ROBAMAT

Operating instructions

V 141

Operating instructions

Important information:

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

Copyright:

Koaserbauerstraße 6
A - 4810 Gmunden
Tel.:++43 7612 70430
Fax:++43 7612 70432
Servicehotline: ++43 7612 70430-23
info@robamat.com
www.robamat.com

Operating instructions

Technical datas

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

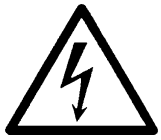
Datas:	Heating capacity			.....	kW
	Cooling capacity / 150 K			.....	kW
	Pump type	.....			
	Pump production no.			.....	
				.....	
	Operating temperature			.....	°C
	Limiter temperature			.....	°C
	Additional safety temperature limiter			.....	°C
	Alarm temperature			.....	°C
Power supply:	Voltage main circuit	.....	V	.....	Hz
	Control voltage			..... 24 ...	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 deactivation of the main switch on the device as well as simultaneous unplugging of the device separates it fully from the network!

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.

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!

Operating instructions

Chapter B: Your safety

Safe 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 temperates 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 first and then switch it off .

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 density of system.

Leakages 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.

Operating instructions

Chapter B: Your safety

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)

Operating instructions

Chapter C: Transport

Type of unit	Weight (kg)
321	100 approx.
3201, 4201, 5201	180 approx.
3211, 3212, 4211, 4212	280 approx.
5211, 5212, 5222	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

All operations may be carried out only by skilled technical personnel on the machine at rest and de-energized and provided with a safeguard to prevent unintentional reclosing.

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.

Check control:

- Connect temperature control unit onto voltage.
- Switch on main switch.

E: Connection - oil circuit

- Only use temperature and pressure resistant hoses with conic sealing screw connection:

  PTFE with steel braided texture up to 250°C, 13 bar.

  METAL with steel 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
PM1	DN13	M22x1,5
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 attrition 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.

Operating instructions

Chapter E: Connection - oil circuit

- 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.
- boiling 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 tank through inlet pipe with a funnel, until the indication „oil minium“ at the µP goes out. Afterwards fill in another 3 litres approx. At units equipped with option „oil level indication“ top up oil until the indication „oil maximum“ does show a reaction.

Circuits/heating elements	Filling quantity
1 circuit with 2 elements	20 ltr approx.
1 circuit with 4 elements	25 ltr approx.
2 circuit with 2 elements	25 ltr approx.
2 circuit with 4 elements	35 ltr approx.

Operating instructions

Chapter E: Connection - oil circuit

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.

Operating instructions

Chapter E: Connection - oil circuit

- Adjust temperature START-SOLL onto 120°C approx.
- Press start mode „START“.
- 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 “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.

Back suction allowed only

- if oil temperature is < 100°C
  or
- after unit has finished the END - mode.

