HB-Therm®
VARIO-5

Instruction Manual

HB-VS180

Switching Unit for Variothermal Control

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Translation of original instruction

(Typenschild)

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1 General

1.1 Information about this manual

This manual enables you to handle the switching unit for variothermal control safely and efficiently.

The manual is a component part of the switching unit. It must always be kept close to the switching unit and be readily accessible for personnel. Before starting any work, the personnel must have read and understood this manual thoroughly. A basic requirement for safe work is the observance of all safety and handling instructions in this manual.

In addition, the local accident prevention regulations and general safety conditions for the area where the switching unit is used apply.

Illustrations in this manual are for basic understanding and may deviate from the actual design.

We reserve the right to make technical modifications in order to improve usability.

1.2 Explanation of symbols

Warnings

Warnings are identified by symbols. These warnings are introduced by signal words, which express the severity of a danger. Adhere to these warnings and act cautiously in order to avoid accidents, personal injuries and damage to property.

DANGER!

… indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

… indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

… indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

ATTENTION!

… indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Hints and recommendations

NOTE!

… emphasizes useful hints and recommendations as well as information for efficient and trouble-free operation.

General

1.3 Limitation of liability

All information and notes in this Manual were compiled under due consideration of valid standards and regulations, the present status of technology and our years of knowledge and experience.

The manufacturer can not be made liable for damage resulting from:

- disregarding this Manual
- unintended use
- employment of untrained personnel
- unauthorized conversions
- technical modifications
- use of unapproved spare parts

In case of customised versions the actual scope of delivery can vary from the explanations and representations in this Manual, because of the utilization of additional options or due to latest technical changes.

Apart from this, the obligations agreed upon in the delivery contract, the general terms and conditions and the delivery conditions of the manufacturer and the legal regulations valid at the time of contract do apply.

1.4 Copyright

This Manual is protected by copyright law and exclusively to be used for internal purposes.

Passing this Manual on to third parties, duplication of any kind – even in form of excerpts – as well as the use and/or disclosure of the contents without the written consent of the manufacturer is not permitted, except for internal purposes.

Violations oblige to compensation. The right for further claims remains reserved.

1.5 Warranty terms

The warranty terms are provided in the manufacturer's terms and conditions.

1.6 Customer Service

For technical information, please contact the HB-Therm representatives or our customer service department → www.hb-therm.ch.

Furthermore, our employees are always interested in new information and experiences resulting from the application that could be valuable for the improvement of our products.

2 Safety

This paragraph provides an overview of all important safety aspects for optimal protection of personnel as well as safe and trouble-free operation.

Disregarding this Manual and safety regulations specified therein may result in considerable danger.

2.1 Intended Use

The switching unit for variothermal control is designed and constructed exclusively for the intended use described herein.

The sole purpose of the switching unit for variothermal control is to switch from hot to cold temperature control medium.

The switching unit for variothermal control must only be operated in accordance with the values specified in the technical data.

Observance of all information in this manual also pertains to the-intended use.

Any use of the switching unit for variothermal control other than or going beyond the intended use is deemed as misuse and can lead to dangerous situations.

WARNING!
Improper use poses danger!

A misuse of the switching units for variothermal temperature control can lead to dangerous situations.

In particular, you must not:

– Use a heat transfer medium other than water or heat-transfer oil.
– Use pressures, temperatures higher than those specified.

Any claims arising from damage as a result of improper use are excluded.

2.2 Customer’s responsibility

The device is implemented commercially. Thus the owner of the device is subject to legal industrial safety obligations.

In addition to the safety instructions in this Manual, the safety, accident prevention guidelines and environmental protection regulations, applicable at the site of implementation must be complied with. In particular:

- Owner must inform himself of applicable industrial safety regulations and determine additional hazards that arise due to the specific working conditions prevailing at the site where the device is implemented, in a risk analysis. The risk assessment must be implemented in the form of work instructions for device operation.
- Owner must check throughout the entire implementation period of the device, whether the work instructions that owner has created satisfy current legislation, and must adapt the instructions if necessary.
- Owner must clearly regulate and specify the responsibilities for installation, operation, maintenance, and cleaning.
- Owner must ensure that all employees who deal with the device have read and understood this Manual.
  In addition, owner must train personnel at regular intervals and inform personnel of the hazards.
- Owner must provide personnel with the required protective equipment.

In addition, owner is responsible to ensure that the device is always in a technically perfect condition, and therefore the following applies:

- Owner must ensure that the maintenance intervals described in these operating instructions are complied with.
- Owner must have all safety devices inspected regularly for function and completeness.

2.3 Personnel requirements

2.3.1 Qualifications

WARNING!
Danger of injury if insufficiently qualified!

Improper operation can lead to serious personal injuries or property damage.

Therefore:

– Have all activities performed only by qualified personnel.

The following qualifications are specified for different areas of activity listed in the Manual.

- **An instructed person**
  has been instructed by the customer in an orientation session on the assigned tasks and possible dangers in case of improper behavior.
- **Qualified personnel**
  based on their professional training, know-how and experience as well as knowledge of the applicable standards and regulations is able to perform assigned work activities and to detect and avoid possible dangers on their own.
- **A professional electrician**
  based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations is able to perform work on electrical systems and to detect and avoid possible dangers on his/her own.
  The professional electrician has been trained for the special location where he/she works and knows the relevant standards and regulations.
- **Hydraulic specialist**
  based on his or her technical training, knowledge and experience as well as knowledge of the relevant standards and regulations, is able to carry out work on hydraulic systems and to independently recognise and avoid possible dangers.
  The hydraulic specialist is trained for the specific location at which he or she is employed and is familiar with the relevant standards.

2.3.2 Unauthorized persons

WARNING!
Danger for unauthorized persons!

Unauthorized persons not meeting the requirements outlined here are not aware of the dangers in the work area.

Therefore:

– Keep unauthorized persons away from the work area.
– If in doubt, address the persons and direct them to leave the work area.
– Interrupt work activities as long as unauthorized persons are present in the work area.

2.4 Personal protective equipment

When working, it may be necessary to wear personal protective equipment in order to minimise dangers to health.

- During work, always wear the protective equipment necessary for the particular work.
- Follow the information placed in the working area with regard personal safety equipment.

Personal protective equipment for special tasks

When performing special tasks it is necessary to wear personal protective equipment. This personal protective equipment will be separately specified in the chapters of this Manual. This special protective equipment is explained below.

Protective clothing

means close-fitting working clothes with long arms and long trousers. It serves primarily as protection against hot surfaces.

Protective gloves

to protect the hands against abrasions, cuts or deeper wounds as well as against contact with hot surfaces.

Safety goggles

to protect the eyes against parts flying around or squirts of fluids.

Safety boots

to protect against heavy parts falling down or slipping on slippery ground.

2.5 Specific dangers

The following section lists the residual risks that have been determined by the risk assessment.

- Heed the safety instructions listed here, and the warnings in subsequent chapters of this Manual, to reduce health hazards and to avoid dangerous situations.

Electric current

DANGER!
Danger of death by electric current!

Live parts are dangerous. Contact with high voltages causes injury or death. Damaged insulation or components can cause injury or death.

Therefore:

– In case of damage of the insulation of the power supply, switch off immediately and arrange repair.
– Work on the electrical system must only be carried out by certified electricians.
– For all work on the electrical system, for maintenance, cleaning or repair work, disconnect from the mains or disconnect all phases of the external power supply and secure them against being switched on again. Check unit is isolated from power supply.
– Do not by-pass or disable fuses. Comply with the correct ampere when changing fuses.
– Keep away humidity from live parts. This could cause a short circuit.

Hot materials

WARNING!
Danger of burns due to hot working materials!

During operation, working materials can reach high temperatures and pressures and can cause burns on contact.

Therefore:

– Only allow work on the hydraulics to be carried out by qualified personnel.
– Before beginning work on the hydraulics, check whether working materials are hot and under pressure. If necessary, cool the unit down, depressurise and switch off. Check that the unit is free of pressure.

Safety

Hot surfaces

CAUTION!
Danger of burning on hot surfaces!

Contact with hot components can cause severe burns.

Therefore:

– Always wear protective clothes and protective gloves when working on hot components.
– Before starting work make sure that all components have cooled down to ambient temperature.

Danger of crushing

WARNING!
Danger of crushing due to rolling away or tipping

With an uneven floor or when the castors are not locked, there is a danger that the unit tips over or rolls away causing crushing.

Therefore:

– Only install the unit on an even floor.
– Ensure that the castors are locked.

2.6 Stickers and decals

The following symbols and information decals can be found in the danger zone. They refer to the immediate vicinity around their location.

WARNING!
Danger of injury because of illegible symbols!

Over the course of time stickers and decals may become dirty or illegible for any other reason.

Therefore:

– Keep any safety, warning and operation related decals in legible condition at all times.
– Replace damaged decals or stickers immediately.

Hot surfaces

Hot surfaces, like hot machine parts, tanks or materials, but also hot fluids, are not always detectable. Do not touch without protective gloves.

2.7 CE Declaration of Conformity for Machinery

(CE-Directive 2006/42/EG, Annex II 1. A.)

Product	Switching Unit for Variothermal Control HB-Therm Vario-5
Unit types	HB-VS180
Manufacturer Address	HB-Therm AG Piccardstrasse 6 9015 St. Gallen SWITZERLAND www.hb-therm.com
CE guidelines	2014/30/EU; 2011/65/EU
Note on the pressure equipment line 2014/68 / EU	The above products are in accordance with Article 4 (3). This means that interpretation and production are consistent with good engineering practice in the Member State.
Responsible for documentation	Martin Braun HB-Therm AG 9015 St. Gallen SWITZERLAND
Standards	EN 60204-1:2018; EN IEC 61000-6-2:2019; EN IEC 61000-6-4:2019; EN IEC 63000:2018; EN ISO 12100:2010; EN ISO 13732-1:2008

We declare of our own responsibility that the above mentioned products, to which this declaration refers, comply with the appropriate regulations of the CE-Machinery Directive. (CE-Directive 2006/42/EG), including its appendices and the corresponding legal remission for implementation of the directive in national law.
Furthermore, the above mentioned CE-Directives and standards (or parts/clauses thereof) are applied.

St. Gallen, 2023-08-17

Reto Zürcher
CEO

Stefan Gajic
Compliance & Digitalisation

2.8 UK Declaration of Conformity for Machinery

(Supply of Machinery (Safety) Regulation 2008, Statutory Instrument 2008 No. 1597)

Product	Switching Unit HB-Therm Vario-5
Unit types	HB-VS180
Manufacturer Address	HB-Therm AG Piccardstrasse 6 9015 St. Gallen SWITZERLAND www.hb-therm.com
UK guidelines	The Electromagnetic Compatibility Regulations 2016 Statutory Instruments 2016 No. 1091 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 Statutory Instruments 2012 No. 3032
Note on The Pressure Equipment (Safety) Regulations 2016 Statutory Instruments 2016 No. 1105	The above products are in accordance with regulation 8. This means that interpretation and production are consistent with good engineering practice.
Responsible for documentation	Martin Braun HB-Therm AG 9015 St. Gallen SWITZERLAND
Standards	EN 60204-1:2018; EN IEC 61000-6-2:2019; EN IEC 61000-6-4:2019; EN IEC 63000:2018; EN ISO 12100:2010; EN ISO 13732-1:2008

We declare of our own responsibility that the above mentioned products, to which this declaration refers, comply with the appropriate regulations of the Supply of Machinery (Safety) Regulations 2008, including its appendices. Furthermore, the above mentioned Statutory Instruments and standards (or parts/clauses thereof) are applied.

St. Gallen, 2023-08-17

Reto Zürcher
CEO

Stefan Gajic
Compliance & Digitalisation

3 Technical data

3.1 General Information

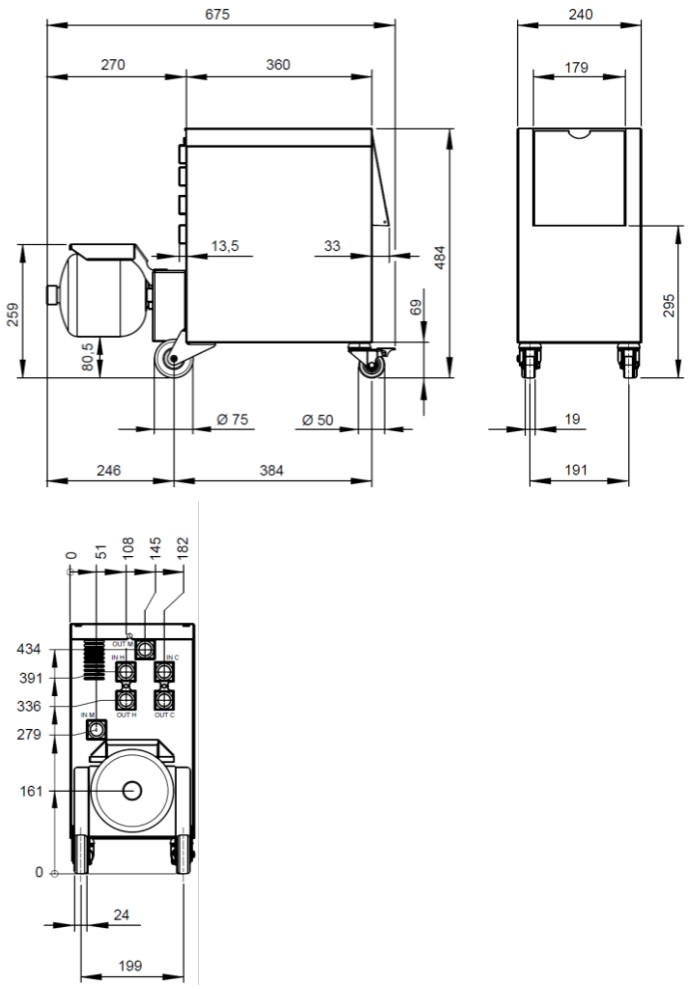


Fig. 1: Dimensions

Max. weight

	Value	Unit
HB-VS180	39	kg

Temperature measurement

	Value	Unit
Measuring range	0-400	°C
Dissolution	0.1	°C
Tolerance	±3	K

3.2 Emissions

	Value	Unit
Continuous sound pressure level	<70	dB(A)
Surface temperature (rear of unit)	>75	°C

3.3 Operating conditions

Environment

The unit may only be operated indoors.

