0 bar, disconnect hoses!**

5.2. Connections

Before installing the connecting lines between temperature control unit and consumer must be subjected following inspections:

- Verify that channels on the consumers are unobstructed
- Remove fouling, e.g. remove shaving in the lines
- Rust and lime deposits must be removed because the greatly interfere with the heat exchange between consumer and heat transfer medium and increase the pressure drop in the consumer.

For the connecting lines (to and from mould, cooling water inlet and outlet, etc.) the following internal diameters of hoses are recommended:

Thread on the unit	Internal hose-Ø
3/8“	10mm
1/2“	15mm
3/4“	20mm
1“	25mm
DN32	32mm

Quick release couplings will give reduced flow. If the recommended tube size cannot be connected to the mould, the connection at the mould should be reduced and not the connection on the temperature control unit. In that way pressure drops can be avoided.

For the cooling water connections it's enough to use pressure- and temperature-resistant rubber hoses. The tap water pressure has to be between 2,0 and 5,0 bar. We recommend to conduct the water from the unit (cooling water outlet) to an unpressurized outlet.

WARNING	
	**To ensure the operational safety is essential to use pressure- and temperature-resistant hoses. Pressure-resistant up to 20 bar / temperature-resistant up to +400°C.** **For reason of safety, the cooling must always be connected!**

NOTE	
	**Process water filter on the return line reduces contamination in the unit, which can cause a unit failure (pollution of the solenoid valve).** **Mark and take down the maximum temperature for which the connections are suitable!**

5.3. Power supply

Compare supply voltage and frequency with the information on the serial plate. Verify the rating of the preliminary fuse according to the information in the electrical diagram. Observe local laws during set-up!

Power cable:

Phases	black / black / black	L1 / L2 / L3
Earth	yellow/green	PE

WARNING	
	**The unit may only be connected by a competent electrician.** **Ensure easy access to means for cutting the power supply (mains adapter or mains connection), the access must be positioned in a distance of 0.6 and 1.9m above the access level.** **Do not connect the power supply until the heating medium hoses are connected!**

5.4. Initial operation

The temperature control unit can only be operated with heat transfer oil. The unit has to be filled manually through the filler neck for the operation. A guideline for the required filling amount can be taken from the technical data.

WARNING	
	**Caution „residual water“ (temperature control unit, consumer, hoses) – water in the oil can lead to dangerous operating conditions. The temperature control unit can be overflow. Risk of injury by escaping oil-water mixture!**

The temperature control unit has to be connected hydraulically and electrically. Possible block valve must be open.

- Switch on the unit electrically: Turn on the main switch and press the unit ON/OFF-switch
- After switching on the unit the unit can be filled through the filler neck. In the meantime the yellow lamp lights and the horn sound. If the correct level is reached the pump starts. If the unit switches down after this, the level has to be corrected as soon as the system has enough heat transfer oil.

NOTE	
	**Too much heat transfer oil reduces the expansion volume! The heat transfer oil expands during the heating and could be overflow.**

WARNING	
	**Warning overflow oil has to be removed immediately!** **Oil-soaked isolation has to be replaced immediately, they can ignite.**

DANGER	
	**Waste oil has to be disposed as prescribed by law. Never let waste oil come into the sewage system or soil.**

5.4.1. Heat transfer oil

Temperatures up to +250°C ask for heating transfer oils such as TOOL-THERM SH-3, Shell Thermia B, BP Transcal N, Essotherm 500 or equivalent products. For operating the temperature control unit up to temperatures +360°C, must be used TOOL-THERM SH-3. Other similar products must be individually clarified. Please note: The used heat transfer oil has to be taken down in a check list. Particularly the maximum operating temperatures according to the specifications of the heat transfer oil manufacturer has to be taken down.

WARNING	
	**The use of unsuitable oil sorts is not permitted and is not regarded as use as agreed.**

5.4.1. Pump rotation check

On top of the unit the direction of rotation can be checked. The unit has been connected to the main supply, hoses must be mounted and heat transfer medium has been filled. Identify the sense of rotation of the motor by switching it on shortly. The sense of rotation must be clockwise as shown by the arrow.
If the sense of rotation is anti-clockwise invert two phases on the electrical connection. This has to be done by a qualified electrician.

5.4.2. Display of pump pressure

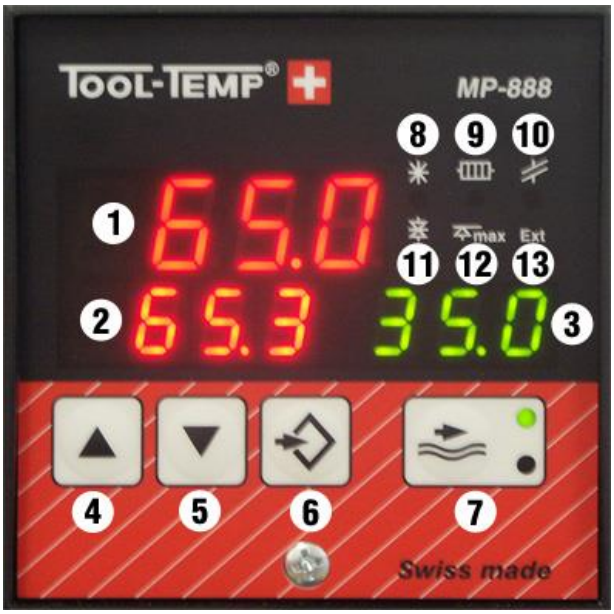
The pump pressure is shown on the manometer.

WARNING	
	**The temperature control unit may be pressurised!** **Only when the pressure gauge shows 0 bar, disconnect hoses!**

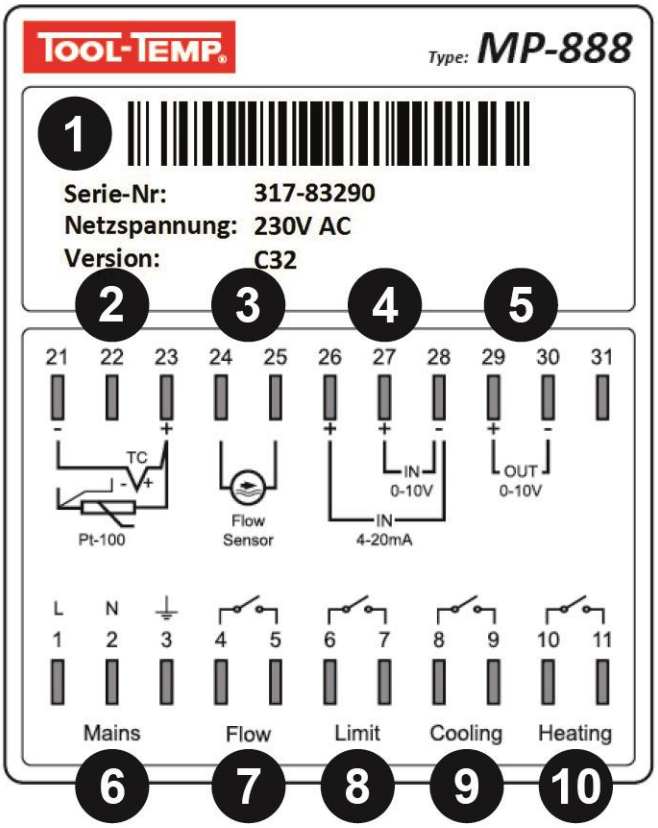
6. Operations

The unit is controlled by the temperature controller MP-888.
The temperature controller MP-888 is a universal controller for all TOOL-TEMP units.

