Technical documentation

Technical documentation

Important information:

Before first putting into operation, this technical documentation must be read thoroughly and it must be available at the operating place at any time.

Copyright:

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Technical datas

Type of unit:	.....	**Serial number**:	.....
		Date:	.....
Switch diagram no.:	.....		

Capacity:	Heating capacity			.....	kW
	Cooling capacity / 150 K			.....	kW
	Pump type			.....	
	Pump production no.			.....	
Power supply:	Voltage main circuit	.....	V	.....	Hz
	Control voltage electrics			.....	VAC
	electronics			..... 12	VDC
	Total connected load			.....	kW
	External fuse protection			.....	A
	Cross-section of line			.....	mm^2
Connection thread:	Heat transfer fluid circuit	R			
	Cooling water circuit	R			

A: Explanation of symbols

Symbol – precaution at operation:

You will find the symbol at the directions for precaution at operation in this manual if there exists any risk for life and limb of a person. Please pay attention to this directions and be very carefully in that cases. Pass all directions for precaution on to the operator as well. Apart from the directions in this manual must be followed all safety-measures and preventions for accident that are valid universally.

Attention Voltage:

Danger to life at contact with electricity.

Damaged electrical lines may lead to extremly dangerous electrical shock.

Only main switch of unit will disconnect this one from electric mains totaly.

CE-Sign:

Heating-Cooling Unit meets the current safety regulations of the European Community concerning the CE characteristics.

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Chapter A: Explanation of symbols

B: Your safety

The user is responsible for safety and health of the operating personnel.

Instruction:

The user is responsible for periodical instruction of operating- and maintenance personnel.

Each person that is instructed to do the setting-up, the putting into operation, the operation, the maintenance or repair of temperature control unit must have read and understood the operating instructions.

Operation personnel which can not read or understand this operation manual must be instructed through the user especially.

It is adviseable to ask for a written confirmation about receipt of operation manual resp. participation at the instructions training.

The operation manual must be kept ready to hand at the operating place of plant every time. Supplementary to operation manual must be trained and has to be paid attention to general valid legal or otherwise obligatory regulations for prevention of accident and protection of environment! Such duties also may have to do with the handling of dangerous substances or with wearing personal protective outfit resp. placing for one's disposal.

Purpose for use:

This heating-cooling unit is destined for the temperature control with allowed heat transfer fluids only.

Another use or a use beyond it does not count to be in conformity with intended purpose. The manufacturer does not accept liability which results from damages which come about from this. The risk is taken from the user all alone.

Temperature control units must not be used within areas where there is a danger of explosion.

Following the instructions of operation manual and keeping the servicing- and maintenance directions is part of a use in conformity with intended purpose.

The temperature control unit must not be switched on before orderly installation does exist and before it has been filled up with heat transfer fluid!

Safely and careful working:

Each working method which impairs the electrical, hydraulical and mechanical safety at the unit must be avoided.

In case of troubles with electrical main supply switch-off the main switch!
The main switch is located at the front side of temperature control unit.
VDE-directions must be observed in dealing with electrical devices.

Danger to fall on floors where any liquids did run out!
Tidiness = concrete prevention of accidents!

The temperature control unit may be operated through trained and authorized personell only.

The responsibility for operating, maintenance and servicing of temperature control unit must be defined exactly, especially for works where dealing with the electrical and hydraulical devices. These works may be carried out from competent personnel only.

One is competent if one has sufficient knowledge because of his professional education and experience. He should be familiar with the relevant national industrial safety regulations, instructions for precaution of accidents, guidelines and generally approved rules of engineering (standards). He must be able to assess if the condition of plant is safe for operation.

The temperature control unit may only be operated being in faultless condition, as well as conform with it's intended use and being aware of safety and danger by following the operation manual.

The user is obliged to periodically check the temperature control unit if there are any damages and faults that can be made out on the face of it.

At any changes of plant which are relevant for safety or it's reaction at operation, the unit must be shut down immediately and the damage must be reported to responsible divison/person.