	Value	Unit
Temperature range	5–40	°C
Relative humidity *	35–85	% RH

* non-condensing

Installation area

Minimum distance according to Fig. 2 have to be observed to achieve sufficient cooling of the electrical component..

ATTENTION!
Reduced durability due to insufficient cooling

If the electrical component is not cooled enough, the durability of the installed electronics is reduced.

Therefore:

– observe minimum distances.
– Do not cover air vents.

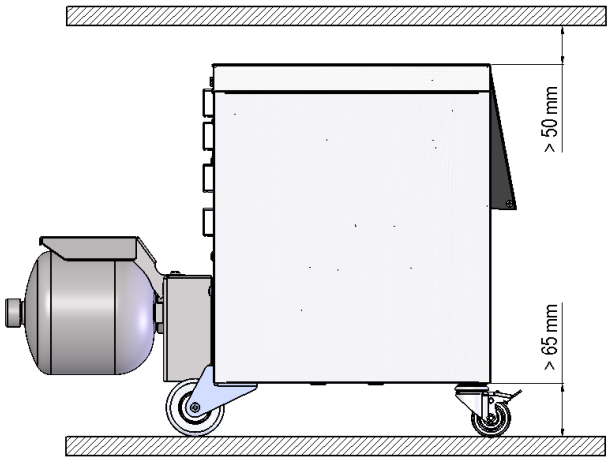


Fig. 2: Installation area

3.4 Connection values

Electrical connection

see nameplate on unit or on page 2

Connection input/output (H/C/M)

	Value	Unit
Thread	G¾	
Resistance	25, 200	bar, °C

G… Connector inside thread in inches

Technical data

3.5 Operating fluids

Heat transfer medium

Normally, if the non-treated water used in the temperature control circuit observe following guideline values, it can be used without special treatment.

> *NOTICE!*
>
> *We recommend, in order to protect the system, to observe these values and to control them from time to time.*

Guideline values

Hydrological data	Temperature range	Guideline value	Unit
pH-value	-	7.5–9	
Conductivity	up to 110 °C	<150	mS/m
	110–180 °C	<50	
	over 180 °C	<3	
Total hardness	up to 140 °C	<2.7	mol/m³
		<15	°dH
	over 140 °C	<0.02	mol/m³
		<0.11	°dH
Carbonate hardness	up to 140 °C	<2.7	mol/m³
		<15	°dH
	over 140 °C	<0.02	mol/m³
		<0.11	°dH
Chlorid ions Cl -	up to 110 °C	<50	mg/L
	110–180 °C	<30	
	over 180 °C	<5	
Sulphate SO4 2-	-	<150	mg/L
Ammonium NH4 +	-	<1	mg/L
Iron Fe	-	<0.2	mg/L
Manganese Mn	-	<0.1	mg/L
Particle size	-	<200	µm

> *NOTICE!*
>
> *For further information, you can go to www.hb-therm.ch to download "Checklist for water treatmentfor temperature control units" (DF8003-X, X=language).*

Water treatment

If the guideline values cannot be observed, a professional water treatment is necessary (→ page 36).

3.6 Nameplate

The nameplate is located on the rear panel of the unit, on the inside of the service flap and on page 2 o these operating instructions.

The following information can be taken from the nameplate:

- Manufacturer
- Type designation
- Unit number
- Year of manufacture
- Performance data
- Connection data
- Type of protection
- Additional equipment

4 Structure and function

4.1 Overview

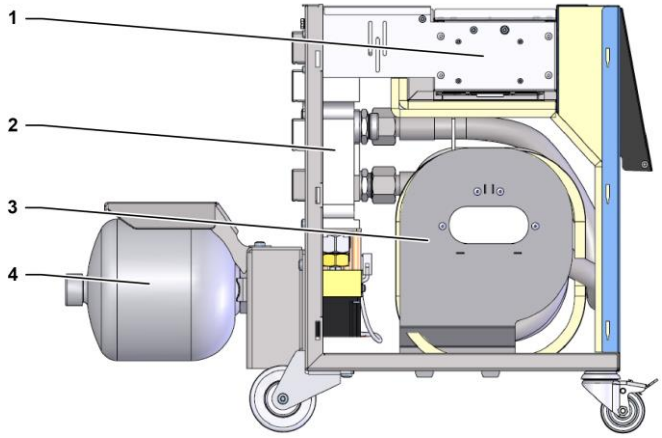


Fig. 3: Overview

1 Control with interface connections
2 Switching valves
3 Switching unit buffer
4 Accumulator

4.2 Brief description

Two temperature control units are used for variothermal temperature control with fluid media. One unit runs with hot temperature, the other runs with cold temperature. With the switching unit, these units are connected to the variothermal temperature control circuit of the mould alternately. The machine control activates the system synchronously with the processing cycle.

Together with the connected temperature control units, the switching unit forms a variothermal system.

4.3 Functional principle

The switching unit is part of a variothermal system. It consists of a valve block, the switching unit buffer, the accumulator and the control.

The valves connect either the hot or the cold temperature control unit with the mould circuit.

The switching unit buffer reduces switching losses by buffering the media that is in the external circuit. Then switching takes place and the media is provided to the unit at the correct temperature during the subsequent cycle.

The accumulator dampens pressure oscillations in the circuit which are created by thermal interaction.

The valves are actuated according to the machine signals forwarded from the integrated control. The switching unit is operated through one of the connect temperature control units Themro-5 or through the control module Panel-5.

4.4 Heat transfer medium

Water is used as the heat transfer medium. It is automatically fed to the temperature control unit via the cooling water inlet.

The heat transfer medium water is located in a closed circuit without oxygen contact in order to prevent oxidation to a large extent.

4.5 Connections

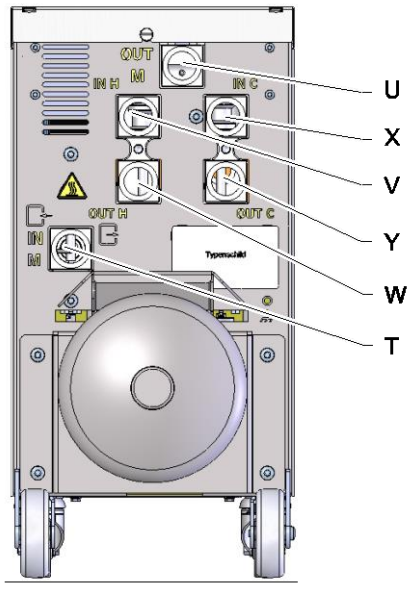


Fig. 4: Connections

The connections on the back of the unit are marked as follows:

T	**IN M**	Mould circuit input (from mould)
U	**OUT M**	Mould circuit output (to mould)
V	**IN H**	Hot water circuit input
W	**OUT H**	Hot water circuit output
X	**IN C**	Cold water circuit input
Y	**OUT C**	Cold water circuit output

4.6 Operation modes

4.6.1 Main operating modes

NOTICE!
When switching on the system and after preparation mode has been completed, the last selected main operating mode is active again.

Process operation

Controlled by the machine signals, the system alternates in the Process operation main operating mode between hot and cold heat transfer medium.

Process interruption

The Process interruption main operating mode is automatically activated, when no machine signals are present. Process operation is resumed, once machine signals are present again.

4.6.2 Modes of auxiliary operation

Manual mode

In Manual mode, the switching unit can be switched to the operating status options "Vario Heating", "Vario Cooling" or "Vario Neutral" for testing purposes.

Teaching

In Teaching mode, specific variotherm parameters can be determined automatically using different assistants.

Test mode

In Test mode, the system can be operated without the injection moulding process running and without machine signals for testing purposes.

Isothermal mode

In Isothermal mode, the system is operated continuously on "Vario Heating" or "Vario Cooling". In this operating mode, the machine signals have no effect.

Cooling

In Cooling mode, the heat transfer medium in the system (tempering units and switching unit) is cooled until the tempering units' temperature levels for main line, return line and external* have reached the defined Cooling temperature. Afterwards, the system is depressurised and switched off.

Mould evacuation

In the auxiliary Mould evacuation mode, the heat transfer medium in the system (tempering units and switching unit) is cooled until the tempering units' temperature levels for main line, return line and external* have reached the defined Mould evacuation limit temperature. Subsequently, consumer and feed lines are sucked until evacuated and depressurized. The evacuation volume is routed to the cooling water or system water outlet or to the tempering units' compressed air outlet.

* if an external sensor is connected

4.7 Work and danger zones

Working areas

- The primary working area is at the operating panel of the Thermo-5 temperature control unit or at the control module Panel-5.
- The secondary working area is at the front and rear side of the switching unit.

Danger areas

- On the back of the switching unit, connections are provided for the two temperature control units and the consumer. These areas are not protected by the unit housing. There is the danger of burning and scalding at accessible hot surfaces. From a bursting hose, hot steam or hot water can escape and cause burns and scalds.

5 Transport, packing and storage

5.1 Safety notes for transport

Improper transport

ATTENTION!
Damage due to improper transport!

Improper transport can result in considerable material damage.

Therefore:

– Unit must be completely emptied (cooling and system circuit)
– Only use original or equivalent packaging.
– On delivery as well as during internal transport, proceed carefully when unloading the packages and observe the notices on the packaging.
– Only use the designated suspension points.
– Only remove the packaging shortly before assembly.

5.2 Transport

Transport by forklift truck

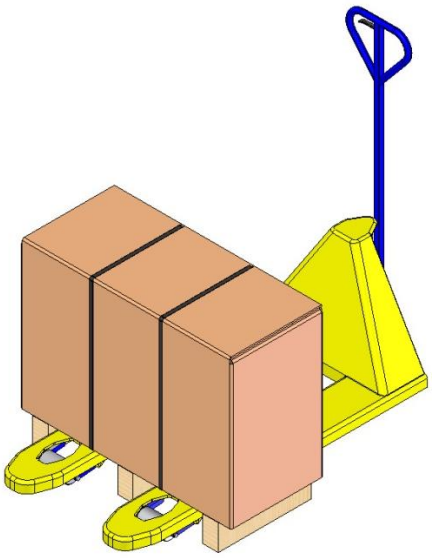


Fig. 5: Attachment points Palette

Packing units mounted on pallets can be transported by forklift truckunder the following condition:

- The forklift truck must be designed for the weight of the unit.
- The driver must be authorised to drive the forklift truck.

Attachment:

1. Insert the forks of the forklift truck between or under the pallet stringers.
2. Insert the forks deep enough so they protrude on the other side of the pallet.
3. Make sure that the pallet cannot tip over, if the centre of gravity is offset.
4. Raise the packing unit and begin with the transport.

Transport with a crane

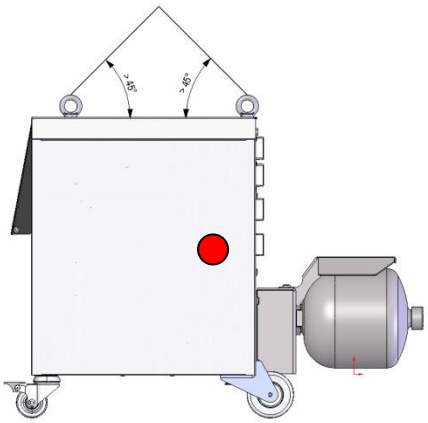


Fig. 6: Suspension points

The switching unit can have jack rings fitted (optional). Transport with a crane can be carried out under the following conditions:

- Crane and lifting gear must be designed for the weight of the unit.
- The operator must be authorised to operate the crane.

Attachment:

1. Attach the ropes and straps according to Fig. 6.
2. Make sure that the unit hangs straight. Pay attention to offset centre of gravity (→ ● Fig. 6).
3. Raise the switching unit and begin with the transport.

5.3 Transport inspection

Check the delivery immediately on receipt for completeness and transport damage.

If externally detectable transport damage is found, proceed as follows:

- Do not accept the delivery, or only with reservation.
- Record the extent of transport damage in the transport documents or on the delivery note of the forwarding agent.
- Start complaints procedure.

NOTE!

Claim any damage as soon as it is detected. Compensation claims can only be submitted within the applicable complaints periods.

5.4 Packing

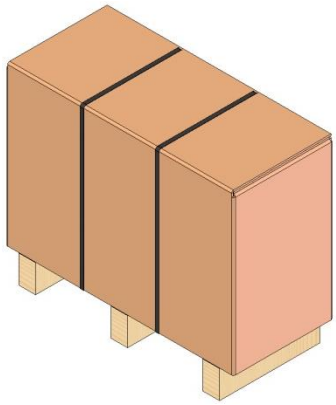


Fig. 7: Packaging

The unit is packaged on a wooden pallet wrapped in stretch film, surrounded by cardboard and secured by PP straps according to expected transport conditions.

Only environmentally compatible materials have been used for packaging.

The packaging should protect the singular components from transport damage, corrosion and other damage. Therefore, do not destroy the packaging.

Handling packing materials

If there is no returns agreement for the packing, separate materials according to type and size and direct to further use or recycling.

ATTENTION!
Environmental damage caused by incorrect waste disposal!

Packing materials are valuable raw materials and can continue to be used in many cases or sensibly reconditioned and recycled.

Therefore:

– Dispose of packing materials environmentally.
– Follow the locally valid waste disposal regulations. If necessary employ a special waste disposal company to dispose of packing material.

Transport, packing and storage

Recycling codes for packaging materials

Recycling codes are markings on packaging materials. They provide information about the type of material used and facilitate the disposal and recycling process.

These codes consist of a specific material number framed by an arrow-triangle symbol. Below the symbol is the abbreviation for the respective material.

Transport pallet

→ Wood

Folding carton

→ Cardboard

Strapping band

→ Polypropylene

Foam pads, cable ties and quick release bags

→ Polyethylene low density

no recycling code

Stretch film

→ Polyethylene linear low density

Transport, packing and storage

5.5 Symbols on the packing

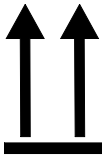
Protect against wetness

Protect packages against wetness and keep dry.

Fragile

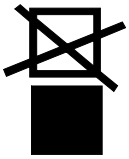
Identifies packages with fragile or sensitive content.

Handle package with care, do not drop and do not subject to shock loads.