6.1. Overview MP-888



1	**Display of set value**	
2	**Display of actual value**	
3	**Flow control** Display of the current flow in litres/min, English or American gallons/min.	
4	**Up arrow**	Raise of set value
5	**Down arrow**	Reduction of set value
6	**Program button**	
7	**Flow control** Flow control active Alarm flow control	 LED green LED red
8	**LED Cooling** Lights up when the cooling relay is active	
9	**LED Heating** Lights up when the heating relay is active	
10	**LED Sensor failure** Lights up when the sensor is intermitted	
11	**LED Temperature deviation control** Lights up when the difference between set and actual temperature is too high	
12	**LED Maximum temperature** Lights up when the maximum temperature has been reached	
13	**LED External temperature control** Lights up when the set value is applied from extern	



1	**Technical specifications**
2	**Temperature sensor connection** 21+23 Temperature sensor – note + / - 22 Pt-100 compensation
3	**Flow control – encoder signal**
4	**Connection external set point** 26+28 Analog input 4 - 20mA 27+28 Analog input 0 - 10 V
5	**Connection actual value - output** 29+30 Analog output 0 - 10V
6	**Power supply** 1 230V AC 2 Neutral 3 PE
7	**Flow control (alarm)**
8	**Temperature monitoring, temperature deviation alarm**
9	**Cooling (command)**
10	**Heating (command)**

6.2. Parameter settings MP-888

Each unit requires a different programme setting. For each model is a programme defined that not every parameter must be set manually. In this program the model specific settings are saved.

Modell: TT-388			**Program: P88**
	Function	**Factory adjusted**	**Description**
P1	Maximum temperature	**365.0°C / 689.0°F** (0.0...400.0°C) (32.0...752.0°F)	If the maximum temperature exceeds, the heating and cooling are inactive and the maximum temperature LED lights up on the controller.
P2	Temperature deviation control (Deviation between set and actual temperature)	**5.0°C / 9.0°F** (0…20.0°C) (0…36.0°F)	The limit determines the maximum deviation from the nominal value, which is still tolerated. If the actual temperature outside the set point window the alarm will sound and the Temperature deviation control LED lights. If the restart lock (P24) is turned on, the temperature deviation control is active only when it reaches the set temperature. A set point changes the start-up lock again.
P3	Flow measurement function	0: Manual **1: Automatic**	If the automatic flow measurement is enabled, after 20s the measured flow is stored and monitoring is enabled. The green LED lights up.
P4	Alarm value flow	**8.0 L** (0.1…999.9 L)	(P3) set to manual Alarm is triggered when the set value is fallen short of.
P20	Temperature unit	**1: °C** 2: °F	Change the temperature unit When the unit started the selected unit will be indicated for a short time.
P23	Analog input	**1: Voltage 0-10V** 2: Current 0-20 mA 3: Current 4-20 mA	Analog input for setpoint selection. 0-10 V (switching threshold <0.1V) 0-20 mA (switching threshold <0.5mA) 4-20 mA (switching threshold <0.1mA)
P27	Temperature at 0 V INPUT	**0.0°C / 32°F** (-50.0...399.9°C) (-58.0...751.8°F)	Lower scaling point of the voltage analog input 0 V corresponds to 0°C
P28	Temperature at 0 V INPUT	**400.0°C / 752°F** (-49.9…400.0°C) (-57.8…752.0°F)	Upper scaling point of the voltage analog input 10 V corresponds to 400°C
P29	Temperature at 0/4 mA INPUT	**0.0°C / 32°F** (-50.0...399.9°C) (-58.0...751.8°F)	Lower scaling point of the voltage analog input 4 mA corresponds to 0°C

P30	Temperature at 20 mA INPUT	**400.0°C / 752°F** (-49.9…400.0°C) (-57.8…752.0°F)	Upper scaling point of the voltage analog input 20 mA corresponds to 400°C
P31	Temperature at 0 V OUTPUT	**0.0°C / 32.0°F** (-50.0…399.9°C) (-58.0…751.8°F)	Lower scaling point of the voltage analog output 0 V corresponds to 0°C
P32	Temperature at 10 V OUTPUT	**400.0°C / 752°F** (-49.9…400.0°C) (-57.8…752.0°F)	Upper scaling point of the voltage analog output 10 V corresponds to 400°C
P45	Relation between cooling- and heating capacity	**0** (0...50)	Adjusting of the cooling capacity 0: 2-point cooling (Standard) 1: cooling capacity maximum 50: cooling capacity minimum
P53	Flow unit	0: Flow OFF 1: Impulse (Hz) **2: litres/min** 3: US gallons/min 4: Imperial gallons/min	Flow unit to display 1 US gallon = 3.785 litres 1 Imperial gallon = 4.546 litres
P60	Flow measurement Calibration table	0 = Manual 1 = Small units 1 2 = Medium units **3 = Large units** 4 = Reserved 5 = Small units 2 6 = Reserve	Selection oft he calibration table for flow measurement

Navigation in the controller

Enter into the controller and navigate to the different parameter:

- To enter into the programme of the controller, the program button has to be pressed for 3 seconds.
- To move from parameter to parameter, press the programme button.

Setting the parameter value:
With the two arrow buttons the value of the parameters can be adjusted.

Save the parameter settings:

- To save the parameter settings and get back to the control function, the flow button must be pressed.
- To save the parameter settings and move to the next parameter, the programme button must be pressed.

6.3. Setting of the temperature – Heating / Cooling

The required temperature on the temperature controller can be adjusted with the arrow buttons.
The heating mode is indicated by the red diode on the temperature controller. The unit can only heat when the 0-1 switch (heating) is active.

The cooling mode is indicated by the green diode on the temperature controller.