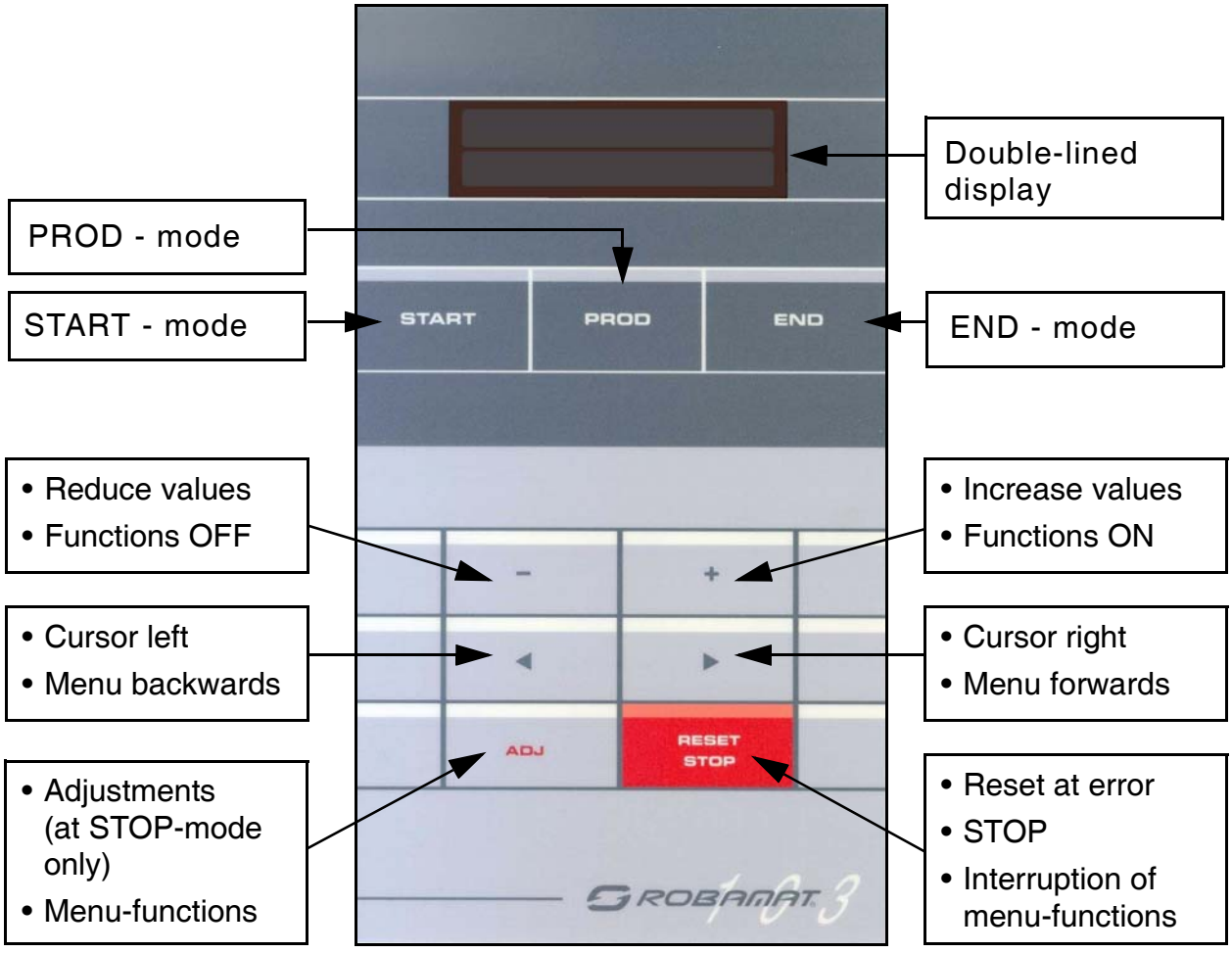
Notice:

In case of a reversal of oil cicuits direction flow (e.g. leak-stop operation, at back suction of oil), all filtered residue will be loosened from the filter element again.

This could lead to a damage of the pump.

F: Operation of Microprocessor

µP103



Operating instructions

Chapter F: Operation of Microprocessor

Function of keys:

Keys	Action	Description
START	Start mode	Temperature control unit works according to rated adjustment **START**.
PROD	Production mode	Temperature control unit works according to rated adjustment **PROD**.
END	Running down mode	Unit cools down the circulating oil rigorously. **STOP** will automatically be activated subsequently.
RESET/STOP	RESET STOP	Quits fault reports. Pump, heating and cooling will be switched off.
RESET/STOP	Standby mode, activating / deactivating controller	Only in STOP mode: activate: press RESET / STOP key for 5 seconds. deactivate: press RESET / STOP key again.
+	- Increase values, - Functions ON	Adjustment of parameters for rated values; Switch-ON functions.
-	- Decrease values, - Functions OFF	Adjustment of parameters for rated values; Switch-OFF functions.
▶	- Cursor right, - Menu forwards	Selection of a menu item.
◀	- Cursor left, - Menu backwards	Selection of a menu item.
ADJ	Menu functions	After pressing **STOP** key, the menu functions can be called. The fault signal is set for approx. 3 seconds.