Safety devices absolutely must not be dismantled or put out of action.

Unit must not be put into operation without it's covers and it's side-doors.

If it is necessary to dismantle safety devices at preparation, repairing and maintenance works, the safety devices must be mounted after finishing this works immediately.

Follow all instructions regarding safety and danger shown at the temperature control unit and see to it that these are complete and in legible condition!

Danger of burning:

Inside and at the temperature control unit high temperatures come about.

There exists an acute danger of burning at touching of:

- metal coated feeding- and lead-off lines, oil-installation, thermo oil hoses
- all parts inside the temperature control unit, such as tubes, screwings, pump, reservoirs etc.
- hot heat transfer fluid
- running out cooling water

Equip your operation personnel with appropriate protective clothing according to regulations.

Before loosening any connecting lines/tubes of temperature control circuit, one must cool down the unit and then switch it off first.

Check if pumps are switched off and system is released from pressure.

Fire hazard:

Customary heat transfer fluid does burn!

Always pay attention to absolut tightness of the system.

Leackages at temperature control circuit must be eliminated at once.

Do not use any inflammable means for cleaning the unit!

Do not use spray liquids containing solvents near the unit!

Always keep insulation material of unit dry and clean because of danger of burning!

Provide a fire extinguisher of sufficient dimensions and duly function.

The fire extinguisher must be suitable for that purpose.

Disposal:

See to it, that following never goes into drains or ground water:

- used oil, thermal oil
- lubricants
- solvents, detergents
- cooling water with anticorrosive fluids/means

See to it that fuels and auxiliary fluids/means, as well as exchanged parts will be disposed safely and ecologically friendly.

Pay attention to the safety data sheet for thermal oil!

Request this sheets from your supplier!

Prohibition of unauthorized reconstructions and changes:

Any unauthorized reconstructions and changes at the temperature control unit are not permitted by reason of safety.

We do not accept any liability for damages that occure from unauthorized reconstructions and changes, through improper handling, operating- and subsequent errors.

Spare parts must correspond to technical demands defined by manufacturer!

This always is guaranteed at original spare parts.

C: Transport

If changing the location or at transport of unit use suitable and technical impeccable lifting gears with sufficient carrying capacity.

Before shipment of unit it must be emptied out completely. Cooling water must be blown out of cooler with a maximum pressure of 6 bar.

Persons must not stay or work beneath hanging loads!

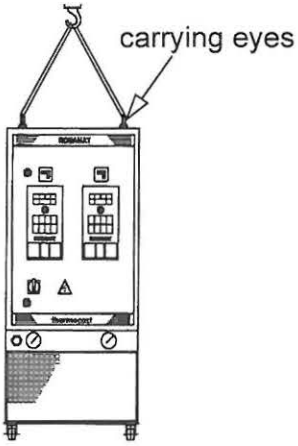
Allways secure temperature control unit against

- sliping
- overturn
- falling down

Avoid hard putting down!
Never stay beneath hanging loads!

transport vertical only

- **with forklift or lifting cart:**
  - unburden wheels of unit
  - pay attention to weight of unit
- **with crane:**
  - carrying eyes at the top of unit
  - pay attention to weight of unit
  - hang unit up according to picture
- **push:**
  - in longitudinal direction only
  - pay attention to obstacles, unevenness (such as crossing grooves, supply shafts)



Type of unit	Weight (kg)
311	100 approx.
3101, 4101, 5101	180 approx.
3111, 3112, 4111, 4112	280 approx.
5111, 5112	350 approx.

Unpack unit:

Screw off both safety shackles and remove them.

Lift down temperature control unit from the palette at the provided carrying eyes.

Auxilliary equipment is packed into palette under the unit.

Check if there are any damages and if unit is complete.

Setting up:

Unit must be put onto it's wheels or onto girders, on which frame of unit does lie completely, so that the wheels are unburdened.

The place where unit is standing must be even and capable of bearing, according to weight of unit.