6.4. Adjustment of electronic flow control

The electronic flow control measures the actual flow in the medium circuit and displays this value digitally on the controller.
Following unit of flow can be selected: litres per minute, English (imperial) gallons or American (US) gallons. When putting the temperature control unit into service the controller shows the unit of flow on the display for a short moment.
For controlling the minimal flow you can choose between **automatic** and **manual** mode. Standard programmed is automatic mode.

Automatic mode:
In this mode the alarm value of the flow will be determined as follows:

- 20 seconds after having put the unit into operation (and starting the controller) the actual flow will be measured and stored. Based on this data the alarm value for the minimal flow will be calculated. E.g. at 10 l/min the alarm value is at approx. 30% (7 litres) – at 40 l/min at approx. 20 % (32 litres).
- The control of the flow is now active and is visualized after a few seconds by the green LED in the flow control button.
- As soon as the flow has fallen under the alarm value, the alarm is indicated by the red LED in the flow control button. The alarm will be reset by pressing the flow control button.
- The actual flow will be measured and stored. Based on this new data the alarm value will be calculated.

Manual mode:
Using this modus the alarm value of the flow can be adjusted manually.

- On the controller the program step 3 (MP-88) the value must be changed to “0”, respectively program step 400 (MP-988) the value must be changed to “2” (manual).
- In the program step 4 (MP-888) respectively the program step 410 (MP-988) the required value for the alarm value of the minimum flow can be adjusted (factory side 8 l/min).
- The control of the flow only starts, when the flow control button has been pressed and the green LED is lit.
- As soon as the flow has fallen under the alarm value, the alarm is indicated by the red LED.

Press the flow control button to activate the monitoring. If the cause of the lower deviation is not followed up, follows the alarm again. Minimum flow is defined in program step 4 (MP-888).

7. Safety and monitoring devices

7.1. Pump

The pump motor is fitted with an overload relay and pre-switch automatic cut-outs.

7.2. Heating – Temperature monitoring

In the temperature controller the maximum temperature (365°C) is limited. Exceeding this temperature the heaters switch off.
A safety thermostat (365°C) with automatic reset protects the switching of the heating and a safety thermostat (370°C) with automatic reset stops the unit. When the temperature is exceeded the indication lamp lights. As soon as the temperature falls below the set temperature the unit and heating switches on.

WARNING	
	**Do not put the maximum temperature in the controller higher, deeper values are allowed!** **The temperature control unit can excess overpressure – risk of injury from escaping hot oil!**

7.3. Level control

The unit is mounted with a level switch. If the system loses oil, the left yellow indication lamp lights and the unit will switch off. The unit has to refill manually.
If there is too much oil, the right yellow indication lamp lights and the unit will switch off. The oil level should be reduced by the drain. As soon as the level is sufficient or permitted again, the yellow indication lamp lights out and the unit switches the pump on.

NOTE	
	**Too much heat transfer oil reduces the expansion volume! The heat transfer oil expands during the heating and could be overflow.**

7.4. Flow control

The electronic flow control measures the actual flow in the heat transfer circuit and displays it digitally on the controller. For controlling the minimal flow you can choose between **automatic** and **manual** mode.

7.5. Temperature deviation control

As soon as the difference between pre-set desired value and the actual value exceeds +/- 5°C, the LED indication lamp lights and the horn sounds, the unit still operates.
This alarm is only activated when the set temperature has been reached the first time. The value of the temperature of the deviation control (factory preset +/- 5°C) and the starting interlock for temperature deviation control (factory preset on) can be adjusted on the controller.

7.6. Acoustic indication of faults (horn)

In order to perceive faults immediately serves a horn.
If the level falls below the minimum level in the system, the thermal relay of the motor or the mechanical safety thermostat shuts off, the unit stops and the horn sounds.
Flow control or temperature deviation control let the horn sound. The temperature control unit still operate. The alarm can be switched off by pressing the flow control button on the controller or the temperature specification.

WARNING	
	**Switch on the horn again!**

8. Maintenance

Inspection and maintenance have to be done by instructed staff (competent).

The following maintenance intervals may be required subject to use and environment:

Water filter	clean / replace	every month
Pump motor	blow out the fan	every 6 months
Hoses and pipes	check tightness	every 6 months
Pump	check tightness	every 6 months
Bolts and seals	check tightness	every 12 months
Heat transfer oil (only valid for oil units)	change	every 4‘000 working hours

For extreme service the intervals must be shortened accordingly. For temperature control units running with oil, the oil should be changed early, depending on the temperature. Comply with the directives and recommendations of the oil manufacturer.

8.1. Inspection

Before starting the unit has to be checked the general condition of the temperature control unit, the electrical connection and the tightness of the connections and hoses (including the consumer).

8.2. Cleaning

The temperature control unit has to be checked and cleaned periodically. Before maintenance the unit has to be disconnected from the power supply.

8.3. Repair

Established defects must be repaired. To guarantee safety the unit must be repaired with original TOOL-TEMP spare parts only.

WARNING	
	**The temperature control unit must be currentless before opening! Press the main switch on the temperature control unit and pull out the mains plug!** **There is a danger of electric shock!** **Caution – risk of injury from escaping hot oil!** **People with pacemaker should not be allowed to demount or maintain the magnetically coupled pump!**

CAUTION	
	**Waste oil has to be disposed as prescribed by law. Never let waste oil come into the sewage system or soil.**

8.4. Repair and maintenance of magnetically coupled pumps

Maintenance and disassembly of the magnetically coupled pump is expressly prohibited. In the event of a defect, it must be sent to the factory in Sulgen. Opening the pump voids all warranty claims.

WARNING	
	**Prohibition for people with pacemaker!** **People with pacemaker should not be allowed to demount or maintain the magnetically coupled pump!** **There is a risk of injury to people with pacemaker.**

9. Out-of-service / transport

Cool the temperature control unit down, mould drainage, turn it off, press the main switch and disconnect the power supply. Disconnect all hoses from the temperature control unit.
The temperature control unit is to be emptied before shipping. The danger of freezing (bursting of pipes or other compontents) at low temperatures can be reduced. The unit must be transported or stored in the operating position.

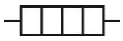
CAUTION	
	**Drain the unit to avoid freezing damages!** **Avoid compressed air, blowing out with compressed air can damage the unit!** **Never transport the unit lying – Lying transport will destroy the unit!**

10. Disposal

The temperature control unit must be drained completely and disposed of in accordance with local regulations.
The temperature control unit can also be returned to TOOL-TEMP for disposal.