Top

The arrows in this sign symbolize the top side of the package. They must always point up, as otherwise the content may get damaged.



Do not stack

Marks packages that cannot be stacked or onto which nothing should be stacked.

Do not stack anything on the marked package.

5.6 Storage

Storing the packages

Store the packages under the following conditions:

- System completely emptied.
- Do not store out of doors.
- Store dry and dust-free.
- Do not expose to aggressive media.
- Protect from sunlight.
- Avoid mechanical vibrations.
- Storage temperature 15–35 °C.
- Relative humidity max. 60 %.

6 Installation and initial commissioning

6.1 Safety

Personnel

- The installation and commissioning must only be carried out by qualified personnel.
- Work on the electrical system must only be carried out by certified electricians.
- Work on the hydraulic system must only be carried out by qualified hydraulics technicians.

Special dangers

The following dangers exist:

- Danger of fatal injury by electric current.
- Risk of burns due to hot materials.
- Risk of burns due to hot surfaces.
- Danger of crushing due to rolling away or tipping.

Improper installation and initial commissioning

WARNING!
Risk of injury due to improper installation and initial commissioning!

Improper installation and initial commissioning can lead to severe personal injury or material damage.

Therefore:

– Before starting work, ensure that there is sufficient space for assembly.
– Open components with sharp edges should be handled carefully.

6.2 Requirements for the installation location

The switching unit must be

- installed on a level, load-bearing surface
- secured against rolling away and tipping
- Connecting cables to and from the unit must not touch any pipelines that have surface temperatures greater than 50 °C.

6.3 Installation work

6.3.1 Lock castors

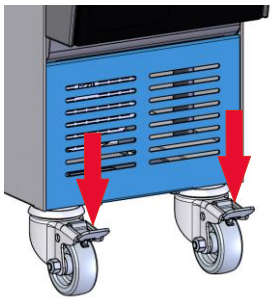


Fig. 8: Lock castors

The castors must be locked in order to secure the unit from rolling away unintentionally.

1. Place the unit in the appropriate location.
2. Press the two brake arms on the castors downwards.

6.3.2 Water treatment

If the guideline values (→ page 24) for water quality during operation cannot be observed, a professional water treatment is necessary.

NOTICE!

We recommend having the water treatment undertaken by a specialist firm.

Carry out the water treatment under the followingconditions:

- Water treatment agents must be capable of being used up to the maximum working temperature of the temperature control unit.
- Do not use any aggressive water treatment agents that could destroy the materials of the system. Depending on the model, the following materials are used in the system:
  - Copper
  - Brass
  - Bronze
  - Nickel
  - Chrome steel
  - MQ (silicon)
  - Titan
  - NBR (Nitrile rubber)
  - FPM (Viton®)
  - PTFE (Teflon)
  - FFKM (Perfluorinated rubber)
  - PEEK (Polyether ether ketone)
  - Ceramic (Al_2O_3)

Viton® is a registered trademark of Dupont Dow Elastomers

NOTICE!

For further information, you can go to www.hb-therm.ch to download "Checklist for water treatment for temperature control units" (DF8003-X, X=language).

6.3.3 Setting up system connections

WARNING!
Danger from hydraulic energy!

When using unsuitable pressure lines and connectors, the danger exists that liquids under high pressure can escape and cause severe or fatal injuries.

Therefore:

– Use only temperature-resistant pressure lines.

NOTICE!

Specific to the product, system connections are screwed or plugged in. If the recommended size of hose cannot be connected to the consumer, a reduction in bore at the consumer and not at the unit must be achieved to keep the pressure drop to a minimum.

WARNING!

Bolted assemblies, especially combinations of stainless steel / stainless steel or steel / stainless steel tend to adhere strongly or can seize up after a longer period of operation at high temperatures. This results in difficulties in dismantling.

Therefore:

– Use a suitable lubricant.

Installation and initial commissioning

Connecting the hot water circuit H

1. Connect main line (OUT) of "hot" Thermo-5 to hot water circuit input (IN H).
2. Connect return line (IN) of "hot" Thermo-5 with to water circuit output (OUT H).

Connecting the cold water circuit C

3. Connect main line (Out) of "cold" Thermo-5 to cold water circuit input (IN C).
4. Connect return line (IH) of "cold" Thermo-5 to cold water circuit output (OUT C).

Connecting mould circuit

5. Connect mould circuit (OUT M) and (IN M) to consumer.

Make electrical connections

6. Have electrical connections made under the following conditions:

- First make the hydraulic connections, then make the electrical connections.
- Ensure that mains voltage and frequency are observed and correspond to the specification on the nameplate and in the technical data.

Secure hose connections

WARNING!
Risk of burns at hot hose connections!

During operation, the hose connections between the temperature control unit, the switching unit and the external consumer can become very hot.
Where hose connections are covered insufficiently, there is the danger of contact which can cause severe burns.

Therefore:

– Secure all hose connections adequately against the possibility of direct contact.

6.3.4 Connect data interfaces

HB interface

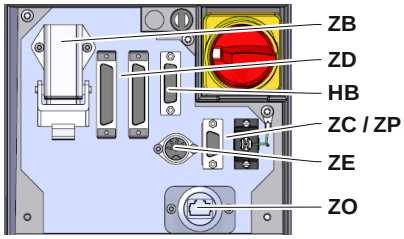


Fig. 9: Interfaces individual unit

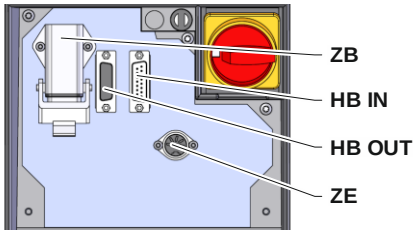


Fig. 10: Interfaces modular unit

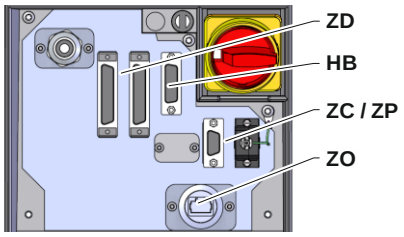


Fig. 11: Interfaces Panel-5

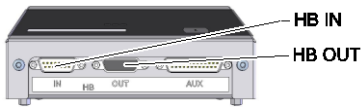


Fig. 12: Interfaces Flow-5
Modul: Unit attached/ stand-alone

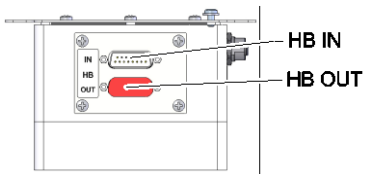


Fig. 13: Interfaces Flow-5
Modul: Autonom.

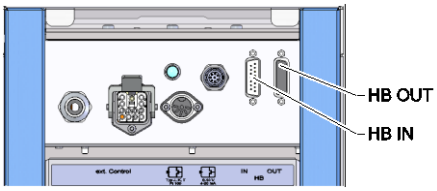
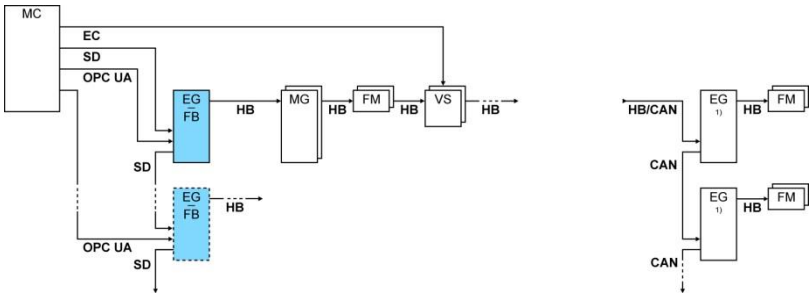


Fig. 14: Interfaces Vario-5

To operate or monitor a modular unit Thermo-5 Ext. Flow meter Flow-5 or a switching unit Vario-5, a control cable must be connectedto the device:

1. Loop the control cable between the front and the service cover at Thermo-5 resp. Panel-5.
2. Plug the control cable into socket HB IN.
3. Attach the other side of the control cable to the HB-Therm Thermo-5, Flow-5 or Vario-5 through the HB IN plug.
4. Attach additional HB-Therm products through the socket HB OUT.
5. Close the service lid.

Legend	Designation	Comment
MC	Machine controller	max. 1
FB	Operating module Panel-5	max. 1
EG	Temperature thermostat Thermo-5 singular unit	max. 16 (per operation)
MG	Temperature thermostat Thermo-5 modular unit	
FM	Flow meter Flow-5	max. 32 (with 4 circuits)
VS	Switching unit Vario-5	max. 8
SD	Communication via serial data interfaces DIGITAL (**ZD**), CAN (**ZC**), PROFIBUS-DP (**ZP**)	Maximum number of sim. modules, operatingvolume and transfer of flow rate values depend on the machine controller or protocol
OPC UA	Communication OPC UA via Ethernet (**ZO**)	
HB 2)	Communication Interface HB	Order of connection not relevant
HB/CAN	Communication Interface HB/CAN	For remote control of singular units
CAN	Communication Interface CAN (**ZC**)	
EC	External control (ext.) Control)	Configuration depends on machine controller

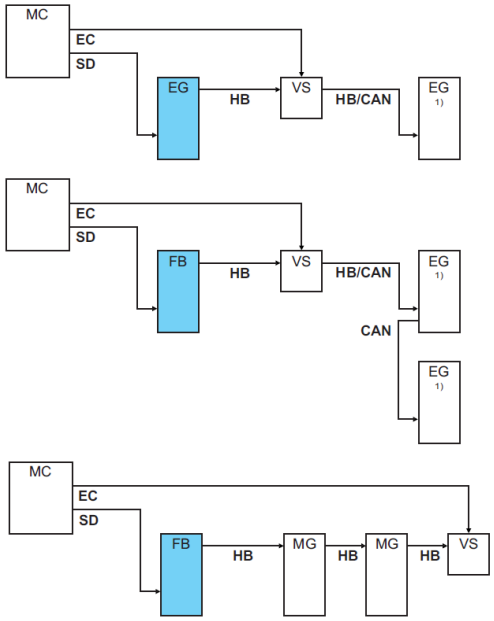


1) operation switched OFF

2) Max. length cable HB: Total 50 m

Installation and initial commissioning

Communication examples



1) Operation schwitched OFF

Ext. Control

For actuation through the machine, either an active 24V DC signal or an isolated contact can be used. If the actuation through the machine is not possible, the synchronisation of the control can be achieved through a proximity switch.

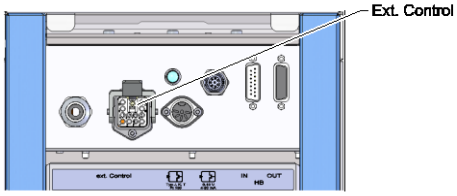


Fig. 15: Interfaces Vario-5

To actuate the switching unit through signals by means of a control cable of the machine control, proceed as follows:

1. Pull the control cable of the machine control between the front and the service cover.
2. Connect the control cable to the socket Ext. Control.
3. Close the service lid.
4. For schematical terminal assignment (→ page 107).

Connecting an external temperature sensor

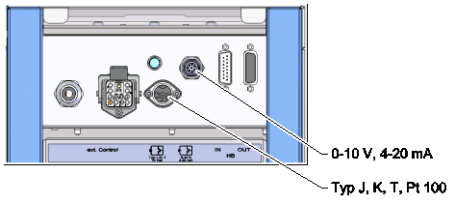


Fig. 16: Interfaces Vario-5

You can connect an external temperature sensor to the switching unit to display the consumer temperature.

1. Loop the cable of the external temperature sensor between the front and the service flap.
2. For type J, K, T or Pt 100, plug the external temperature sensor into socket type J, K, T or Pt 100.
3. For type 0–10 V or 4–20 mA, plug the external temperature sensor into socket type 0–10 V or 4–20 mA.
4. Close the service lid.
5. Setting of sensor type (→ page 72).

Table: Sensor type designation

Type	Code	Casing	Core
J (Fe-CuNi)	IEC	black	black (+) / white (-)
	DIN	blue	red (+) / blue (-)
K (NiCr-Ni)	IEC	green	green (+) / white (-)
	DIN	green	red (+) / green (-)
T (Cu-CuNi)	IEC	brown	brown (+) / white (-)
	DIN	brown	red (+) / brown (-)

NOTE!

The pin assignment for the various control cables is given in page 105.

6.4 Connecting the functional grounding

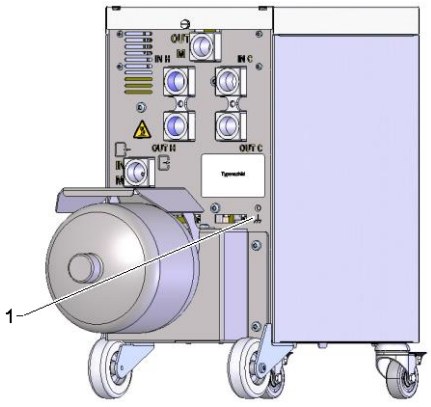


Fig. 17: Functional grounding

Large emitters of electromagnetic disturbance near the switching unit can influence its operation. In this case, the switching unit casing must be earthed with an grounding strap (for functional grounding connecting point, refer to (1) Fig. 17).

7 Control

NOTICE!

The switching unit for variothermal control does not have a separate control panel. Operation and display take place through a Thermo-5 single unit or a Panel-5 operating module.