Operating instructions

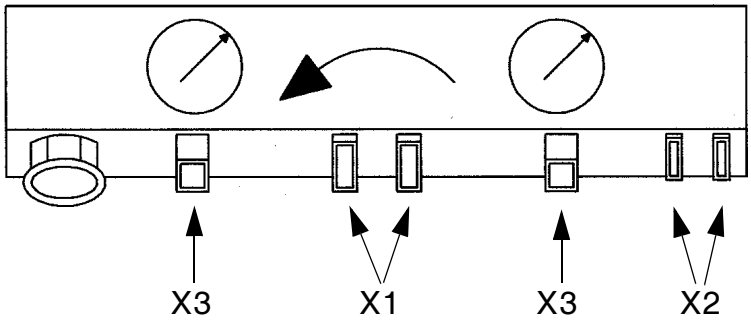
Chapter F: Operation of Microprocessor

Keys	Action	Description
ADJ '+' ◀	Locking key	During operation of the unit (mode START, PROD, END) the keys '+' and '-' can be locked by using this combination of keys. Use the same way to unlock keys.

Plugs:

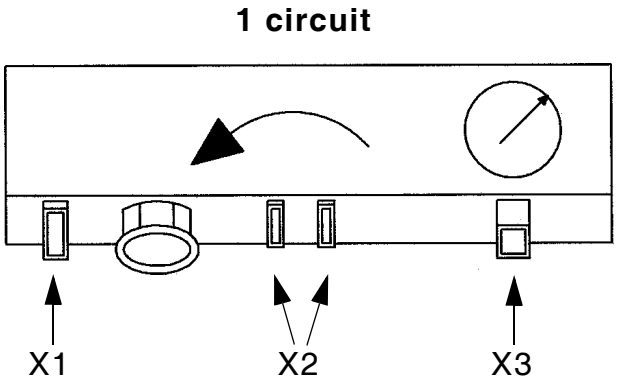
Plug	Description
X1	External temperature sensor.
X2	Interface.
X3	Pause controller.
X5	Operating signal / fault signal (The mounting-position of the plug is freely choosable).

2 circuits



Operating instructions

Chapter F: Operation of Microprocessor



Power failure:

After a power failure ≤ 5 sec. the µP returns to the previously adjusted mode, after > 5 sec. the unit goes to **STOP** modus.

Option: After a power failure the µP returns to the **STOP** mode.

G: Programme functions

Heating programme:

If rated value will be approched, heating step 2 will be switched off first and following heating step1.

Display: heating step 1 and 2 active ▲▲

heating step 1 active ▲

Efforts at continous operation are to do with heating step 1. If this will not do, heating step 2 will be switched on 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: cooling step 1 and 2 active ▼▼

cooling step 1 active ▼

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.
- Indication at display through: "cold-start".

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 a certain time, display will show the disturbance **"E 07 cold-start"**.

Operating instructions

Chapter G: Programme functions

Fault programme:

A fault report will be shown on display as text in clear and code.

The default report must be quit through pressing the key RESET / STOP.

Programming:

After switching on the main switch, the microprocessor runs through a function test.

After successful function test the microprocessor goes into **operating level**.

Internal conditions of unit can be interrogated at the operating level with cursor ◀ ▶.

- temperature of circuit and heater, charging rate of motor,
- if existing: temperature of external sensor, additional heater and flow.

Key START:

START mode will be activated through pressing the START key.

START-rated temperature belonging to this can be changed with +/-

(Range from 20°C to max. operating temperature).

Key PROD:

Production mode will be activated through pressing the key PROD.
PRODuction-rated temperature can be changed with +/-.

(Range from 20°C to max. operating temperature).

Key END:

Normal operation (END / night mode = OFF):

Heat transfer fluid will be cooled down through pressing the key END and unit switches to STOP automatically as soon as the end-temperature has been reached. END-rated temperature can be changed with +/-
(Range from 20°C to 100°C).