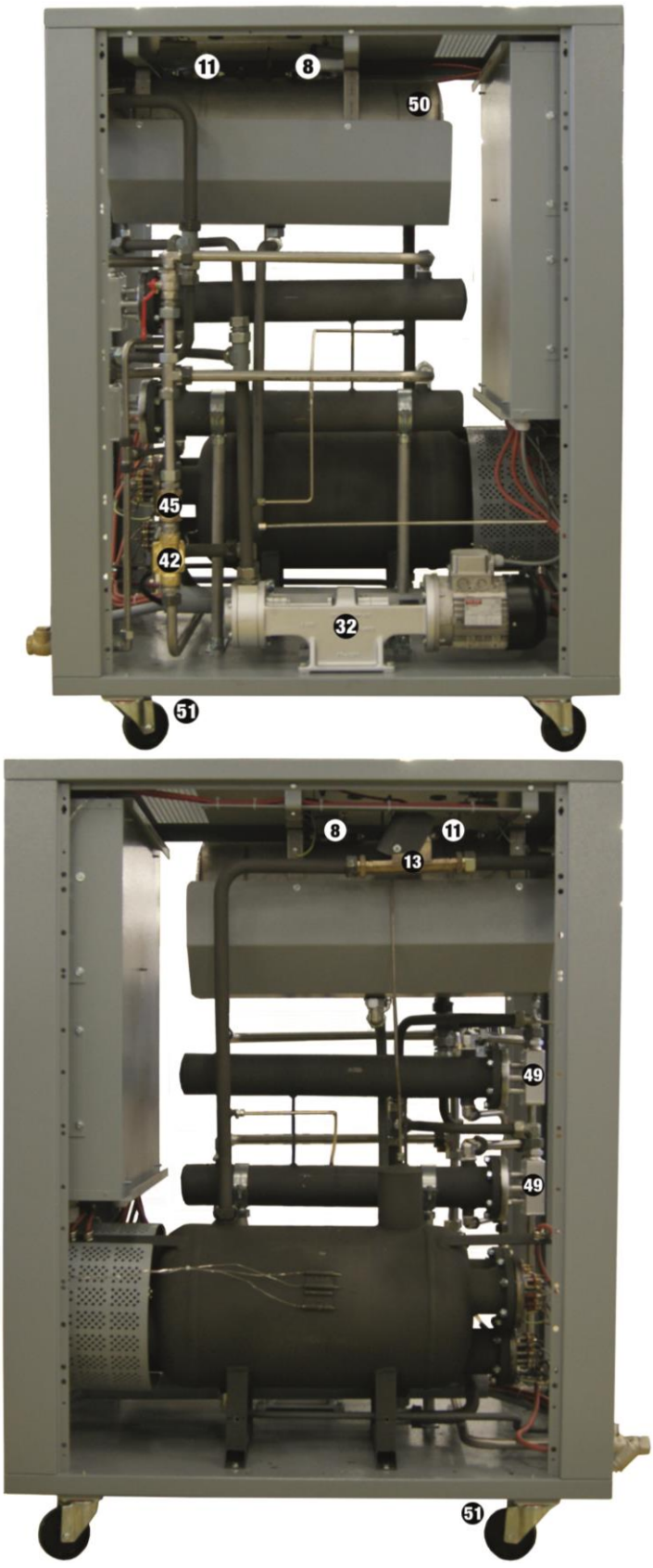
11. Failure corrective action

Symbol	Symptom	Probable cause	Correction
0 - I	Green ON/OFF-switch as well as all lamps do not light	• Fuse defective • Possibly transformer or switch defective	• Replace the 5 x 20 mm 1 A fuse • Replace defective parts
M	Red lamp “thermal relay” lights Horn sounds	• Overload relay of the pump motor has responded • Unit switches off (pump) • Possibly 2-phase running	• Let the motor cool down • Open the unit and press the blue button of the overload relay “motor” • Check the electrical connection When the motor has cooled down the unit switches on again.
T max intern	Red lamp „temperature monitoring“ lights and the unit switches off Horn sounds	• Maximum temperature of the unit is reached – thermostat has respond	• Cool the unit down • Try to establish the cause, maybe too low adjustment of the thermostat • Check the controller • Check the contactors
T max extern	Red lamp is lit.	• the unit works with temperature control at the mould and the liquid heated up faster than the mould. The heating switches off, the unit continues to operate.	• Check circulation, mould channels and sensor (the safety thermostat sets back) •
ΔT diff	Control lamp “Temperature deviation control” lights Horn sounds	• Temperature deviation between required and actual temperature is too big	• Check heating contactors and heating resistor • Check the cooling
 	„Flow control“ lights Horn sounds	• Too low flow in the unit • Flow has changed down	• Check heat transfer circuit • Event. remove fast couplings • The alarm can be reset by pressing the flow control button on the controller. • In automatic mode the lower flow value will automatically be taken over as new pre-set flow value.
	Right yellow lamp „level control“ lights, unit works	• Not enough heat transfer medium in the circuit • Level switch defective	• Cool the unit below 60°C • Search leakage and repair it
	Left yellow lamp „level control“ lights, unit switches off	• Too much heat transfer medium in the circuit • Level switch defective	• Cool the unit below 60°C • Level should be reduced by the drain.

	The required temperature will not be reached, heating lamp on the controller lights	• Solenoid valve of the water cooling system not closed or defective • Maybe to big consumer • Heating defective • Contactor of heating defective	• Clean the solenoid valve, check signal to valve and function, repair or replace it • Contact the supplier • Measure resistance of heating • Replace contactor
	Lamp „cooling“ lights, unit is not cooling	• Cooling water inlet or outlet is closed • Filter is dirty • Solenoid valve defective	• Check water supply check counter pressure on cooling water outlet • Clean filter • Check solenoid valve