Tilting, laying or putting on top is not permitted.

Temperature control unit must be protected against moisture.

Ventilation slots must be kept open.

Do not place unit close to sources of heat.

D: Electrical connection

Jobs at the temperature control unit must be carried out by specialists only!

Type plate – check voltage:

- One must pay attention to valid instructions and regulations for safety regarding connection to electric mains.
- Make a comparison between mains voltage/mains frequency and the statement at the type plate.
- See sheet "TECHNICAL DATAS" referring cross section and external fuse protection.
- Open switch box.
- Mount connection cable – with plug if necessary.
- Use relieve from tension for electrical cables, interface cables.

Earthing/grounding system:

The unit will be supplied with safety type "zero voltage VDE 0100" ex works.

If this is not suitable the user must provide another form of safeguard.

Check control:

- Connect temperature control unit to voltage.
- Switch on main switch.
- Measure secondary voltage:

  at 220 V = 200 – 225 max. difference

  at 115 V = 105 – 120 max. difference

  at 110 V = 100 – 120 max. difference

If necessary alter transformer at primary side – according to connection diagram at type plate of transformer!

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Chapter D: Electrical connection

E: Connection - oil circuit

- Use hoses that are resistant to pressure and temperature:

  PTFE with metal braided texture up to 250°C, 20 bar

  METAL with metal braided texture up to 400°C, 20 bar

- Mount filters or pump protection filter at oil return line.

Oil-flow line

Oil-return line

Pay attention to cross-sections of installation!

Pump type	Cross-section installation	Thread
Z03	DN8	M16x1,5
Z03/ Z11/ Z13/ PS/ PH/ PR/ PM1	DN13	M22x1,5
Z13/ PM3	DN16	M26x1,5

- Do not install any contractions of cross-section (e.g. throttles)!
  - small cross sections will lead to high resistance flow, unnecessarily high pressure at pump and wear and tear caused by that.
  - too large a cross-section will mean large volumes of oil and thus sluggishness in the system.
- Choose the correct die connection parts considering cross-section, temperature and pressure.
- One should avoid to use hoses which are longer than 4 meters.
  If distance is more than 4 meters we recommend to use an insulation tubbing.
- Temperature control units/circuits may not be switched in series (one after another) at heat transfer in-/outlet.
- Further on must be paid attention to the following at the installation:
  - movement of die, core, protective doors etc.

- danger of stumbling over hoses or get burned through them.
- do not bend hoses.
- do not use any copper or brass screwings within the oil circuit.
- overflow pipe at expansion reservoir/tank must be open every time.

Fill in heat transfer fluid:

- use suitable heat transfer fluid.(see below table)
- skin temperature of heat transfer fluid must be higher than the maximum operating temperature.
- never fill with too much oil.
- never spill any oil - danger of burning, danger to slip.

Way of proceedings:

Main switch ON.

Slowly fill up the tank until lamp **H9** at the µP goes out, then add about another litre.

We recommend to connect the oil flow line and return line only after the first filling because by that the filling up and the air vent will be easier.

Circuits/heating elements	Filling quantity
1 circuit with 2 elements	20 ltr. approx.
1 circuit with 4 elements	22 ltr. approx.
2 circuit with 2 elements	45 ltr. approx.
2 circuit with 4 elements	50 ltr. approx.

Cooling water connection:

One must pay attention to valid instructions and safety regulations regarding connection to public water mains.

Cooling water must not be polluted and must be suitable for cooling purpose.

Use pressure resistant hoses for feed lines only, mount filters.

Water outlets should be free of counter-pressure and open all the time.

If the unit is installed into a closed water circuit a return valve must be fitted at the exit because cooling water that flows back will reduce heating capacity and flowing back cooling water will cause a stronger calcification of cooler as well.

Cooling water exit must be resistant to pressure and temperature (150°C minimum) and it must be fixed tightly as well (danger of "whip punch").

Do not mix up flow line and return line!