Night mode (END / nightmode = ON):

Through pressing the key END the temperature of the heat transfer fluid will be lowered without cooling until the adjusted END temperature is reached. The unit continues operating with reduced temperature. The END-rated temperature belonging to this can be changed with +/-
(Range from 20°C to max. operating temperature).

Key STOP:

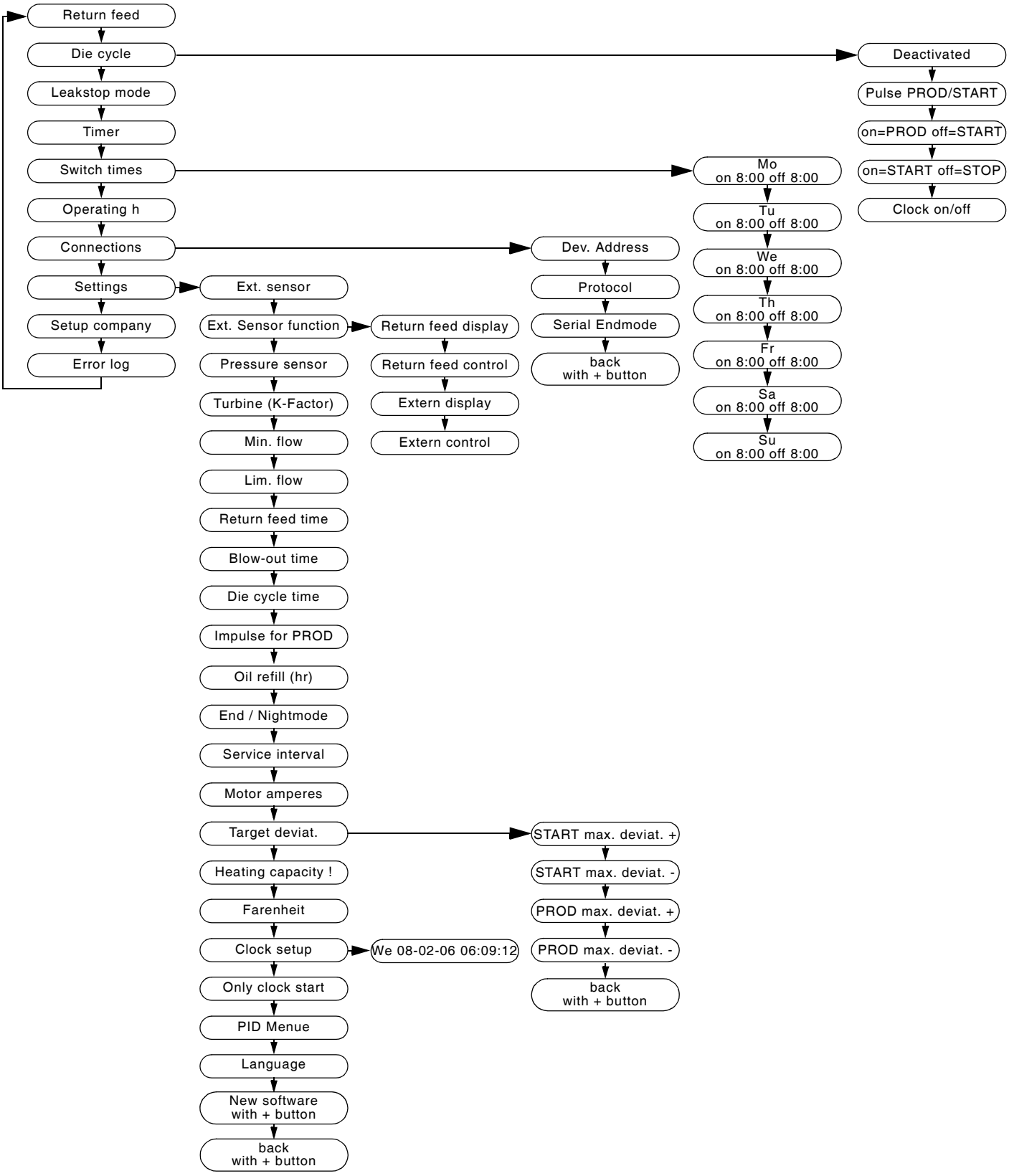
Pumps, heater and cooler will be switched off through pressing the key STOP.