12. Components and spare parts

12.1. Overview components and spare parts (without isolation)

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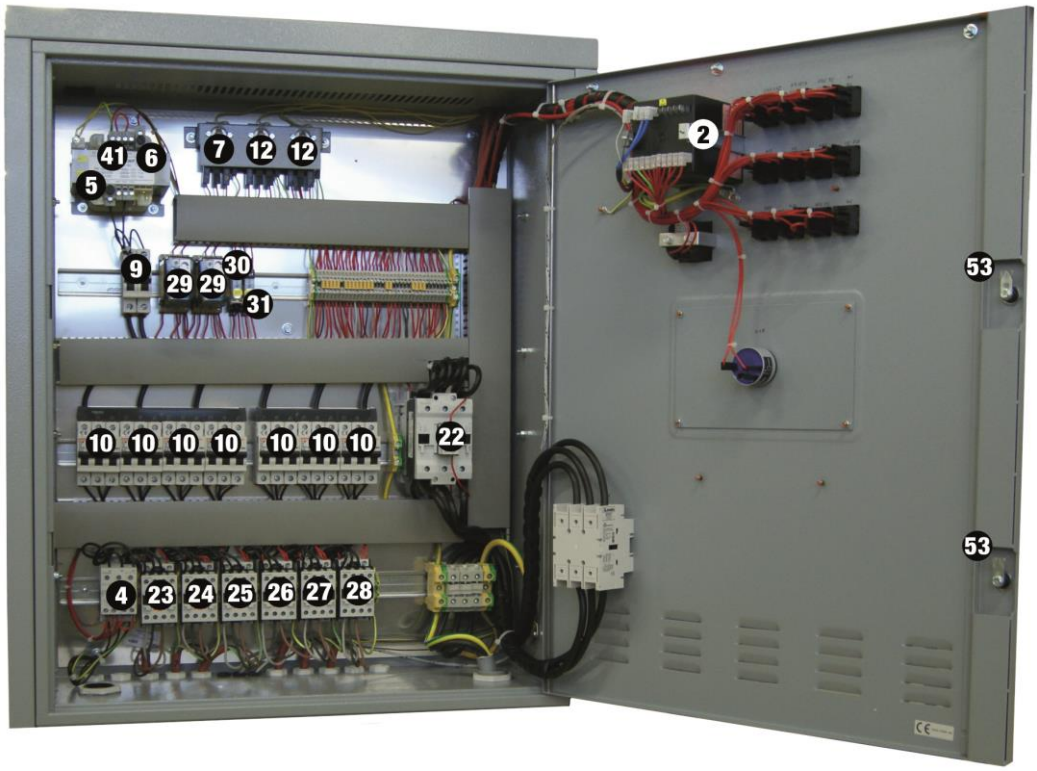
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12.2. List components and spare parts

	Art.-Nr.	ELD-Code	Description	Comment
1	Fa0800326 Fa0800328	N 1	Digital temperature controller MP-888 Digital temperature controller MP-888	new revised
2	Fa0900003		Fixing clips for controller MP-888	As a pair incl. straining screw
3	Wa1000017	B 1	Temperature probe FeKo (typ J)	length 2000 mm, with straight plug 2.8 mm
4	Gb0700825 Gb0700832 Gb0700827	F 1	Motor protection relay pump 2.5 – 4.0 A Motor protection relay pump 4.0 – 6.5 A Motor protection relay pump 6.3 – 10.0 A	3 x 380 – 480 V 60 Hz 3 x 380 – 415 V 50 Hz 3 x 200 – 240 V 50/60 Hz
5	Gl0200003 Gl0200001	F 7	Fuse 1 A primary T1, 6.3 x 32 mm Fuseholder big	Packing of 10 pieces
6	Gl0200000 Gl0200002	F 8	Fuse 1 A secondary T1, 5 x 20 mm Fuseholder small	Packing of 10 pieces
7	Gf0101200	F 10	Capillary pipe thermostat 80°C – 370°C	Tmax
8	Gi0100001	F 15	Level control	Unit off
9	Gl0400219	F 20	Automatic cutout 6 A, 2-poles	
10	Gl0400213	F 22 / -2 / -3 / -4 -5 / -6 / -7	Automatic cutout 16 A, 3-poles	
11	Gi0100001	F 35	Level switch for level control	Maximum
12	Gf0101200	F 36 / -2	Capillary pipe thermostat 80°C – 370°C	Pre-warning heating
13	Df0000028	F 64	Flow control type A, complete	with sensor length 2 m
14	Gk0300400	H 4	Indication lamp (yellow)	Level control – too low
15	Gk0300400	H 21	Indication lamp (yellow)	Level control – too high
16	Gk0300100	H 6	Indication lamp motor overload (red)	
17	Gk0300500	H 7 H 20	Double indication lamp (red) Double indication lamp (red)	Safety thermostat Limit
18	Gg0300001	H 15	Horn	
19	Gk0300200	H 17	Indication lamp (green)	Cooling
20	Gk0300100	H 36	Indication lamp (red)	Safety thermostat for heating

21	Gk0300100	H 63	Indication lamp (red)	Flow control
22	Gb0101213	K 1	Contactor 125 A pump motor (main contactor)	
23	Gb0101210	K 3	Contactor 3 2A	Heating 1
24	Gb0101210	K 3/2	Contactor 32 A	Heating 2
25	Gb0101210	K 4	Contactor 32 A	Heating 3
26	Gb0101210	K 4/2	Contactor 32 A	Heating 4
27	Gb0101210	K 4/3	Contactor 32 A	Heating 5
28	Gb0101210	K 4/4	Contactor 32 A	Heating 6
29	Gb0705801	K 23 / -2	Time delayed relay RR-900	
30	Gb0706021	K 51	Mini-relay, 8-poles	
31	Gb0706021	K 68	Mini-relay, 8-poles	
32	Wb0202044	M 1	Pump type Z,(C-572) with motor, with impeller 50 Hz, with standard axial face	3 x 380 – 415 V 50 Hz
	Wb0202045		Pump type Z,(C-572) with motor, with impeller 50 Hz, with standard axial face	3 x 200 – 230 V 50 Hz
	Wb0202046		Pump type Z,(C-572) with motor, with impeller 60 Hz, with standard axial face	3 x 380 V, 60 Hz 3 x 440 – 480 V 60 Hz
	Wb0202047		Pump type Z,(C-572) with motor, with impeller 60 Hz, with standard axial face	3 x 200 – 240 V 60 Hz
	Wb0202014		Pump insert for type Z	with impeller 50 Hz
	Wb0202015		Pump insert for type Z	with impeller 60 Hz
	Wb0203018		Pump type A (magnetic-coupled), with motor, with impeller 50 Hz	3 x 380 – 415 V 50 Hz
	Wb0203019		Pump type A (magnetic-coupled), with motor, with impeller 50 Hz	3 x 200 – 230 V 50 Hz
	Wb0203020		Pump type A (magnetic-coupled), with motor, with impeller 60 Hz	3 x 380 V, 60 Hz 3 x 440 – 480 V 60 Hz
	Wb0203021		Pump type A (magnetic-coupled), with motor, with impeller 60 Hz	3 x 200 – 240 V 60 Hz
33	Gg0400100	P 2	Working hour meter 50 Hz	
	Gg0400000		Working hour meter 60 Hz	
34	Gk0701601	Q 1	Main switch 100 A	without locking