Water feed line

Water outlet

Put into operation:

Pumps may be switched on only if oil hoses are connected as a circuit (flow line with return line) and if heat transfer fluid has been filled in.

Check direction of rotation of motor (Arrow at front side of housing).

Alter direction of rotation at main supply line only.

- Adjust temperature with Poti **R1** onto 120°C approx.
- Press production mode "**PROD S3**".
- Let the unit run at this setting for about half an hour, eventually short-circuit flow line and return line. Use of this is air vent first of all.
- At filling the unit for the first time it will switch to (**H9**) "shortage of oil" several times.Here again, when topping up the oil level, be sure not to overfill the unit.
- If unit will be switched on and off many times, the air vent of temperature control unit will be pushed ahead.
- Once the unit runs smoothly the actual required temperature can be set.

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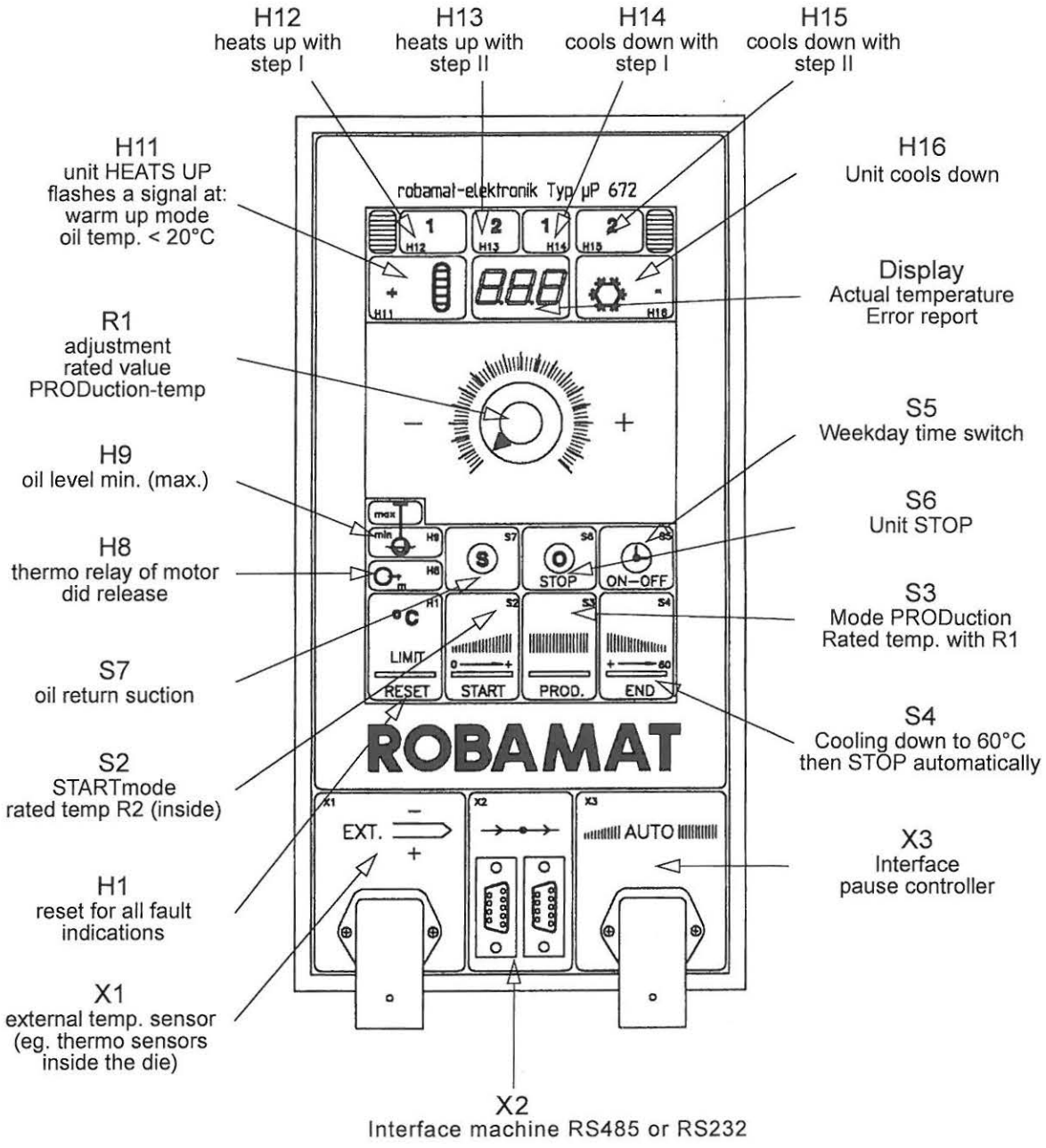
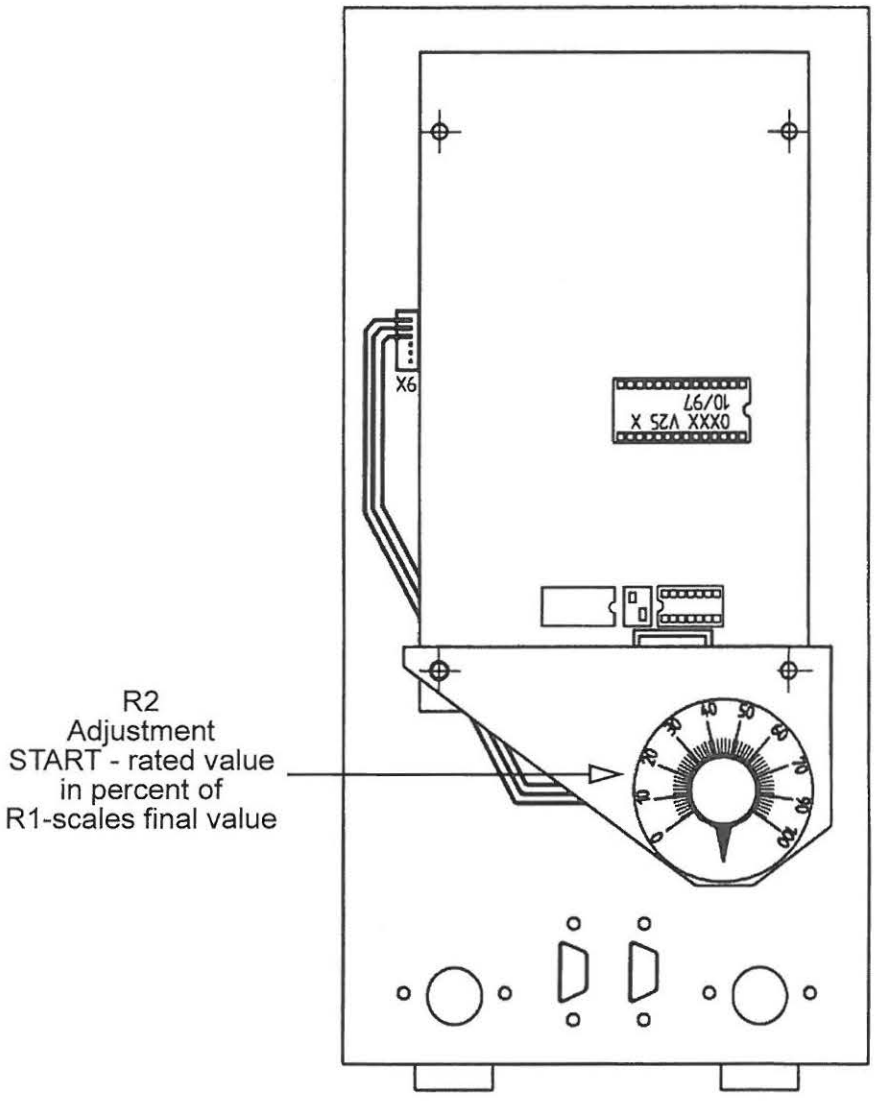
Chapter E: Connection - oil circuit