Basic display of variothermal system

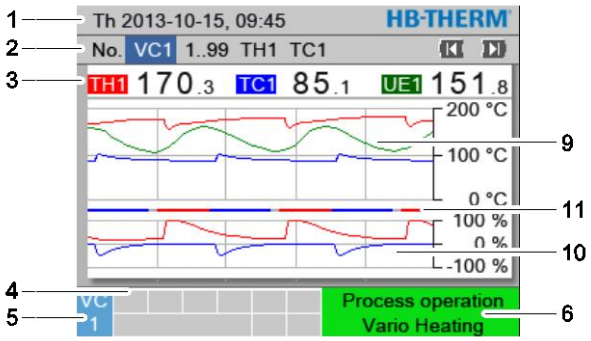


Fig. 18: Basic display graph

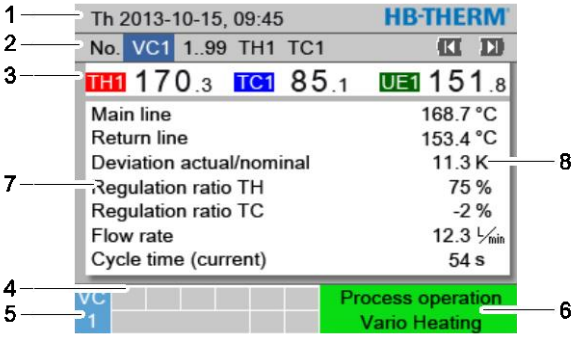


Fig. 19: Basic display text

Pos. No.	Designation	Display
1	Menu bar	Date and time
2	Module bar	Shows registered modules
3	Actual value display	Shows current measured temperatures of main line TH (red), main line TC (blue) and actual value of external sensor (green) of switching unit.
4	Symbol field	Shows active functions and details.
5	Address field	Shows module address or DFM module address.
6	Operating mode and colour-coded condition display	Shows current operating mode and pending alarms and warnings.
7	User values	Shows max. 7 freely selectable actual values.
8	Unit	Unit for actual values.
9	Temperature chart	Chart for main line TH (red), main line TC (blue) and external sensor (green) temperatures.
10	Regulation ratio chart	Chart for regulation ratios of TH (red) and TC (blue).
11	Status display	Indicates status history of switching unit. Vario heating (red), Vario cooling (blue) and Vario Neutral (grey).

Status display switch over unit

The status lamp (HL 1) lights up differently depending on the operating state. The following conditions are defined:

Display	Description
OFF	Network not available
blinking 0,5 s	Software update
blinking 2 s	Network available, switching unit (VC) not logged in
ON	Network available, switching unit (VC) logged in

Status indicator operating module or singular unit

The condition display lights in a different colour depending on the operating condition. The following conditions are defined:

Display	Description
green	trouble-free
green flashing	Start-up phase, limiting values not set
yellow	Warning
red	Fault

Symbol display operating module or singular unit

Symbol	Description
	Simulation mode active
	Auto tuning active
	Remote mode active
	Ramp programme active
	Switch clock active
	Maintanance interval reached
	Recording USB
	Switch off horn
	Acknowledge alarm

Control

7.1 Operating structure

Navigate through the menu structure as follows:

- Press the OK key to display step-by-step the next lowest hierarchy level starting from the basic display.
- Press the C key to display step-by-step the next highest hierarchy level up to the basic display.
- Press and hold the C key for more than 1 second to directly display the basic display from a lower hierarchy level.
- Press the ◀ and ▶ arrow keys to toggle between the singular modules.

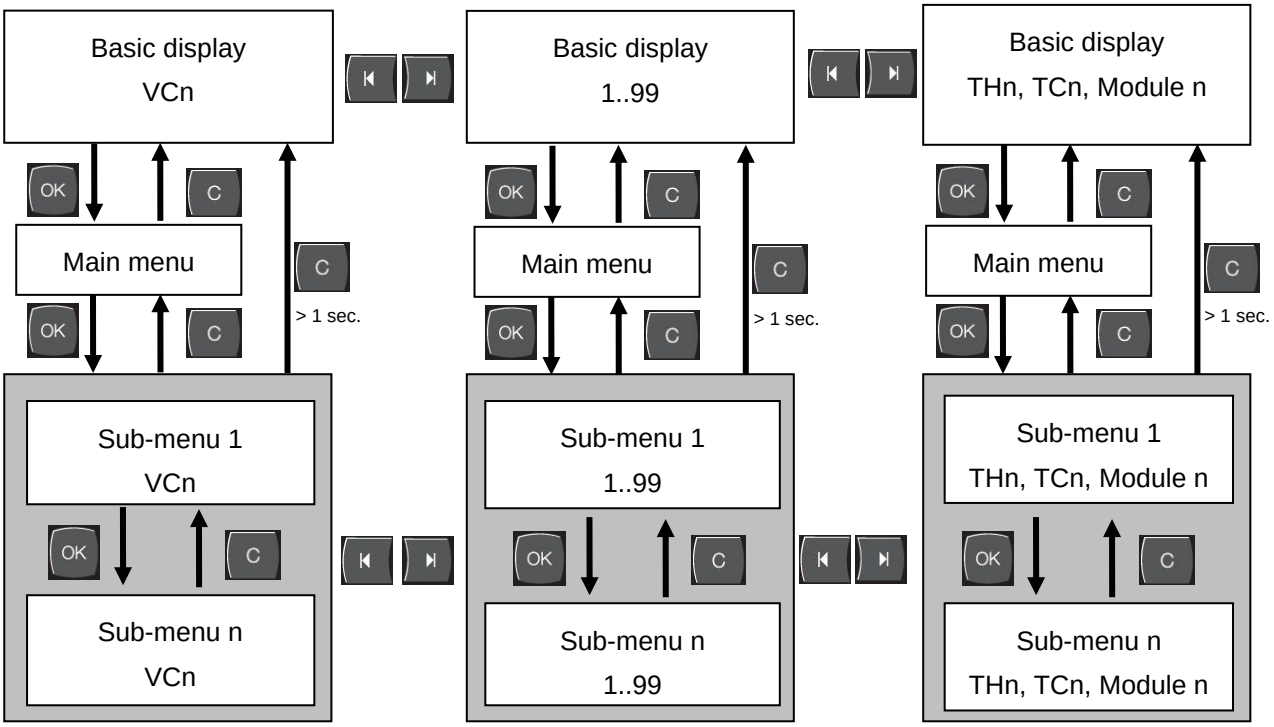


Fig. 20: Operating structure

7.2 Menu structure

NOTE!

Depending on the software version used, the menu structure and the parameter values can deviate from the following table.

Display	User profile	Operating-release	Default value	Unit	Ancillary - equipment/ model	Type
Nominal values	S	-	-	-	-	-
Nominal value TH	S	1	40.0	°C	-	M
Nominal value TC	S	1	40.0	°C	-	M
Nominal value isothermal	S	1	40.0	°C	-	M
Nominal value mould up	S	1	70.0	°C	-	M
Nominal value mould down	S	1	50.0	°C	-	M
Nom. value ready for operation	S	1	autom.	°C	-	M
Functions	S	-	-	-	-	-
Cooling	S	1	OFF	-	-	M
Mould evacuation	S	1	OFF	-	-	M
Remote	S	1	OFF	-	ZD, ZC, ZP	M
Switch clock	S	1	OFF	-	-	M
Manual mode	S	1	OFF	-	-	M
Process operation	S	1	OFF	-	-	M
Teaching	S	1	OFF	-	-	M
Test mode	S	1	OFF	-	-	M
Isothermal mode	S	1	OFF	-	-	M
Display	S	-	-	-	-	-
Screen type	S	2	Graph	-	-	A
Time axis	S	2	Cycle	s	-	M
Actual value	S	-	-	-	-	-
Hold screen	S	1	OFF	-	-	A
Nominal (current) value TH	S	-	-	°C	-	M
Nominal (current) value TC	S	-	-	°C	-	M
Main line	S	-	-	°C	-	M
Main line TH	S	-	-	°C	-	M
Main line TC	S	-	-	°C	-	M
Return line	S	-	-	°C	-	M
Return line TH	S	-	-	°C	-	M
Return line TC	S	-	-	°C	-	M
External	S	-	-	°C	-	M
Deviation actual/nominal	S	-	-	K	-	M
Regulation ratio TH	S	-	-	%	-	M
Regulation ratio TC	S	-	-	%	-	M

Control

Flow rate	S	-	-	L/min	-	M
Flow rate TH	S	-	-	L/min	-	M
Flow rate TC	S	-	-	L/min	-	M
Operating hours	S	-	-	h	-	M
Valve stroke heating	U	-	-	%	-	M
Valve stroke cooling	U	-	-	%	-	M
Valve stroke buffer	U	-	-	%	-	M
Temperature Buffer	U	-	-	°C	-	M
Temperature compensation 1	U	-	-	°C	-	M
Unit temperature above	U	-	-	°C	-	M
Unit temperature below	U	-	-	°C	-	M
Cycle time (current)	S	-	-	s	-	M
Reaction time	S	-	-	s	-	M
Maintenance valve heating	U	4	-	%	-	M
Maintenance valve cooling	U	4	-	%	-	M
Maintenance valve buffer	U	4	-	%	-	M
Selection	S	-	-	-	-	-
Nominal (current) value TH	S	3	ON	-	-	M
Nominal (current) value TC	S	3	ON	-	-	M
Main line	S	3	ON	-	-	M
Main line TH	S	3	OFF	-	-	M
Main line TC	S	3	OFF	-	-	M
Return line	S	3	ON	-	-	M
Return line TH	S	3	OFF	-	-	M
Return line TC	S	3	OFF	-	-	M
External	S	3	OFF	-	-	M
Deviation actual/nominal	S	3	OFF	-	-	M
Regulation ratio TH	S	3	ON	-	-	M
Regulation ratio TC	S	3	ON	-	-	M
Flow rate	S	3	ON	-	-	M
Flow rate TH	S	3	OFF	-	-	M
Flow rate TC	S	3	OFF	-	-	M
Operating hours	S	3	OFF	-	-	M
Valve stroke heating	U	3	OFF	-	-	M
Valve stroke cooling	U	3	OFF	-	-	M
Valve stroke buffer	U	3	OFF	-	-	M
Temperature Buffer	U	3	OFF	-	-	M
Temperature compensation 1	U	3	OFF	-	-	M
Unit temperature above	U	3	OFF	-	-	M
Unit temperature below	U	3	OFF	-	-	M
Cycle time (current)	S	3	OFF	-	-	M
Reaction time	S	3	OFF	-	-	M
Maintenance valve heating	U	3	OFF	-	-	M
Maintenance valve cooling	U	3	OFF	-	-	M
Maintenance valve buffer	U	3	OFF	-	-	M

Control

Variothermal systems	S	-	-	-	-	-
Variothermal systems 1..8	S	3	aktive	-	-	A
Monitoring	S	-	-	-	-	-
Monitoring	S	3	autom.	-	-	A
Monitoring level	S	3	rough	-	-	M
Reset monitoring	S	3	no	-	-	M
Startup-alarmsuppression	S	3	complete	-	-	A
Horn volume	S	3	10	-	-	A
Temperature	S	-	-	-	-	-
Upper dev. nominal/actual	S	3	10,0	K	-	M
Lower dev. nominal/actual	S	3	10,0	K	-	M
Flow rate	S	-	-	-	-	-
Flow rate max.	S	3	OFF	L/min	-	M
Flow rate min.	S	3	-	L/min	-	M
Setting	S	-	-	-	-	-
Remote	S	-	-	-	-	-
Protocol	S	3	1	-	-	-
Transfer rate	E	4	4800	B/s	-	-
Transfer rate CAN Bus	E	4	250	k/s	-	-
Decimal place flow rate CAN	S	4	ON	-	-	-
Parity	E	4	even	-	-	-
Data bit	E	4	8	-	-	-
Stop bit	E	4	1	-	-	-
Serial recording cycle	S	4	1	s	-	-
Delay emergency switch off	U	4	30	s	-	A
Profibus node 1	S	4	5	-	-	-
Profibus node 2	S	4	6	-	-	-
Profibus node 3	S	4	7	-	-	-
Profibus node 4	S	4	8	-	-	-
Status VC via Ext. Contact	U	4	OFF	-	-	M
Switch clock	E	-	-	-	-	-
Time	E	3	CET	HH:MM	-	A
Date	E	3	CET	-	-	A
Status	E	3	inactive	-	-	A
Day	E	3	Mo-Fr	-	-	A
Switch mode	E	3	OFF	-	-	A
Switch time	E	3	06:00	HH:MM	-	A
Vario	S	-	-	-	-	-
Cycle time	S	2	autom.	°C	-	M
Cycle delay	S	2	0.0	s	-	M
Heating duration	S	2	20.0	s	-	M
Cooling duration	S	2	20.0	s	-	M
Heating-cooling pause	S	2	0.0	s	-	M
Cooling-heating pause	S	2	0.0	s	-	M
Buffer valve	S	2	autom.	-	-	M

Control

Process interruption	S	2	Neutral	-	-	M
Machine actuation	S	2	Contact HC	-	-	M
Number of release contacts	S	2	2	-	-	M
Invert input signal	S	2	no	-	-	M
Invert output signal	S	2	no	-	-	M
Buffer measure. inhibit time	U	2	3,0	s	-	M
Deviation cycle factor	U	2	4,0	-	-	M
Number of values cycle time	U	2	3	-	-	M
Min. cycle time	U	2	5,0	s	-	M
Max. cycle time	U	2	3600,0	s	-	M
Output signal function	S	2	OFF	-	-	M
Position when inactive	U	4	Neutral	-	-	M
Recogn. process interruption	U	4	ON	-	-	M
Waiti. Time Heat.Temp HC	S	2	OFF	s	-	M
Waiti. Time Cool.Temp HC	S	2	OFF	s	-	M
Test mode	S	-	-	-	-	-
Nominal value TH test	S	2	60	°C	-	M
Nominal value TC test	S	2	30	°C	-	M
Heating test duration	S	2	20.0	s	-	M
Cooling test duration	S	2	20.0	s	-	M
Heating-cooling test pause	S	2	0.0	s	-	M
Cooling-heating test pause	S	2	0.0	s	-	M
Controller	E	-	-	-	-	-
Contr. parameter deadband HC	E	4	20	K	-	M
Contr. parameter idle time HC	E	4	5.0	min	-	M
Date / Time	S	-	-	-	-	-
Time	S	3	MEZ	HH:MM	-	A
Date	S	3	MEZ	-	-	A
Time zone	S	3	MEZ	-	-	A
Time zone Offset UTC	S	3	autom.	-	-	A
Switch over summer/winter	S	3	60	min	-	A
Summer/Winter	S	3	Winter	-	-	A
Units	S	-	-	-	-	-
Temperature scale	S	2	°C	-	-	A
Flow rate scale	S	2	L/min	-	-	A
Pressure scale	S	2	bar	-	-	A
Recording USB	S	-	-	-	-	-
Serial recording cycle	S	4	1	s	-	A
Activate all values	S	3	OFF	-	-	M
Deactivate all values	S	3	OFF	-	-	M
Nominal (current) value TH	S	3	ON	-	-	M
Nominal (current) value TC	S	3	ON	-	-	M
Main line	S	3	ON	-	-	M
Main line TH	S	3	ON	-	-	M
Main line TC	S	3	ON	-	-	M