35	Wa0100082 Wa0100083 Gm0001303	R 1 / R 2 / R 3 R 4 / R 5 / R 6	Heating 8000 Watt Heating 8000 Watt Gasket for heating	3 x 380 – 415 V 3 x 440 – 480 V Ø 108 x 90 x 1.8 mm
36	Gk0300704	S 1 / H 1	Switch unit "ON-OFF" (green)	
37	Gk0300704	S 2 / H 2 S 2/2 / H 2/2	Switch heating 1(green) Switch heating 2 (green)	
38	Gk0300704	S 3 / H 3 S 3/2 / H 3/2	Switch heating 3 (green) Switch heating 4 (green)	
39	Gk0300704	S 3/3 / H 3/3 S 3/4 / H 3/4	Switch heating 5 (green) Switch heating 6 (green)	
40	Gk0300705	S 5 / H 5	Switch horn	
41	Gc0100801	T 1	Transformer control 200VA	
42	Df0200200 Df0200940 Df0200600	Y 1	Solenoid valve 1“ Repair kit for solenoid valve 1“ Trip coil 230V 50/60Hz	water cooling material: membrane, spring, tappet Ø 12 mm
43	De0701303 De0701203		Manometer -1 up to 9 bar Fixing clips for manometer	Ø 63 mm 85 x 30 x 2 mm
44	De0100300		Waterfilter 1” with mesh bottom	Cooling water inlet
45	De0200110		Non-return flap 1”	Cooling
46	Ca2000502		Screwed cap for manual refill pipe 1”	
47	De0300004		Stop valve 1/2”	
48	De0203800		Non-return valve 1”	
49	Wc1000012		Heat exchange model WT-31	
50			Expansion tank 46 Liter	
51	Dc0100400		Steering rollers Ø 100 mm	With 4 mounting holes
52	Bb0300500		Clip fastener for side panels	(clip, knop, base and screw nut M5) Packing of 5 pieces
53	Bb0300101		Turning lock with snap closure	For electrical cabinet door
54	Wf0100098		Insulation-Set	

	Deutsch	Englisch	Französisch	Italienisch
B 1	Thermoelement intern	internal thermocouple	thermocouple interne	termocoppia interna
F 1	Thermorelais Pumpe 1	overload relay pump 1	relais thermique pompe 1	termocoppia pompa 1
F 7	Feinsicherung 2A primär T1	fuse 2A prim. T1	fusible verre 2A prim. T1	fusibile fino 2A primario T1
F 7/1	Leitungsschutzschalter 2A	automatic cut-off 2A	disjoncteur 2A	interruttore 2A
F 8	Feinsicherung 2A sekundär T1	fuse 2A sec. T1	fusible verre 2A sec. T1	fusibile fino 2A secondario T1
F 10	einstellbarer Sicherheitsthermostat	safety thermostat adjustable	thermostat de sécurité ajustable	termostato di sicurezza regolabile
F 15	Niveaukontrolle (Gerät aus)	level control (unit off)	contrôle de niveau (appareil arrêt)	controllo livello (spegne centralina)
F 20	Leitungsschutzschalter 6A	automatic cut-off 6A	disjoncteur 6A	interruttore 6A
F 22-/7	Leitungsschutzschalter 16A	automatic cut-off 16A	disjoncteur 16A	interruttore 16A
F 35	Niveau zu hoch	level too high	niveau trop haut	livello alto
F 36-/2	einst. Thermostat Temp.begrenzung für Heizung	adjust. thermostat temp.limit for heater	thermostat ajust. pour limitation du chauffage	termostato di sicurezza registrabile per temp. mass. riscald.
F 64	Sensor Durchflussmessung	flow sensor	capteur contrôle de débit	sensore del controllo di flusso
H 1	Lampe Gerät EIN/AUS	unit ON/OFF lamp	lampe MARCHE/ARRET	lampada centralina ACCESO/SPENTO
H 2	Lampe Heizung 1	heater 1 light	lampe chauffage 1	lampada riscaldamento 1
H 2/2	Lampe Heizung 2	heater 2 light	lampe chauffage 2	lampada riscaldamento 2
H 3	Lampe Heizung 3	heater 3 light	lampe chauffage 3	lampada riscaldamento 3
H 3/2	Lampe Heizung 4	heater 4 light	lampe chauffage 4	lampada riscaldamento 4
H 3/3	Lampe Heizung 5	heater 5 light	lampe chauffage 5	lampada riscaldamento 5
H 3/4	Lampe Heizung 6	heater 6 light	lampe chauffage 6	lampada riscaldamento 6
H 4	Lampe Niveaukontrolle	level control lamp	lampe contrôle du niveau	lampada controllo livello
H 5	Lampe Hupe	horn lamp	lampe klaxon	lampada segnale acustico
H 6	Lampe Motorschutzrelais	overload relay lamp	lampe relais thermique	lampada relais di sicurezza motore
H 7	Lampe Sicherheitsthermostat	safety thermostat lamp	lampe thermostat de sécurité	lampada termostato di sicurezza
H 15	Hupe	horn	klaxon	segnale acustico
H 17	Lampe Kühlen	cooling lamp	lampe refroidissement	lampada raffreddamento
H 20	Lampe Grenzwert	limit contact lamp	lampe valeur limite	lampada valore limite
H 21	Lampe Niveau zu hoch	lamp for level too high	lampe du niveau trop haut	lampada livello alto
H 36	Lampe Sicherheitsthermostat für Heizung	lamp for safety thermostat for heater	lampe thermostat sécurité du chauffage	lampada termostato di sicurezza per riscaldamento
H 63	Lampe Durchfluss Störung	lamp flow control failure	lampe contrôle de débit alarme	lampada difetto flusso
K 1	Schütz Pumpenmotor 1 (Hauptschütz)	contactor pump motor 1 (main contactor)	contacteur moteur pompe 1 (relais générale)	relais motore pompa 1 (relais generale)
K 3	Schütz Heizung 1	contactor heater 1	contacteur chauffage 1	relais riscaldamento 1
K 3/2	Schütz Heizung 2	contactor heater 2	contacteur chauffage 2	relais riscaldamento 2
K 4	Schütz Heizung 3	contactor heater 3	contacteur chauffage 3	relais riscaldamento 3
K 4/2	Schütz Heizung 4	contactor heater 4	contacteur chauffage 4	relais riscaldamento 4
K 4/3	Schütz Heizung 5	contactor heater 5	contacteur chauffage 5	relais riscaldamento 5
K 4/4	Schütz Heizung 6	contactor heater 6	contacteur chauffage 6	relais riscaldamento 6
K 23-/2	Hilfsrelais anzugverzögert	auxiliary relay start-delayed adjustable	relais aux. temporisé à l`enclenchement	relais ausiliario ad azionamento ritardato
K 51	Relais Grenzwert	relay for limit value	relais limit	relais limite
K 68	Relais Durchfluss Störung	relay flow control failure	relais contrôle de débit alarme	relais difetto flusso
M 1	Motor Pumpe 1	motor pump 1	moteur pompe 1	motore pompa 1
N 1	Temperaturregler	electronic temperature controller	régulateur électronique de température	regolatore temperatura
P 2	Betriebsstundenzähler	hours meter	compteur horaire	contatore ore funzionamento
Q 1	Hauptschalter	main switch	interrupteur générale	interruttore generale
R 1	Heizung 1	heater 1	chauffage 1	riscaldamento 1
R 2	Heizung 2	heater 2	chauffage 2	riscaldamento 2
R 3	Heizung 3	heater 3	chauffage 3	riscaldamento 3
R 4	Heizung 4	heater 4	chauffage 4	riscaldamento 4
R 5	Heizung 5	heater 5	chauffage 5	riscaldamento 5
R 6	Heizung 6	heater 6	chauffage 6	riscaldamento 6
S 1	Schalter Gerät "EIN-AUS"	switch unit "on/off"	interrupteur appareil "en/arrêt"	interruttore centralina "acceso/spento"
S 2	Schalter Heizung 1	switch for heater 1	interrupteur chauffage 1	interruttore riscaldamento 1
S 2/2	Schalter Heizung 2	switch for heater 2	interrupteur chauffage 2	interruttore riscaldamento 2
S 3	Schalter Heizung 3	switch for heater 3	interrupteur chauffage 3	interruttore riscaldamento 3
S 3/2	Schalter Heizung 4	switch for heater 4	interrupteur chauffage 4	interruttore riscaldamento 4
S 3/3	Schalter Heizung 5	switch for heater 5	interrupteur chauffage 5	interruttore riscaldamento 5
S 3/4	Schalter Heizung 6	switch for heater 6	interrupteur chauffage 6	interruttore riscaldamento 6
S 5	Schalter Hupe	switch for horn	interrupteur klaxon	interruttore segnale acustico
T 1	Trafo Steuerung	transformer for electric control	transformateur de commande	trasformatore di comando
Y 1	Magnetventil Wasserkühlung	solenoid valve for water cooling	électrovanne eau de refroidissement	valvola magnetica raffreddamento acqua