F: Operation of microprozessor

µP672 - view of front side:



µP672 - view flip side:



Displays:

Display	Description
H1	Fault display.
H8	Thermo relay of motor did release.
$H9_{min}$	Oil level too low.
$H9^{max}$	Oil level max.
H11	Temperature control unit heats up, flashes up at warm up mode < 20°C.
H12	Heating step 1 is active.
H13	Heating step 2 is active.
H14	Cooling step 1 is active.
H15	Cooling step 2 is active.
H16	Temperature cooling unit does cool down.
	Display actual temperature, Indication about state of unit, Indication about faults.

Function of keys:

Key	Action	Description
S2	start mode	The temperature control unit works according to temperature setting at scale **R2**.
S3	production	The temperature control unit works according to temperature setting at scale **R1**.
S4	running down mode	Unit cools down the circulating oil to 60°C rigorously. Mode **S6** will automatically be activated subsequently.
S5	weekday time-switch	As far as this one does exist and is programmed, the µP672 automatically switches ON and OFF as appropriate. Mode is active if **S5** has been pressed and the key lights up. Switch off through pressing key again.
S6	STOP	Pump, heating and cooling will be switched off.
S7	oil return from die	As far as not provided automatically: slightly loosen return line at unit in advance, so that air can get in. - pump runs as long as key will be pressed. - if key will be pressed two times running, the pump will operate for one minute in suction mode. One can interrupt with **S6** STOP.
H1 / RESET	general reset of faults	only active if there are any faults.

Key (**S2** - **S7**) is lighted up if it's function has been choosen.

Knobs:

Knob	Action	Description
R1	rated value PROD - temperature	Mode **S3** PROD controls according to this rated value.
R2	Rated value START-temperature	Mode **S2** STARTcontrols according to this rated value. Potentiometer is mounted at the rear of µP. Door of switch cupboard must be opened. Scale in percent of front scales final value. (eg.: R1-scale 250°C, R2 adjusted to 50%, rated value R2 = 125°C).

Plugs:

Plug	Description
X1	external temperature sensor.
X2	interface RS232 (V24) or RS485.
X3	pause controller (START / PROD).

Indication on display:

Current temperatures will be shown in °C generally.

It can be changed to °Fahrenheit in the manufacturers works if required.

Oil circulating temperature will be shown on display as standard.

If an EXTERNAL sensor is connected, this temperature will be shown.

Interrogation of unit's temperature trough pressing the key:

First press key **H1** and hold it (display shows 3 strokes). Now wished temperature can be interrogated with keys **S2 – S5**.

Key	Temperature	Designation of thermo sensor
H1 + S2	Oil circulating temperature	B14, B24
H1 + S3	Skin temperature heater 1	B13, B23
H1 + S4	Skin temperature heater 2 (if existing)	B12, B22
H1 + S5	Skin temperature heater 3 (if existing)	B11, B21

Interrogation of set rated values:

If key **S2** (START-mode) resp. **S3** (PROD-mode) will be pressed, the display shows the appropriate rated value.

Key	Rated Value
S2	rated value START mode
S3	rated value PROD mode

At first press STOP-key **S6** and hold (display shows "0").

Now you can interrogate the rated values and set them at the same time, but unit will not switch itself on.

Key	Rated value	Potentiometer
S6 + S2	START	R2
S6 + S3	PROD	R1

During operation through interface can rated values, which have been determined by a central controller, be interrogated at the µP672.

G: Programme functions

Heater programme:

If rated value will be approched, heating step 2 will be switched off first and following heating step1. Display **H11 / H12, H13**.

Efforts at continous operation are to do with heating step1. If this will not do, heating step2 will be switched on after a determined time as well, to reach the rated value.

Switch parameters (temperature differences rated- actual values) of heater programme will be set in the factory of manufacturer.

Cooling programme:

If actual value is too high cooling will be switched on until temperature droped down to rated value.