Key ADJ:

Main level at STOP-mode will be activated through pressing the key ADJ. One can go forward and backward within the operating level with cursor ◀ ▶.

Operating instructions

Chapter G: Programme functions



Operating instructions

Chapter G: Programme functions

Menus provided:

Main level

- **Return feed:**
  - \+ switch ON.
  - \- switch OFF.
- **Die cycle:**

  Display at operating level: ◈ pulsating.

  +/- Deactivated.

  Pulse PROD/START:

  adjustable number of cycles until START-mode switches to PROD-mode. Pause time after last cycle, until PROD-mode switches to START-mode.

  on = PROD off = START:

  Signal off = START-mode, signal on = PROD-mode.

  on = START off = STOP:

  Signal off = STOP-mode, signal on = START-mode.

  Clock on / off:

  Weekday time switch activated / deactivated.
- **Leakstop mode:**
  - \+ Switch ON: if leakstop is activ, the pump goes to suction operation as soon as the key START resp. PROD will be pressed.

    Display: "ST + Leckstp.", "PR + Leckstp."

    Notice: no display in End / Night-mode

    Leakstop will be deactivated through pressing the STOP key.
  - \- Switch OFF.
- **Timer:**
  - \+ Switch ON : display at operation level: 🕒
  - \- Switch OFF.

- **Switch times** Menue**:**

  Switching time level will be activated with +.

  Switching times can be addressed with cursor ◀ ▶, and be adjusted with +/- accordingly.

  Switching time level will be left with key RESET.

- **Operating h:**

  Display of working hours only.

- **Connections** Menue**:**

  Activating and adjustment through authorized personnel only.

  Adjustment level will be activated with key +.

  One can go forwards and backwards with cursor ◀ ▶.

  Dev. Address:

  +/- changing unit's adress.

  Protocol:

  +/- Adjustment of interface protocol.

  Interface operation will be shown as rotating "/" on the display.

  Notice: With adjustment "Bühler-protocol": warnings and messages are not transfered.

  With adjustment "Profibus-protocol": key STOP is deactivated

  Serial Endmode:

  +/- 0: After stop or interrupt of the communication the unit goes on working with the last rated temperature value.

  1: After stop or interrupt of the communication the unit returns to the END-mode.

  Back with (+) button:

  + Goes back to menu "**Connections**".

- **Settings** Menue**:**

  Activating and adjustment through authorized personnel only.

  Adjustment level will be activated with key +.

  One can go forwards and backwards with cursor ◀ ▶.

  Ext. sensor (option):

+/- Adjustment of sensor type.

Notice: when replacing temperature sensors only use sensors of the same type (see also chapter I: servicing)!

Ext. Sensor function:

Return feed display: automatic control by circuit.

Display:

C-START / **C**-PROD, circuit, flow line, heater, ...

Return feed control: automatic control by return line.

Circuit and H1 / H2 supervised.

Display:

R-START / **R**-PROD, circuit, return line, heater, ...

Extern display: automatic control by circuit.

Display:

C-START / **C**-PROD, circuit, extern, heater, ...

Extern control: automatic control by extern.

Circuit and H1 / H2 supervised.

Display:

E-START / **E**-PROD, circuit, extern, heater, ...

Pressure sensor (option):

+/- Adjustment of pressure sensor (0 ... 16 bar).

Turbine (k-factor) (option):

+/- Adjustment of flow turbine.

Mean K-factor Circuit 1: _____

Circuit 2: _____

Min. flow (option):

+/- Adjustment of min. flow quantity. If flow falls below warning W 00 will be shown.

Lim. flow (option):

+/- Limit adjustment of min. flow quantity, If flow falls below error E14 is displayed.