Date	Prepared	Approved
4.10.22	A.Bieri	FBI

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Legend

VERSION
2

EL-000116
3x380-415V/50Hz
3x440-480V/60Hz;3x380V/60Hz

TT-388
MP-888
48kW

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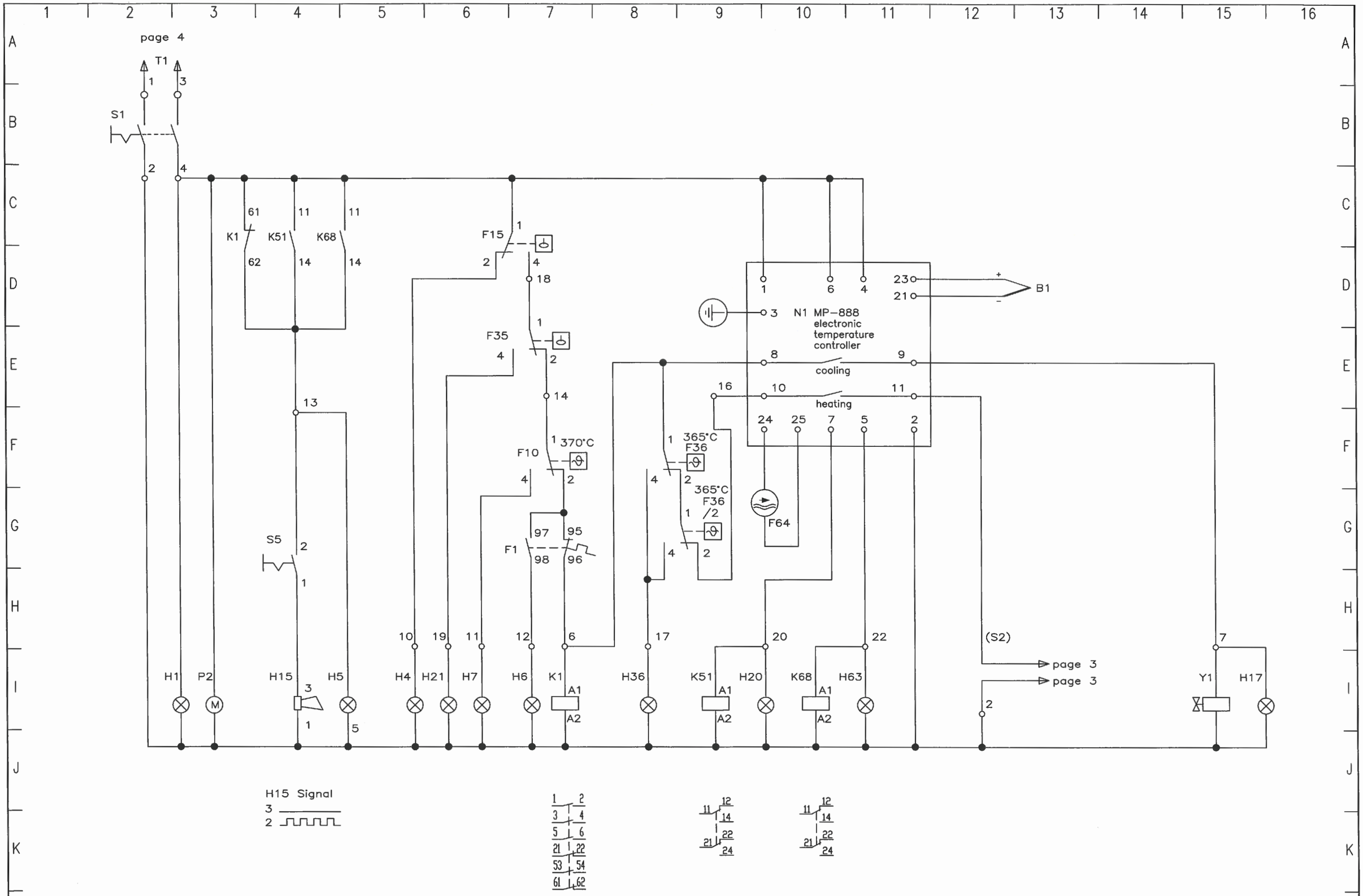