Display **H16 / H14, H15**.

Switch parameters (temperature differences rated- actual values) of cooling programme will be set in the factory of manufacturer.

Warm up programme:

Will automatically be active at switching on, if oil temperature is lower than 20°C. This first of all protects the pump against overload through cold, tough oil.

- Heating 1 will be switched on.
- Pump switches on and off with a cycle of 20 seconds.
- **H11** flashes during the whole start programme.

Oil inside the manifold will be heated-up gradually. As soon as a fix determined temperature has been reached, temperature control unit starts working with the normal heating-/cooling programme.

In case temperature can not be reached after 30 seconds, display shows fault **C10**.

Fault programme:

Will be activated at faults.

- heating and safety contactors will be switched off.
- mode **S4** (run-out mode) will be selected automatically.

Indication of fault will be shown at Display  , **H1** flashes at the same time.

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Chapter G: Programme functions

H: Indication of faults - causes - tracing of faults

Kind	Designation	Cause
C1	Failure sensor B14/24	- sensor oil circuit missing or defect - terminal point corroded strongly - defect measuring line
C2	Failure sensor B13/23	- sensor heater 1 missing or defect - terminal point corroded strongly - defect measuring line
C3	Failure sensor B12/22	- sensor heater 2 missing or defect - terminal point corroded strongly - defect measuring line - mount wire bridge PIN3-4 at the rear of µP672 at units with a heating capacity of 10 kW
C4	Failure sensor B11/21	- sensor heater 3 missing or defect - terminal point corroded strongly - defect measuring line
C5	Failure sensor B15/25	- external sensor missing or defect (at 40 kW heater sensor 4) - terminal point corroded strongly - defect measuring line - bad plug contact
C6	Thermo of pump motor	- defect motor - too high pump load because of increased resistance of flow - fuse of motor defect (too high current at motor of pump)
C7	Oil level too low (oil units)	- oil circuit not tight - air in the system - pump not tight - short circuit of oil level switch

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Chapter H: Indication of faults - causes - tracing of faults

Kind	Designation	Cause
C8	Over-temperature	- defect at switching-off of heater - heat transfer fluid will be heated up too strong externally (alarm temperature has been reached)
C9		
C10	Time overflow	- see C11 start programme
C11	Time overflow, if heater1 core-temperature for more than 5 min. is > 5 °C and < 60°C :	
	Disturbance of flow	- wrong rotary motion of motor - defect pump
	Time overflow, if circulation temperature is smaller than 80°C and heater skin temperature has been reached:	
	Short circuit sensor B14/24	- defect motor/motor fuse - shortage of oil at defect float switch - quantity of oil delivered is too small, and "heat stowage" in heater, because of closed or soiled die channels, tubes, pipings or filters.
C12	Time overflow, if within 10 sec. the heater1 core temperature is >5°C and the heater1 core temperature is 50°C smaller than the circulation flow:	
	Short circuit sensor B13/23	- defect sensor heater 1 - defect measuring line - defect heater/heater fuse - defect heater contactor

Technical documentation

Chapter H: Indication of faults - causes - tracing of faults

Kind	Designation	Causes
C13	All 10 seconds will be checked, if sensor temperatur heater2 is 50°C more than the circulation flow:	
	Short circuit sensor B12/22	- defect sensor heater2 - defect measuring line - defect heater/heater fuse - defect heater contactor - wrong adjusted DIP switch at units with 10 kw (DIP 1 OFF, DIP 2 OFF)
C14	All 10 seconds will be checked, if sensor temperature heater3 is 50°C more than the circulation flow:	
	Short circuit sensor B11/21	- defect sensor heater3 - defect measuring line - defect heater/heater fuse - defect heater contactor
C15 – C16		
C17	If no pressure will be measured, though pump runs:	
	Defect pump with magnetic coupling	- defect magnetic coupling - defect pump - defect motor/motor fuse - defect pressure switch
C18	(WATER UNIT) maximum fill-up time of 1,5 min. exceeded	- missing water pressure - missing water connection - breakage of pipe
C19	(WATER UNIT) Not come up to the estimated intervall of fill-up time	- pump leaking - pipe system leaking - external pipes, die leacking
C20		
C21	Over-temperature circuit	- temperature of circuit too high, >380°C