Return feed time:

+/- adjustment of re-suction time for automatic re-suction.

Operating instructions

Chapter G: Programme functions

Blow-out time (option):

+/- Adjustment of blow-out time for cooler.

Die cycle time:

+/- holding time for "production mode without mould interval". Subsequently return to start mode.

Impulse for PROD:

+/- Increase / decrease of number of pulses.

Oil refill (hr):

+/- With 2 oilrefills during the adjusted time the warning W07 will be displayed. The unit goes on working.

End / nightmode:

+/- On: Lowering the temperature without cooling.
Off: Usual END-mode.

Service interval:

+/- Increase / decrease hours.
Adjustable up to 2999 houres. This function counts back to zero, then message 'service interval' will be displayed. One can alter this function by pressing key STOP-ADJ and go foreward until menu-setting 'setup user -> service interval'. This function has no influence on the operation of the µP. Value > 2999 means: OFF (service interval deactivated)

Motor amperes:

+/- With supervision of current consumption of pump motor including a thermorelais the adjustment has to be 0,0. Otherwise max. current consumption must be adjusted.

Operating instructions

Chapter G: Programme functions

Target deviat.:

Adjustment level will be activated with key +.

One can go forwards and backwards with cursor ◀ ▶.

START max. deviat. +

+/- Adjustment of START max. deviation **+**, 0 = not active.

START max. deviat. -

+/- Adjustment of START max. deviation **-**, 0 = not active.

PROD max. deviat. +

+/- Adjustment of PROD max. deviation **+**, 0 = not active.

PROD max. deviat. -

+/- Adjustment of PROD max. deviation **-**, 0 = not active.

back with (+) button

+ goes back to menu item "**Target deviat.**".

Heating capacity !

+/- Display / hide warning W09

Fahrenheit:

+/- ON / OFF.

Values of temperatures in °F (Fahrenheit).

Clock setup:

+ Adjustment of timer activated.

◀ ▶ Selecting datas.

+/- Adjustment of day resp. time.

Only clock start:

+/- On: The unit starts with the first adjusted switching time - all other switching times will be ignored.

Off: The unit operates according to the adjusted switching times.

PID menue (option):

Function can only be activated after release through works of suppliers.

Language:

+/- German, English, ...

New Software with (+) button:

To read a new software, a software modul must be plugged in and be activated with (+).

back with (+) button:

\+ Goes back to menu item "**Settings**".

- **Setup company** Menue**:**

  Adjustments made in the works of supplier can be activated with a code only.

- **Error log** Menue**:**

  +/- Errors and warnings including date are saved in a logfile, one can use + and - key to recall them. To leave error log list press Reset.

Quit main level with Reset.

H: Indication of faults - causes - tracing

If heating- and cooling unit reaches alarm temperature, the microprocessor switches to END-mode.

One must be careful that this END-mode will be kept until temperature of oil has dropped!

Signal lamps: (option)

Red (H1)	On	**Fault** (Unit enters STOP-mode, except that alarm temperature has been reached). **Warning** (Unit goes on working).
	Blinking	Thermorelais has released.
White (H2)	On	Oil_{max} niveau reached.
Green (H3, H4)	On	Unit is working (one lamp for each circuit).

Operating instructions

Chapter H: Indication of faults - causes - tracing

Faults:

Display	Code	causes
alarm temp.	E 00	• Disturbance at switching-off heater. • Heat transfer fluid will be heated up too strong externally. Unit switches to END-mode.
E00 Alarm Temp 0 (intern sensor)	E 00	• Sensor of circuit not connected or defect. • Terminal point corroded strongly. • Defect measuring line.
E00 Alarm Temp 1..4 W04 Heater sens 1..4 (heater sensor 1..4)	E 00	• Sensor heating not connected or defect. • Disturbance at switching-off heater. • Terminal point corroded strongly. • Defect measuring line.
E00 Alarm Temp 5 (extern sensor, return line sensor) (option)	E 00	• External sensor / return line sensor not connected or defect. • Terminal point corroded strongly. • Defect measuring line.
Pump overload	E 01	• Defect motor. • Too high pump load because of increased resistance flow.
Circuit sensor	E 02	• Defect measuring line. • After return from menu. • Discontinuous temperature values generated by circuit sensor.