Return line	S	3	ON	-	-	M
Return line TH	S	3	ON	-	-	M
Return line TC	S	3	ON	-	-	M
External	S	3	ON	-	-	M
Deviation actual/nominal	S	3	ON	-	-	M
Regulation ratio TH	S	3	ON	-	-	M
Regulation ratio TC	S	3	ON	-	-	M
Flow rate	S	3	ON	-	-	M
Flow rate TH	S	3	ON	-	-	M
Flow rate TC	S	3	ON	-	-	M
Operating hours	S	3	OFF	-	-	M
Valve stroke heating	S	3	ON	-	-	M
Valve stroke cooling	S	3	ON	-	-	M
Valve stroke buffer	S	3	ON	-	-	M
Temperature Buffer	S	3	ON	-	-	M
Temperature compensation 1	S	3	OFF	-	-	M
Unit temperature above	S	3	OFF	-	-	M
Unit temperature below	S	3	OFF	-	-	M
Cycle time (current)	S	3	ON	-	-	M
Reaction time	S	3	OFF	-	-	M
Operating hours USR	S	3	OFF	-	-	M
Operating hours VFC	S	3	OFF	-	-	M
Total number of alarms	S	3	OFF	-	-	M
Average heating capacity TH	S	3	OFF	-	-	M
Average heating capacity TC	S	3	OFF	-	-	M
Average cooling capacity TH	S	3	OFF	-	-	M
Average cooling capacity TC	S	3	OFF	-	-	M
Total number of cycles	S	3	ON	-	-	M
Maintenance valve heating	S	3	OFF	-	-	M
Maintenance valve cooling	S	3	OFF	-	-	M
Maintenance valve buffer	S	3	OFF	-	-	M
Miscellaneous	S	-	-	-	-	-
Sensor type external sensor	S	3	J/Fe-CuNi	-	-	M
Emissivity	S	3	1.00	-	-	M
Temperature compensation IR	S	3	30	°C	-	M
Profile	S	-	-	-	-	-
User profile	S	3	Standard	-	-	A
Operating release	S	0	2	-	-	A
Code	S	3	1234	-	-	A
Language	S	0	-	-	-	A
Key press volume	S	3	5	-	-	A
Fault finding	S	-	-	-	-	-
Logbook Alarms	S	-	-	-	-	-
Logbook Alarms	S	4	-	-	-	M
Save/Load	S	-	-	-	-	-

Control

Start USB Software Update	E	4	OFF	-	-	A
Recording USB	S	3	OFF	-	-	M
Load configuration data	E	4	OFF	-	-	M
Save configuration data	S	4	OFF	-	-	M
Load parameter data	E	4	OFF	-	-	M
Save parameter data	S	4	OFF	-	-	M
Save error and operation data	S	4	OFF	-	-	M
Save Serviceinfo	S	4	OFF	-	-	A

8 Operation

8.1 Registering new switching units

Initialisation window

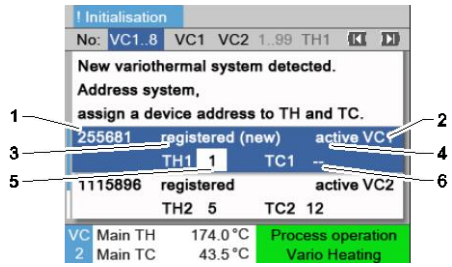


Fig. 21: Initialisation

If a new switching unit is detected, the initialisation window appears at the singular unit or operating module.

Pos. no.	Display
1	Module ID
2	VC module address
3	Registration status of switching unit
4	Active/inactive status of switching unit
5	Assignment TH (Thermo-5 cold water circuit)
6	Assignment TC (Thermo-5 cold water circuit)

Address allocation and assignment

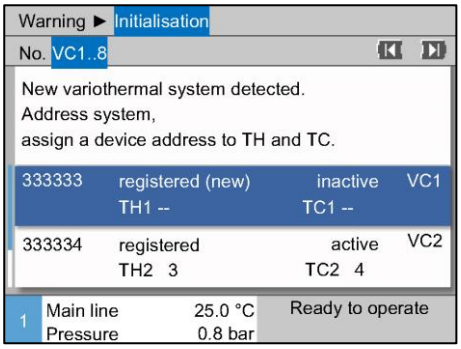


Fig. 22: New system detected.

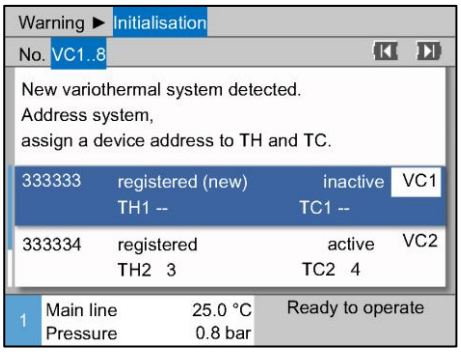


Fig. 23: Assign Module ID

The switching unit must be assigned an address (VC1 to VC8), status ("active" or "inactive") and a respective unit address for TH and TC. Proceed as follows:

NOTICE!

To completely define the assignment of the switching unit, the hydraulically connected Thermo-5 units need to be switched on and already registered at the control.

1. Select the Module ID with the ▲ or ▼ key.
2. Press the OK key and adjust the address of the VC module (→ Fig. 23 Ex. VC1)

NOTICE!

A set address (VC module) may only exist once in a network. The menu page can not be exited as long as the address is repeatedly assigned.

Operation

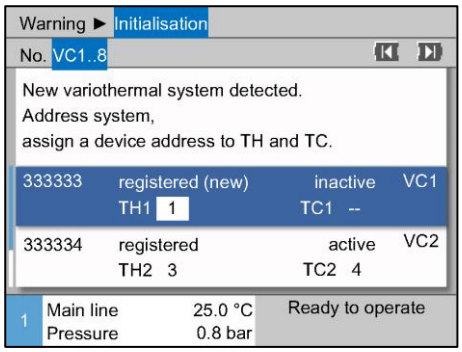


Fig. 24: Assign TH address

3. Jump to the TH address with the ⏭ key and assign the registered address.
(→ Fig. 24 Ex. assign address 1 to TH1)

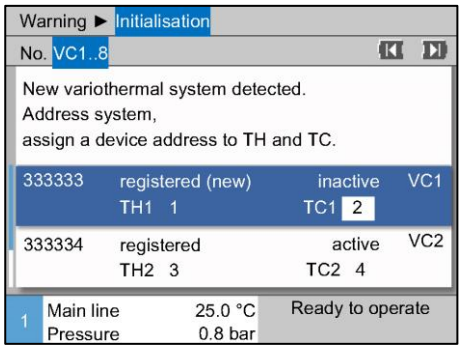


Fig. 25: Assign TH address

4. Jump to the TC address with the ⏭ key and assign the registered address.
(→ Fig. 25 Ex. assign address 2 to TC1)

NOTICE!

A VC switching unit must be assigned a registered address of a Thermo-5 and the parameter TH and TC. Otherwise the variothermal system cannot be operated.

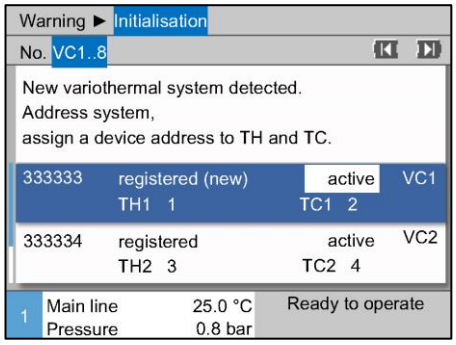


Fig. 26: Setting of the status

5. Jump to Status with the ⏭ key and set to "active".

6. Confirm assignment with the OK key and then leave the initialisation window with the C key.

Change the address resp. assignment

Proceed as follows in order to subsequently change the address assignment:

1. Open the Display \ Variothermal systems menu page.
2. Choose VC module address and confirm with the OK key.
3. Set the VC module address.
4. Press the ▶| key and assign a registered TH address.
5. Press the ▶| key and assign a registered TC address.
6. Acknowledge assignment with the OK key.

Activate and deactivate

Switching units can be activated and deactivated. To activate resp. deactivate a swithing unit, proceed as follows:

1. Open the Display \ Variothermal systems menu page.
2. Choose VC module address and confirm with the OK key.
3. Jump to Status with the |◀ key and set status to "active".resp. "inactive"
4. Confirm with the OK key.

8.2 Operate singular unit as modular unit

An singual unit can be operated as a modular unit. The operation takes place through the higher-level command Thermo-5 or Panel-5.

Requirement

- Additional equipment ZC
- only one module logged on.
- Software version newer then SW51-2_1413

> *NOTICE!*
> *The numer of modules currently logged on is displayed under* Display / Module

Operate unit as module

To operate an singular unit as module, proceed as follows:

1. Switch the unit off with the ⏻ key.
2. Display the menu page Setting \ Remote operation.
3. Set parameter Operate unit as module to „ON“.

> *NOTICE!*
> *If the parameter* Operate unit as module *is not available, check the requirements.*

→ The unit starts up again after confirmation of the warning with the OK key.

→ The unit logs on to the higher-level unit Thermo-5 or Panel-5 (→ Instruction Manual Thermo-5).

Operate unit as single unit

To operate the unit again as singular unit, proceed as follows:

1. Switch of the unit through the higher-level command Thermo-5 or Panel-5.
2. Select Main menu at the modular unit with the OK key.
3. Set parameter Operate unit as module to „OFF“.

→ The unit starts up again after confirmation of the warning with the OK key.

→ The unit can be operated again as an singular unit.

8.3 Special features when operating multiple switching units

Parameter types

When operation multiple switching units, a distinction is made between 2 types of parameters:

A Module independent (value adjustment only possible for "VC1..8")

M Module dependent (value adjustment possible per module) i.e. VC1, VC2 etc.

NOTICE!

Refer to menu structure, to learn which parameters can be set module independently or module dependently (→page 45).

Module No. "VC1..8" selected

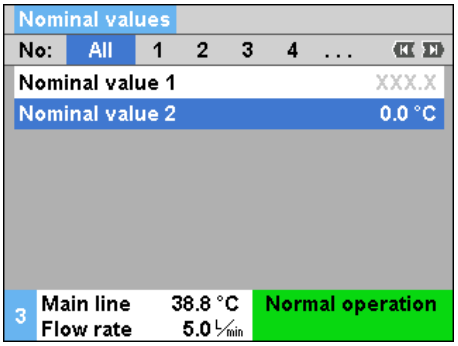


Fig. 27: Example for nominal values

When selecting the module no. "VC1..8", the value of a parameter is displayed with X's (grey), unless the setting is identical for all switching units.
In all other cases, the value is displayed normally in black.
(→ Example Fig. 27)

Value adjustment for all switching units

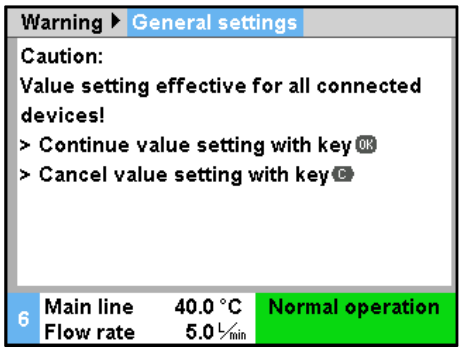


Fig. 28: Warning text value adjustment

Proceed as follows to apply a setting to all detected switching units simultaneously:

1. To select module no. "VC1..8" press the ◀ key or the ▶ key.
2. Select the desired parameter and press the OK key.
   → To confirm warning text, press the OK key.
3. Set the desired value and press the OK key to confirm.
   → Value adjustment takes place simultaneously for all detected switching units.

8.4 Switching on

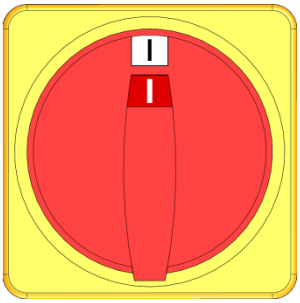


Fig. 29: Main switch

Switch on the system as follows:

1. Insert the mains cable from the Vario-5 switching unit.
2. Turn all main switches of the associated Thermo-5 and Panel-5 to position "I".

→ The device initializations are terminated.

8.4.1 Ready to operate

Switching on the system

Fig. 30: Basic screen VC1

Switch on the system as follows:

1. To select the module no., press the or key.

> *NOTICE!*
>
> *You can switch on the systems using module no. VCn, THn or TCn.*

2. Press the key.

→ The system starts in the set operating mode. If necessary, the units TH and TC are automatically filled and vented.

→ When the nominal values are reached, the set operating mode is displayed.

Setting "Nominal value ready for operation"

When the consumer is switched on, it is conditioned to the temperature set in Nom. value ready for operation. By default, Nom. value ready for operation is set to "auto". With the "auto" setting, the consumer is conditioned to the mean value of Nominal value TH and Nominal value TC. If a different starting temperature is desired, you can adjust your setting as follows:

1. Open the Nominal values menu page.
2. Set the Nom. value ready for operation parameter to the desired value.

> *NOTICE!*
>
> Nom. value ready for operation *must never be larger than* Nominal value TH*.*

8.4.2 Process operation

Process operation switching ON/OFF

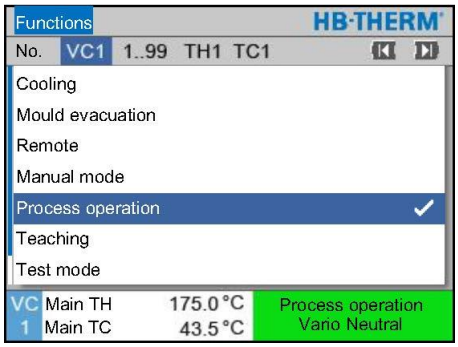


Fig. 31: Menu functions

Switch on the process operation as follows:

1. Select model No. "VCn" with ◀ or ▶.
2. Display menu page Functions.
3. Select the paramter Process operation and activate with the OK key.
   The activated function is indicated with the ✓ symbol.