Technical documentation

Chapter H: Indication of faults - causes - tracing of faults

Kind	Designation	Causes
C22	Difference of temperature >50°C within 10 seconds:	
	Defect of sensor heater1	- short circuit of line
		- line breackage sensor
C23	Difference of temperatur >50°C within 10 seconds:	
	Defect of sensor heater2	- short circuit of line
		- line breackage sensor
C24		
C25	Disturbance of flow	
	(Peugeot version)	
C31	DIP switch position 20 kW	- at unit with 20 kW heating capacity
		and µP 672 for 10 kW
		(DIP1 ON, DIP 2 OFF)
C32	DIP switch position 30 kW	- at unit with 30 kW heating capacity
		and µP672 for 10 or 20 kW
		(DIP 1 OFF, DIP 2 ON)
C33	Key has been pressed at the same time as unit has been controlled	
	over interface.	
C34	DIP switch position 40 kW	- at unit with 40 kW heating capacity
		and µP for 10, 20 or 30 kW
		(DIP 1 ON, DIP 2 ON)
C35 – C39		
C40	Control of contactor at 4I1004	- contactor did not drop
C42	Too high pressure of system >30 bar	- open circuit ! ! !
	(4H8002 – pre-heating unit)	
H9 flashes up	Shortage of oil	- Top up oil!
H8 flashes up	Thermo of pump motor	see C6

I: Servicing

Works on the temperature control unit may be carried through by qualified personnel only.
Before starting any works, mains plug must be pulled in any case.
Damaged or defect parts must be repalced in any case.

If temperature control unit has been switched off completely for servicing- and repair works, it must be protected against unintentional re-start.

All tubes must be checked if they are in a safe condition once a year. The examination must be made through an expert.

In case original spare parts will be ordered, one always must state the type of unit and the serial/production number of unit!

Check the following points:

- Damages at the coating of tube lines, tears, bends, cuts, loosenings, scrub spots and friability.
- Check if there are any deformations at condition with and without pressure.
- Exchange tube lines in suitable periodes even if there can not be seen damages which are relevant for safety!
- Fittings, length and quality of tube lines must correspond to demands.
- Controllers, electrical / electronical components only may be changed if unit is switched off.
- If one carries out works at pumps with magnetic coupling, it must be pointed out that there is a danger through magnetic fields!

We recommend to make a systematical servicing every **3000 hours**. This works must be carried through at a testing place with following equipment:

Equipment of testing place:

- solid underframe with integrated oil sump, on which the servicing of temperature control unit will be made.
- cooling water supply, feed- and drain-off pipe.
- current supply with an own fuse protection.
- thermo oil hose, to connect oil-supply and oil-return line.

Proceedings of testing:

- Open and remove side doors.
- Inspect oil- and water system if there are any visible leakages.
- Inspect condition of insulations (damged, soaked with oil, . . .).
- Drain-off thermal oil and checked if it is soiled.

  If there is a strong soiling, thermal oil must be exchanged and the whole temperature control unit must be cleaned (expansion tank, pump housing etc.).
- Cleaning of all filters in the oil circuit, such as: filter, pump protection filter.
- Cleaning of all filters in the cooling water circuit.
- Cooling water flow, solenoid valves and non-return valve, decalcify eventually.
- Clean motor cover and ventilator wheel, as well as filter mat in control desk.
- Check the whole electrics if there are any damages.
- Measure flow at the heaters and if possilble resistance of insulation.
- Check cable connection at heating element.
- Check contacts of heater contactors.
- Fill in thermal oil.
- Connect temperature control unit ready for operation (oil circuit, cooling water, current supply).
- Put temperature control unit into operation and check all functions.