Heater sensor	E 03	• Circuit temperature 50°C above heater temperature. • Circuit sensor mixed up with heater sensor. • + mixed up with - at both of the sensors.
Oil minimum	E 05	• New unit. • Oil circuit not tight. • Pump not tight. • Loss of oil. • Oil level too low, refill, RESET.
Date, time CHECK OIL, PRESS STOP		• Oil level ok again, refill, RESET
Safety	E 06	• Safety contactor resp. safety switching defect. • Analog limiter released (adjusted temperature exeeded).
Cold start	E 07	• Starting program at circulating temperature <20°C. • Defect heater or check heater fuse. • Sensor of circuit wrong connected.
pressure switch	E 08	• At filling the unit resp. putting into operation for the first time (system contains air). • Defect pressure switch. • Defect magnetic coupling. • Defect pump. • Defect motor / motor fuse. • Wrong direction of rotation of motor.

I/O communic.	E 10	• Connection between µP103 and display defect. • After main switch off / on.
lim flow	E 14	• If lim flow falls below adjusted value the unit returns to STOP mode after about 15 sec.
Power on		• Disturbance of machine program.
machine data		• Interface plug defect or not connected.

Operating instructions

Chapter H: Indication of faults - causes - tracing

Warnings:

minimum flow (option)	W 00	• Flow is below the adjusted parameter.
too little oil (option)	W 01	• Oil_{min} previous warning.
pneum. pressure (option)	W 02	• Pneumatic pressure too low.
Too much oil (option)	W 03	• Oil_{max}.
Heater sensor 1 - 4	W 04	• Discontinuous temperature value > 20°C.
Target deviat.	W 06	• Exeeding or falling below the tolerance limit of START- resp. PRODuction temperature. One can quit warning with RESET but only if temperature is within the adjusted temperature range.
Oil refills	W 07	• Oil minimum warning with automatic oilrefill. Adjustable in menupoint: oilrefill (h) - granted number of hours up to next automatic oilrefill.
Heating capacity !	W 09	• Defect heater. • Required heating capacity greater than maximum heating capacity of unit.

I: Servicing

Works on the temperature control unit have to be carried through by qualified personnel only.
Before starting any works, main plug must be pulled in any case.
Damaged or defect parts must be replaced 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 porosity.
- 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:

Operating instructions

Chapter I: Servicing

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 (damaged, soaked with oil, . . .).
- Drain-off thermal oil and check 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.
- Check 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.

If a temperature sensor is changed or an external temperature sensor is mounted take care that only sensors of the same type are used (see also menu -> settings -> ext sensor)! Standard sensor type is J.

J: Recommended heat transfer medias for unit types

Types	Heat transfer oil	Data
3201	Mobiltherm 605 up to 250°C	See table 'typical datas'
4201	Mobiltherm 605 up to 250°C Marlotherm SH up to 340°C	
5201		
3212	Mobiltherm 605 up to 250°C	
4212	Mobiltherm 605 up to 250°C Marlotherm SH up to 340°C	
5212		
5222		

Conditions of storage

We recommend the storage to be cool and dry. Look at the references on lead seal of the seal.

Above mentioned oil types are recommended by ROBAMAT - the units have been tested with these oils. By using wrong oil the heating elements can be damaged.

Typical datas

Product	**Density** at 15ºC g/cm³/s (ca.)	**Viskosity** at		**Fire point ºC (PM) min.**	**Pour point temp. ºC** max.	**Flow line temp. ºC** max.	**Filmtemp. max.**
		40ºC mm²/s (ca.)	100ºC mm²/s (ca.)				
Mobiltherm 605	0,868	31,7	5,3	218	-18	320	350
Marlotherm SH	1,03	16,5	3,1	200	-35	350	380