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Control

VERSION
2

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3x440-480V/60Hz;3x380V/60Hz

TT-388
MP-888
48kW

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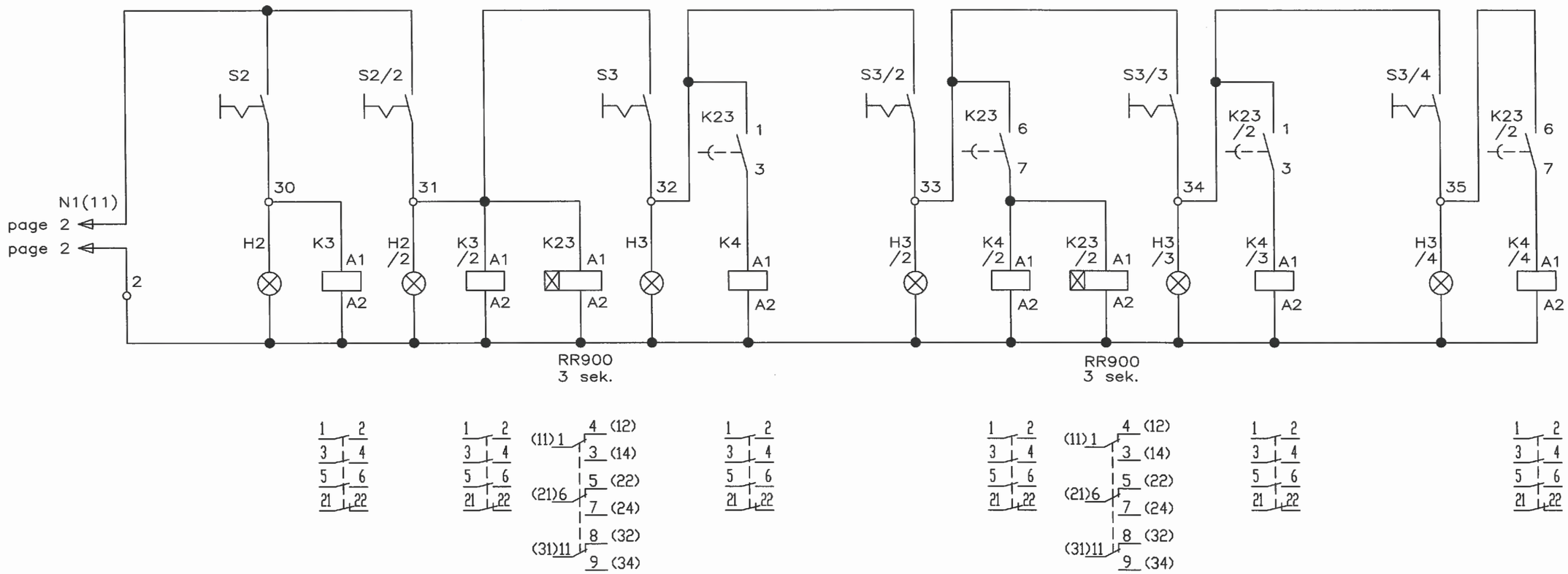
48kW



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Control

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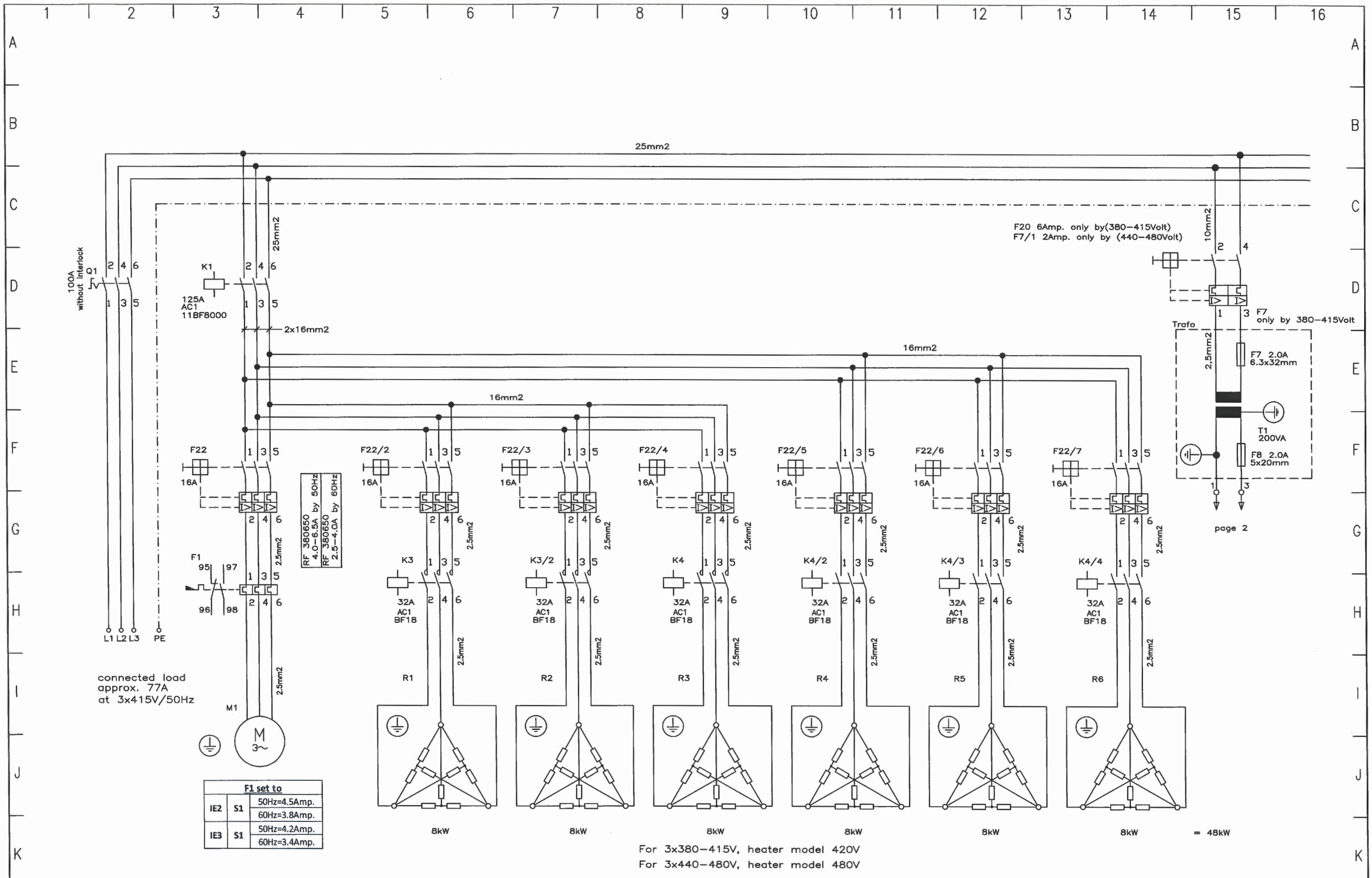

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Wiring diagram

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3x380/60Hz

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48kW

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