→ For as long as the system is not ready, the operating mode "Process Operation" flashes.

→ As soon as the machine signals are available, switching between "Vario Heating“, „Vario Neutral“ and „Vario Cooling“ is enabled.

NOTICE!

For the pin assignment of the machine signals →page 107).

Process interruption

Process interruption is being activated automatically in case of missing machine signals. As soon as the machine signals are functional again, the operating mode changes automatically to process operation.

To define the settings for the switching valves, the nominal value TH and the nominal value TC during a process interruption, please proceed as follows:

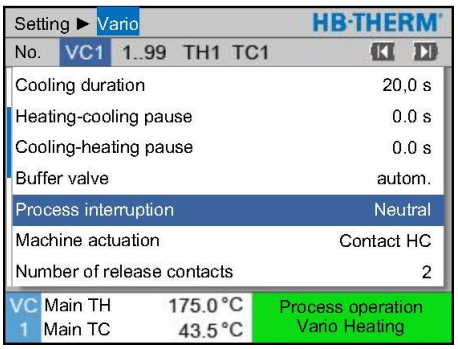


Fig. 32: Process interruption

1. Select model No. "VCn" with ◀ or ▶.
2. Display the menu page Setting \ Vario.
3. Set parameter Process interruption to the desired value according the table.

Value	Description
Neutral	Position "Vario Neutral": Nominal values for TH and TC remain unchanged
Heating	Position "Vario Heating": Nominal values for TH and TC remain unchanged
Cooling	Position "Vario Cooling": Nominal values for TH and TC remain unchanged
ISO_TH	Position "Vario Heating": Nominal value for TH corresponds to Nominal value isothermal
ISO_TC	Position "Vario Cooling": Nominal value for TC corresponds to Nominal value isothermal

4. For setting Process interruption = ISO_TH or ISO_TC:
   Set parameter Nominal value isothermal to the desired value on the menu page Nominal values.

Operation

Settings machine actuation

Set the machine signal actuation as follows:

1. Select model No. "VCn" with ⏮ or ⏭.
2. Display the menu page Setting \ Vario.
3. Set parameter Machine actuation to the desired value according the table.

Value	Description
Contact HC	Direct actuation with 2 contacts for "Vario Heating" and "Vario Cooling".
Contact H	Direct actuation with 1 contact for "Vario Heating". If the "Vario Heating" contact is open, then switching on "Vario Cooling" is enabled.
Trigger HC	Trigger actuation with 2 signals for "Vario Heating" and "Vario Cooling".
Trigger H	Trigger actuation with 1 signal for Start "Vario Heating". The times for each phase must be set manually.
Trigger C	Trigger actuation with 1 signal for Start "Vario Cooling". The times for each phase must be set manually.
Temp HC *)	Temperature-dependent trigger actuation with 2 signals for "Vario Heating" and "Vario Cooling". If the External temperature exceeds the value Nominal value mould up in "Vario Heating", the system switches to "Vario Neutral". If the External temperature falls below the value Nominal value mould down in "Vario Cooling", the system switches to "Vario Neutral".

*) Connection for external sensor required

Setting actuation times for machine "Trigger H" and "Trigger C"

If Machine actuation settings are "Trigger H" or "Trigger C", times for Heating duration, Cooling duration, Heating-cooling pause and Cooling-heating pause must be set. Set times as follows:

1. Display the menu page Setting \ Vario.
2. Set parameter Heating duration and Cooling duration to the desired value.
3. Set the parameter Heating-cooling pause for "Trigger H" or Cooling-heating pause for "Trigger C", as applicable, to the desired value.

NOTICE!

The sum of times set for Heating duration, Cooling duration and Heating-cooling pause resp. Cooling-heating pause should correspond to the cycle time (time between 2 pulse). If the sum of the set times is larger then the time between 2 pulse, the actual cycle is aborted and the new cycle starts.

Settings for Wait After Trigger (only for Machine Actuation "Trigger H" and "Trigger C")

Using Wait After Trigger, the reaction time between the trigger signal and Start "Vario Heating" or Start "Vario Cooling" can be defined. To set Wait After Trigger, please proceed as follows:

1. Select model No. "VCn" with or .
2. Display the menu page Setting \ Vario.
3. Set parameter Wait After Trigger to the desired value.

Setting Waiting Time Heating or Cooling (only for Actuation Machine "Temp HC")

Using Wait Time Heat. Temp HC, the waiting time between the trigger signal and Start "Vario Heating" can be defined.

Using Wait Time Cool. Temp HC, the waiting time between the trigger signal and Start "Vario Cooling" can be defined.

Set waiting time as follows:

1. Select model No. "VCn" with or .
2. Display the menu page Setting \ Vario.
3. Set parameter Wait Time Heat. Temp HC or Wait Time Cool. Temp HC to the desired value.

Operation

Setting nominal values

Set nominal values as follows:

> *NOTICE!*
> *The nominal values can only be set with Modul VCn and not with THn or TCn.*

1. Select model No. "VCn" with ◀◀ or ▶▶.
2. Display menu page Nominal values.
3. Set parameter Nominal Value TH and Nominal value TC to the desired value.

Limit of the nominal value

A nominal value can be adjusted at a maximum to the value of the Temperature nominal value limitation.

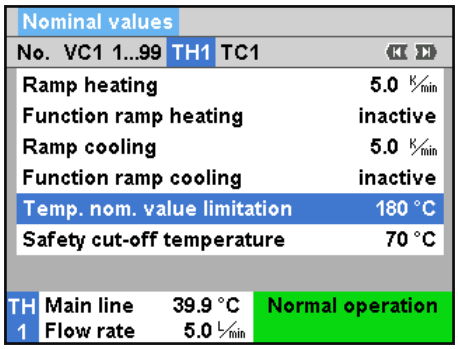


Fig. 33: Nominal value limit

Proceed as follows in order to set the tolerances:

1. Open the Nominal values menu page.
2. Set parameter Temp. nom. value limitation to the desired value.

Automatic temperature nominal value limit

Temperature nominal value limitation is automatically reduced when using different types of devices in variothermal systems. The reduction depends on the built-in safety valves.

The reduction is as follows:

Type of unit	Safety valve	Temperature nominal value limit
HB-100/140/160Z	10 bar *)	160 °C
HB-180Z	17 bar	180 °C

*) a special edition with a safety valve 17 bar instead of 10 bar (→ nameplate below additional, inscription „XA“, means special edition with appendix) for devices up to 160 °C (housing size 2 and 3).

8.4.3 Manual mode

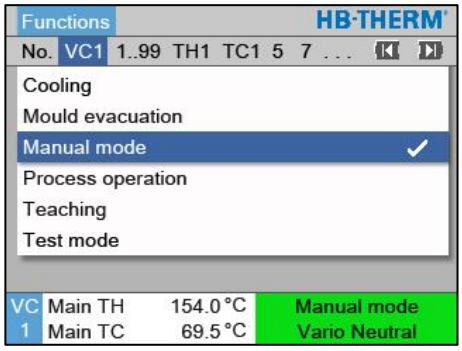


Fig. 34: Menu functions

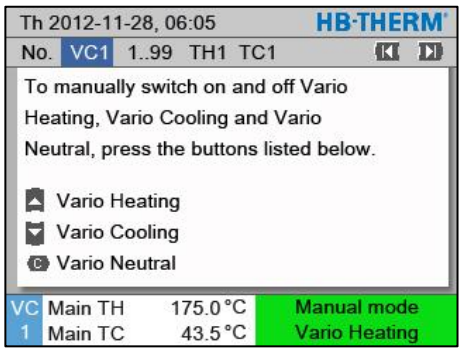


Fig. 35: Basic screen for manual mode

Switch on the manual mode as follows:

1. To select module no. "VCn", press the key or the key.
2. Open the Functions menu page.
3. Select Manual mode and press the key to activate it.
   The ✓ symbol indicates the activated function.

→ The operating mode "Manual mode" flashes, until the system is ready for operation.

→ Use the key to activate "Vario Heating", use the key to activate "Vario Cooling", and use the key to activate "Vario Neutral".

NOTICE!

"Vario Heating", "Vario Cooling" and "Vario Neutral" cannot be active simultaneously.

NOTICE!

The manual mode can only be active at a single variothermal system.

Operation

8.4.4 Test mode

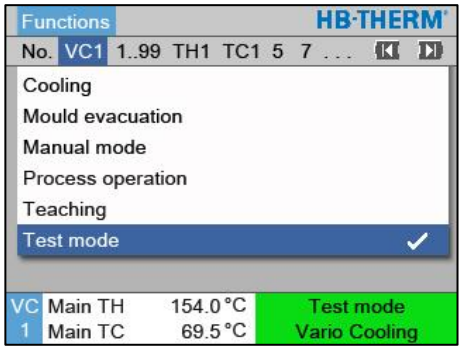


Fig. 36: Menu functions

Switch on the test mode as follows:

1. To select module no. "VCn", press the ◀ key or the ▶ key.
2. Open the Functions menu page.
3. Select Test mode and press the OK key to activate it.
   The ✓ symbol indicates the activated function.

→ The operating mode "Test mode" flashes, until the system is ready for operation.

NOTICE!

In test mode, a variothermal process can be run without machine signals and using the set durations.

Test mode settings

For the test mode, separate settings for the nominal values and durations apply. To define the parameter, proceed as follows:

1. To select module no. "VCn", press the ◀ key or the ▶ key.
2. Open the Setting \ Vario \ Test mode menu page.
3. Set the Nominal value TH test and Nominal value TC test parameters to the desired values.
4. Set the Heating test duration, Cooling test duration, Heating-cooling test pause and Cooling-heating test pause parameters to the desired values.

8.4.5 Isothermal mode

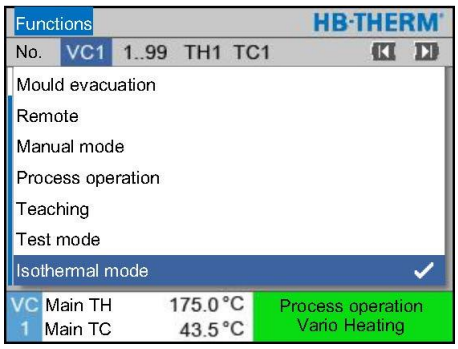


Fig. 37: Menu functions

Switch on Isothermal mode as follows:

1. Select model No. "VCn" with ◀ or ▶.
2. Display menu page Functions.
3. Select the function Isothermal mode and activate with the OK key.
   The activated function is indicated with the ✓ symbol.

→ As long as the system is not ready, the operating mode "Isothermal mode" flashes.

NOTICE!

In Isothermal mode, machine signals have no effect.

Setting nominal value isothermal

Set nominal value isothermal as follows:

1. Select model No. "VCn" with ◀ or ▶.
2. Open the Nominal values menu page.
3. Set parameter Nominal value isothermal to the desired value.

NOTICE!

The switching unit will switch to "Vario Heating" or "Vario Cooling", depending on which current nominal value of THn or TCn is closer to the Nominal value isothermal. If the intervals are identical, the unit will switch to "Vario Heating".

NOTICE!

Monitoring of the variothermal system's temperature and flow rate is not active in Isothermal mode.

Operation

8.4.6 Remote mode

In remote operation, the system is activated via the corresponding Thermo-5 or Panel-5 units.

Special features of the remote operation

With active remote operation, the system is not switched on, unless both Thermo-5 units (TH and TC) have received the "ON" command.

With active remote operation, the system is switched off, once a Thermo-5 unit (TH and TC) has received the "OFF", the "Cooling" or the "Mould evacuation" command.

NOTE!

For the pin assignment of the various interface cables → page 107.

Turn remote mode on or off

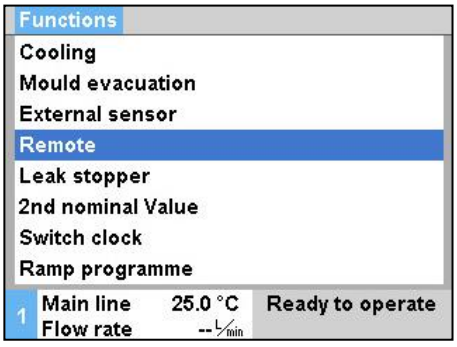


Fig. 38: Remote mode

Proceed as follows in order to switch the remote mode on and off:

1. Display menu page Functions .
2. Select the functionRemote and activate or deactivate with the OK key.

   The activated function is indicated with the ✔ symbol.

→ When the remote mode is switched on, the symbol appears on the basic display.

NOTE!

When the remote mode is active, all parameters and functions that are defined via the protocol are blocked at the unit.

Remote mode settings (additional equipment ZD, ZC, ZP, ZO)

Operation and monitoring of the temperature control unit can take place via the serial interface.

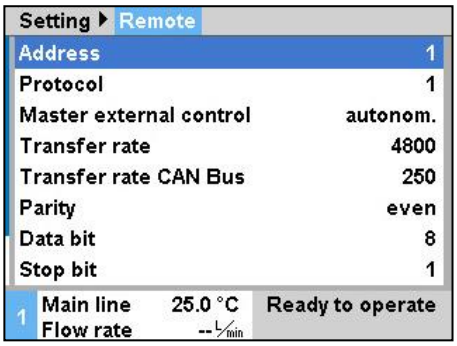


Fig. 39: Set address, protocol

The following settings must be made in order to communicate with an external controller:

1. Display the menu page Setting \ Remote operation .
2. Set parameter Address to the desired value.
3. Set parameter Protocol to the desired value.

NOTE!

A set address may only exist once in a network.

Protocol	Used for
HB	Internal communication (only use when setting is operate unit as module)
0	Recording text
1	Arburg, Billion, Bühler, Dr. Boy, Ferromatik Milacron, KraussMaffei, Negri Bossi, Sumitomo Demag, Wittmann Battenfeld, Zhafir
2	Sumitomo Demag (CAN)
4	Engel, Haitian
5	Stork
9	EUROMAP 66 (CANopen; Netstal, etc.)
14	MODBUS (RTU-Mode)
15	Profibus-DP
16	SPI (9600 8-N-1; 1. Adr. =1)

Operation

8.5 Switching off

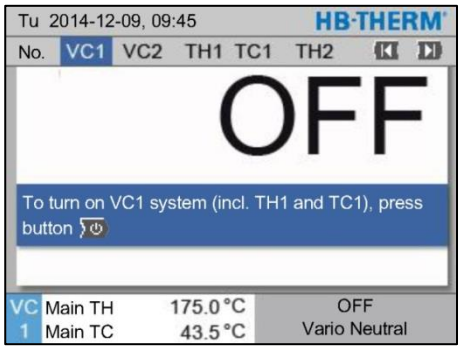


Fig. 40: Basic screen VC1

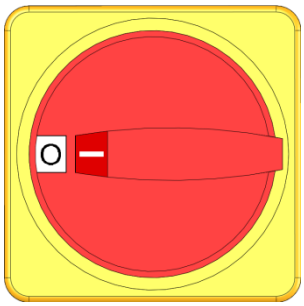


Fig. 41: Main switch

After use, switch the unit off as follows:

1. Select the Module No. with the ◀ or ▶ key.

> *NOTICE!*
> *The system can be installed under module no. VCn, THn, and TCn, respectively.*

2. Press the ⏻ key.

→ Cool the associated Thermo-5 units until the flow and return - temperature is less than the set Safety cut-off temperature.

→ Afterwards, a pressure release is carried out.

→ The associated Thermo-5 devices then switch off. In the operating mode display "OFF" is indicated.

3. Turn all main switches of the associated Thermo-5 and Panel-5 to position "0".
4. Connect the mains plug of the changeover unit to the variothermal temperature control.

8.5.1 Cooling down and switching off

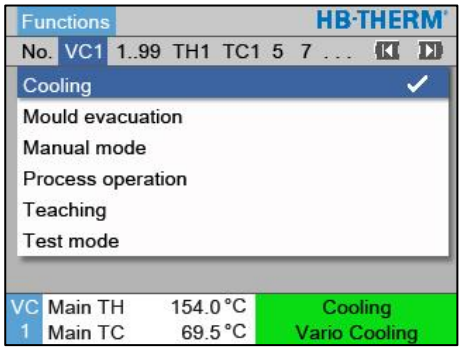


Fig. 42: Switch on cooling

Switch on cooling as follows:

1. To select module no. "VCn", press the ◀ key or the ▶ key.
2. Open the Functions menu page.
3. Select the Cooling parameter and press the OK key to activate it.
   The activated function is indicated with the ✓ symbol.

→ The switching unit switches to "Vario Cooling" and the associated Thermo-5 units cool down to the set Cooling temperature. Then a pressure release is carried out.

> *NOTICE!*
> *If the Mould evacuation function is activated after activating the Cooling function, the system carries out a mould evacuation before the system is switched off.*

8.5.2 Mould evacuation

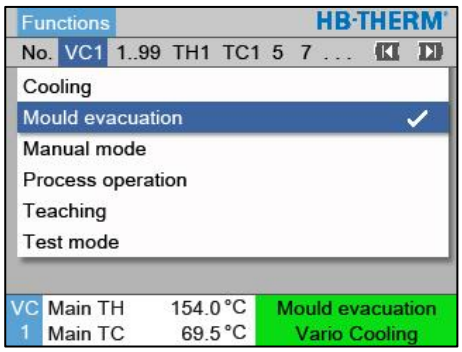


Fig. 43: Switch on mould evacuation

Switch on mould evacuation as follows:

1. To select module no. "VCn", press the ◀◀ key or the ▶▶ key.
2. Open the Functions menu page.
3. Select the Mould evacuation parameter and press the OK key.
   The ✓ symbol indicates the activated function.

→ Before mould evacuation is started, the associated Thermo-5 units are cooled down to 70°C.

→ The switching unit switches to "Vario Cooling" and the consumer and feed lines are evacuated by suction and depressurised.

→ Finally the system switches off.

NOTICE!

Check pressure for 0 bar before opening connections between switching unit and consumer.

8.6 Emergency stop

In dangerous situations, the unit must be stopped as quickly as possible and the power supply switched off.

Emergency stop

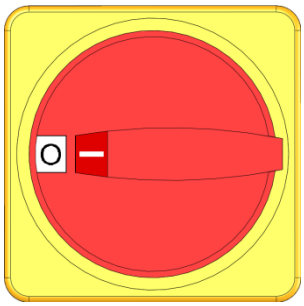


Fig. 44: Main switch

Proceed as follows in a hazardous situation:

1. Turn the main switches on all associated Thermo-5 and Panel-5 devices to position "0".
2. Disconnect the plugs on all associated Thermo-5 and Panel-5 devices and on the switching unit for or disconnect the voltage on all poles and secure against reconnection.
3. If necessary, bring people out of the danger area and carry out first-aid.
4. If necessary, alert a doctor and the fire brigade.
5. Inform the responsible person on site.

After rescue measures

6. If required by the severity of the emergency, inform the responsible authorities.
7. Commission qualified personnel to do the fault rectification.

WARNING!
Danger of fatal injury from premature restart!

On restarting there is a danger of fatal injury for people in the danger area.

Therefore:

– Before restarting, ensure that there are no persons in the danger area.

8. Before recommissioning, check the unit for perfect functioning.

8.7 Define access rights

8.7.1 Set user profile

Function

In order to avoid operating error and to improve clarity, menus, functions and parameters are suppressed corresponding to the set user profile.

Differentiating user profiles

A differentiation is made between the following user profiles.

User profile	Code	User/Characteristic
Standard	S	For the standard user
Enhanced	E	For the machine setter
Support	U	For the manufacturer and service personnel authorised by them

Set user profile

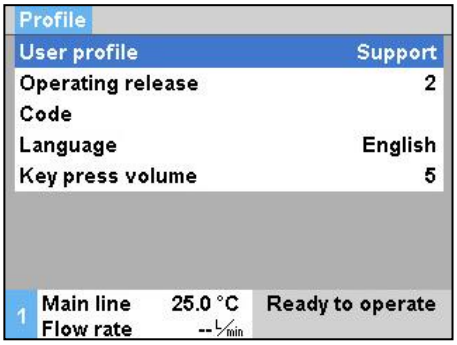


Fig. 45: User profile

The user profile can be set as follows:

1. Display menu page Profile .
2. Select parameter User profile.
3. Enter access code.
4. Set desired user profile.

Operation

8.7.2 Set operating release

Function

With the operating release level, it is determined which functions or values can be changed. If it is attempted to change locked values, a corresponding warning text appears on the display.

Levels of operating release

Level	Operating release
0	No access
1	Access to functions
2	Access to nominal values
3	Access to settings and monitoring
4	Access to service

Once-only operating release

1. Select locked parameter and press the OK key, warning text appears on the display.
2. Press the OK key.
3. Enter access code.

> *NOTE!*
>
> *The once-only operating release is valid until the basic display reappears.*

Permanent operating release

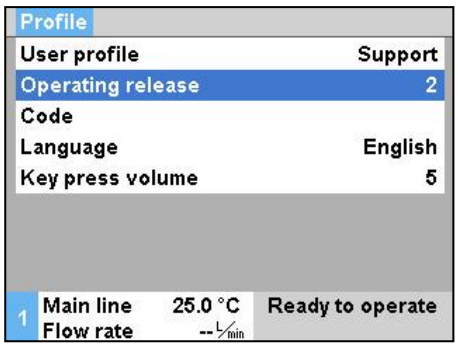


Fig. 46: Operating release

1. Display menu page Profile .
2. Select parameter Operating release and press the OK key.
3. Enter access code.
4. Set parameter Operating release to the desired value.

8.7.3 Change access code

The access code is a four-digit numeral and comprises the numbers *1*, *2*, *3* and *4.*

When the unit is delivered, the access code is *1234.*

NOTE!

For protection against misuse of the unit, change the access code immediately after commissioning.

If the current code is lost, please contact the nearest HB-Therm representative.

Change access code

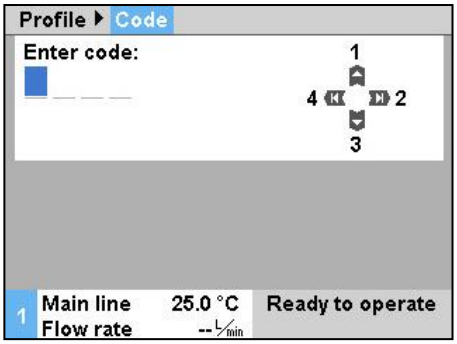


Fig. 47: Enter code

To change the access code:

1. Display menu page Profile .
2. Select the parameter Code and press the OK key.
3. Enter existing access code.
4. Enter new access code.
5. Confirm new access code.

8.8 Settings

8.8.1 External sensor

Pre-selection of external sensor type

The external sensor type is set as follows:

1. Open theSettings \ Miscellaneous menu page.
2. Set the Sensor type external sensor parameter to the connected sensor type.

NOTICE!

On variothermal systems, the external sensor is used for temperature indication only.

NOTICE!

For the pin assignment cable → page 105.

8.8.2 Switching unit buffer

The switching unit buffer activation is set to "auto" by default. If the activation is not to be carried out automatically, set as follows:

1. To select module no. "VCn", press the key or the key.
2. Open the Setting \ Vario menu page.
3. Set the Buffer valve parameter to "close" or "open".

NOTICE!

With short cycle times (i.e. <20 s), it might be useful to set the Buffer valve parameter to "close".

8.8.3 Output signal function

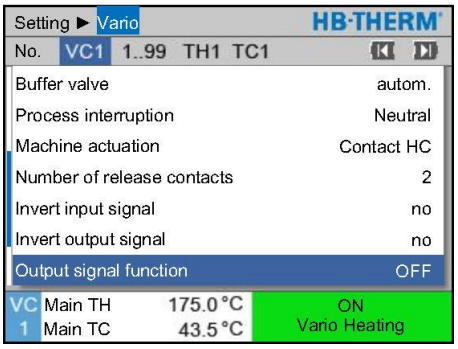


Fig. 48: Output signal function

Using the Output signal function, various signals can be defined through the digital outputs Output 1 and 2 (→ page 107).

To set the Actuation Output Signal, please proceed as follows:

1. Select module No. "VCn" using button ◀ or ▶.
2. Display the menu page Setting \ Vario.
3. Set parameter Output signal function to the desired value according the table.

Value	Description
OFF	No actuation
OUT H/C	Position "Vario Heating": Output 1 actuated
	Position "Vario Cooling": Output 2 actuated
	Position "Vario Neutral": No actuation
Release *)	Temperature Nominal value mould up reached: Output 1 actuated until the following pulse signal Cooling is recognised.
	Temperature Nominal value mould down reached: Output 2 actuated until the following pulse signal Heating is recognised.

*) only for setting Machine actuation = Temp HC (→ page 58)

8.8.4 Variothermic system (VC) active / inactive via external contact

The Variotherme system (VC) can be switched to active or inactive via an external contact. The parameter Status VC via Ext. Contact is set to "OFF" by default. To activate the active / inactive state via Ext. Proceed as follows to set the contact:

1. Select model No. "VCn" with or .
2. Display the menu page Setting \ Remote.
3. The parameter Status VC via Ext. Contact is set to "ON".

Value	Description
OFF	Function switched off
ON	Function switched on When contact is open, the system is active; when contact is closed, the system is inactive.

NOTICE!

For the pin assignment cable → page 107.

8.8.5 Positioning change-over valve

The positioning of the change-over valves when inactive is set to "Neutral" by default. Proceed as follows in order to change the positioning:

1. Display the menu page Setting \ Vario.
2. Set the parameter Position when inactive to "Heating" or "Cooling".

8.8.6 Setting time zone, date and time

Set time zone

By default, date and time of the unit are set to Central European Time (CET) at delivery. To accommodate for different time zones, date and time must be set manually before commissioning. In this case, please proceed as follows:

1. Open the Setting \ Date / Time menu page.
2. Set the Time zone parameter to the appropriate time zone.

Set date and time

If the required time zone is not available in the parameter list, date and time will have to be set as follows:

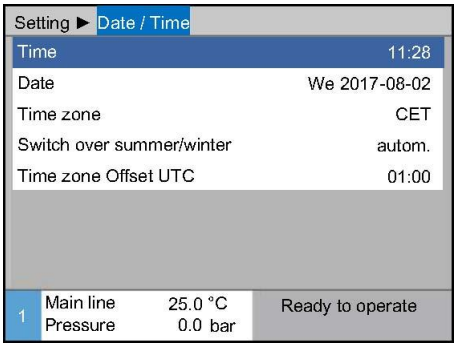


Fig. 49: Setting date / time

1. Open the Setting \ Date / Time menu page.
2. Set the Time parameter to the appropriate value.
3. Set the Date parameter to the appropriate value.

NOTICE!

If the required time zone is not available, then switching between summer and winter time will have to be done manually.

Set switching to summer and winter time

For the selectable time zones, switching between summer and winter time is done automatically.

Set the following to suppress the automatic switch:

1. Open the Setting \ Date / Time menu page.
2. Set the Switch to summer/winter parameter to "manual".

Operation

8.8.7 Setting the switch clock

Function

With the switch clock, the system can be switched on and off at pre-programmed times and days.

Turn switch clock on or off.

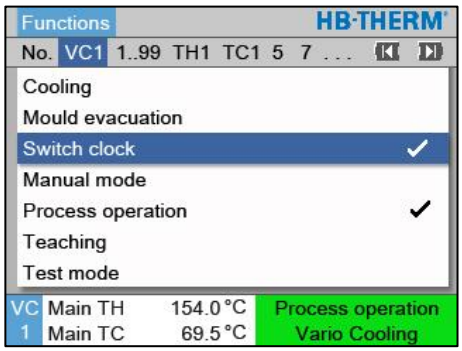


Fig. 50: Turn switch clock on or off.

Proceed as follows to turn the switch clock on or off:

1. To select module no. "VCn", press the ◀ key or the ▶ key.
2. Open the Functions menu page.
3. Select Switch clock and press the OK key to activate it.
   The activated function is indicated with the ✓ symbol.

→ As soon as the set switch-on or switch-off time has been reached, the system automatically switches on or off.

→ The active switch clock is indicated with the 🕐 symbol on the basic display.

Programme switch-on and switch-off times

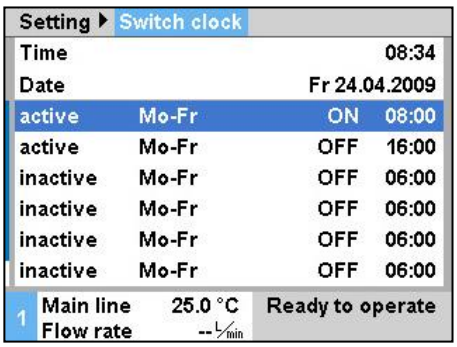


Fig. 51: Switch clock settings

Proceed as follows in order to programme the switch-on and switch-off times for one day:

1. Display the menu page Setting \ Switch clock.
2. Set parameter Day to the desired day(s).
3. Set parameter Switch time to the desired time for the selected day.

NOTE!

If a day is set to "inactive", the programmed switch time has no effect. If all days are set to "inactive", the function Switch clock will not be displayed on the Functions menu page.

8.9 Functions

8.9.1 Teaching

With the function Teaching, using different assistants, specific varioterm parameters can be automatically determined.

Start function Teaching

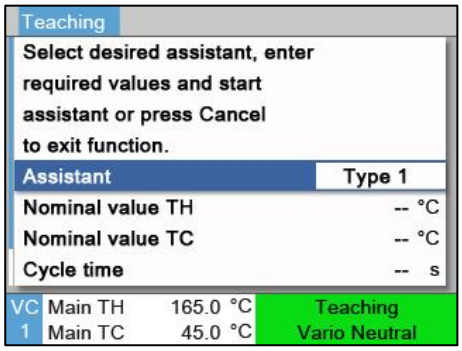


Fig. 52: Choose assistant

Proceed as follows in order to activate the function Teaching:

1. Select model No. "VCn" with ◀ or ▶.
2. Display menu page Functions.
3. Select the paramter Teaching and activate with the OK key. The activated function is indicated with the ✓ symbol.

→ For as long as the system is not ready, the operating mode "Teaching" flashes.

4. Select the desired Assistant in the input filed and cofirm with the OK key.
5. Choose all parameters shown in black with the OK key and set to the desired value. Confirm with the OK key.

NOTICE!

Depending in the chosen assistant the input may differ.

6. Choose Start assitant and confirm with the OK key. Use Cancel to stop the function Teaching.

→ Teaching starts. Follow indications on screen.

Operation

Types of assistants

Five types of assistants are available. However, types 4 and 5 are combinations of types 1, 2 and 3. The selection depends on the existing basic requirements of the application involved.

Type	Designation	Short description	Necessary input	Calculated parameter
1	Only dry running condition, without external sensor connected	Decision on the delay time at the open mould, if there is only a hand thermometer available.	Nominal value TH Nominal value TC Cycle time	Reaction time
2	Only dry running condition, with external sensor connected	Decision on the typical values at the open mould.	Nominal value mould up Nominal value mould down Cycle time	Reaction time Nominal value TH Nominal value TC
3	Set/adjust only time lapse	Determination of the switching times depending on the machine cycle during production.	Nominal value TH Nominal value TC Nominal value isothermal Reaction time	Wait After Trigger Heating duration Cooling duration Heating-cooling pause Cooling-heating pause Machine actuation
4	Dry running operation and setting of time lapse without a connected external sensor.	Combination type 1 and 3	Nominal value TH Nominal value TC Cycle time Nominal value isothermal	Reaction time Wait After Trigger Heating duration Cooling duration Heating-cooling pause Cooling-heating pause Machine actuation
5	Dry running operation and setting of time lapse with a connected external sensor.	Combination type 2 and 3	Nominal value mould up Nominal value mould down Cycle time Nominal value isothermal	Reaction time Nominal value TH Nominal value TC Wait After Trigger Heating duration Cooling duration Heating-cooling pause Cooling-heating pause Machine actuation

NOTICE!

More detailed information can be obtained from HB-Therm representatives, in the “Process Description" (O8352-X, X = language) manual (→ www.hb-therm.ch).

8.10 Process monitoring

8.10.1 Limit value monitoring

Function

After each unit start-up, the limit values for process monitoring are automatically determined and set in the standard settings according to the set monitoring level.

NOTICE!

If the limit values have not been set, the operating mode indicator flashes green.

Cancelling monitoring

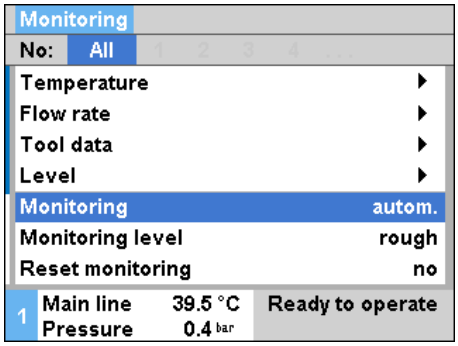


Fig. 53: Monitoring

If automatic limit value calculation is not desired, make the following setting:

1. Open menu page Monitoring.
2. Set parameter Monitoring to "manual" or "OFF".

NOTICE!

If monitoring is set to "OFF", the process will not be monitored. This can lead to unnecessary connections.

Operation

Reset monitoring

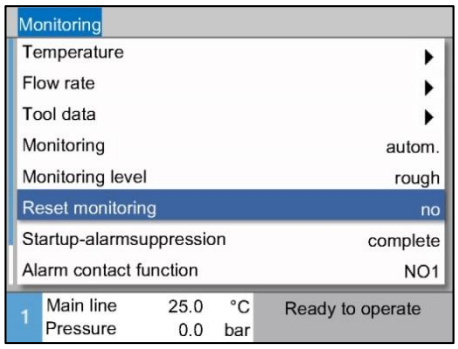


Fig. 54: Reset monitoring

Proceed as follows in order to automatically adjust the limit values during operation:

1. Open menu page Monitoring.
2. Set parameter Reset monitoring to "yes".
3. Press the key OK.

NOTICE!

Limit values that are set to "OFF" will not be adjusted.

Set monitoring level

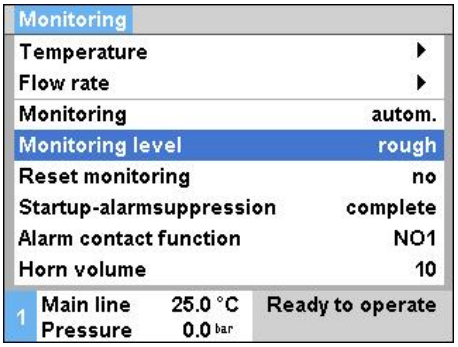


Fig. 55: Monitoring level

The tolerance range is determined with the parameter Monitoring level and can be adapted as follows:

1. Display menu page Monitoring.
2. Set parameter Monitoring level to "fine", "middle" or "rough".

The limit values for temperature and flow rate are calculated according to the following table:

Designation	Monitoring level						Basis
	fine		middle		rough		
	Factor	min	Factor	min	Factor	min	
Upper dev. nominal/actual	1.5	5 K	2	10 K	2.5	20 K	max. deviation during "Vario Cooling"
Lower dev. nominal/actual	1.5	5 K	2	10 K	2.5	20 K	max. deviation during "Vario Heating"
Flow rate internal max.	1.2	-	1.4	-	1.7	-	max. flow rate during "Vario Heating" resp. "Vario Cooling"
Flow rate internal min.	0.8	0.5 L/min	0.6	0.5 L/min	0.3	0.5 L/min	min. flow rate during "Vario Heating" resp. "Vario Cooling"

8.11 Explorer window

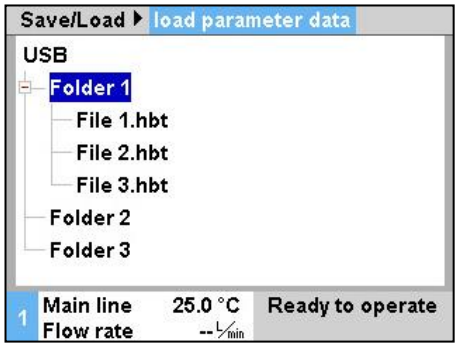


Fig. 56: Example Explorer window

The Explorer window displays the directories and files on the inserted USB data carrier.

- Directories with ⊞ are opened with the ▶▶ key.
- Directories with ⊟ are closed with the ◀◀ key.

NOTE!

Depending on the number of files and directories on the USB data carrier, it can take several minutes before the directory structure is displayed.

NOTE!

From the operating panel it is not possible to create, delete or process directories on the USB data carrier.

8.12 Save/Load

Function

With the menu page Save/Load, various data can be saved to a USB data carrier or loaded from a USB data carrier. With this function, it is possible to transfer data from one unit to another unit.

In case of failure, the service information can be stored on an USB device for fault diagnosis by a representative of HB-Therm.

WARNING!
Damage due to wrong settings!

Loading wrong parameter or configuration data can lead to malfunction or total breakdown.

Therefore:

– Only load data that is intended for the unit.

NOTICE!

The relevant user profile is saved in the file when saving the parameter.
During the subsequent charging, only the relevant parameter with the profile saved and its subordinates is charged.

NOTICE!

Only FAT32 formatted USB data carriers are supported.

Saving data

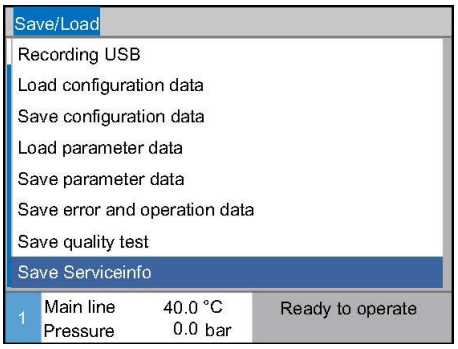


Fig. 57 Saving data

Proceed as follows in order to save data from the unit to a USB data carrier:

1. Display menu page Save/Load.
2. Connect USB data carrier to front connector.
3. Select the data to be saved and confirm with the OK key.
4. In the Explorer window, select the directory and confirm with OK.

→ The file is saved to the selected directory on the USB data carrier.

NOTICE!

Saving service information includes all service relevant data (configuration-, parameter etc.) that are necessary for a fault diagnosis.

Loading data

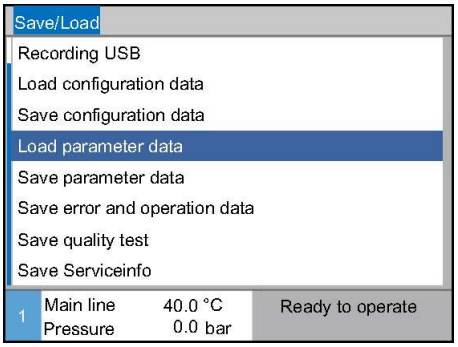


Fig. 58 Loading data

Proceed as follows in order to load data to the unit from a USB data carrier:

1. Display menu page Save/Load.
2. Connect USB data carrier to front connector.
3. Select the data to be loaded and confirm with the OK key.
4. In the Explorer window, select the directory and file and confirm with OK.

→ The data is loaded to the unit. If loaded values are outside the permissible range, then these are reset to the standard settings.

File name

The unit automatically creates file names on the USB data carrier according to the following examples:

Serviceinfo

Exa. **Serviceinfo_2017-03-10_15-26-08**

Time
Date

Configuration data

Exa. **HBVC 180 1 [1].csv**

Index [1]
Address
Max. operating temperature

Parameter data

Exa. **Par HBVC 180 1 [1].csv**

Index [1]
Address
Max. operating temperature

Error and Operation data

Exa. **BD HBVC 180 1 [1].csv**

Index [1]
Address
Max. operating temperature

[1]An index will be automatically added if the file name already exists.

8.12.1 Recording actual data

Function

When the Record USB function is activated, the values selected in Setting \ Recording USB are written to the USB data carrier.- A new recording file is created each day. If saving to the USB data carrier is not possible, a corresponding warning is displayed.-

Start recording

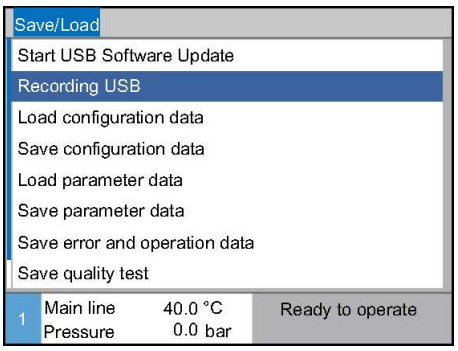


Fig. 59: Recording USB

Proceed as follows to start recording actual data to a USB data carrier:

1. Display menu page Save/Load.
2. Connect USB data carrier to front connector.
3. Select the Recording USB function and confirm with the OK key.

   The function activated is indicated with the ✔ symbol.

→ The data is saved to the USB data carrier.

→ The active Recording USB is indicated with the ● symbol on the basic display.

Stop recording

Proceed as follows to stop an active recording:

1. Display menu page Save/Load.
2. Select the Recording USB function and confirm with the OK key.

→ The USB data carrier can be removed.

Set recording interval

Proceed as follows to set the recording interval:

1. Display the menu page Settings \ Recording USB
2. Set parameter Cycle serial recording to the desired value.

NOTICE!

If the desired recording interval is not possible, recording will be made at the fastest possible interval.

Select values

Proceed as follows to choose the values to be recorded:

1. Display the menu page Settings \ Recording USB
2. Select the desired value and confirm with the OK key.

   The active value is indicated with the ✔ symbol.

NOTICE!

You may choose as many values as you like.

NOTICE!

When the Recording USB function is activated and/or deactivated at module no. VCn, recording for THn and TCn is also activated and/or deactivated.

File name

For each unit, a separate directory is created on the USB storage medium into which the recording files are written.

Exa. **HB_Data_00001234**

VFC ID

The unit automatically creates file names on the USB storage medium according to the following examples:

Exa. **HBVC180_00001234_20100215_165327.csv**

Time
Date
VFC ID
Unit Type

NOTICE!

For VFC-ID, refer to Display \ Variothermal system.

Visualize the data recorded

To visualize and prepare the actual data recorded, the VIP (Visualisation programme – Recording of actual values) software can be downloaded from www.hb-therm.ch.

9 Maintenance

9.1 Safety

Personnel

- Maintenance tasks described here can be performed by the operator, unless otherwise indicated.
- Some maintenance tasks must only be carried out by qualified personnel or by the manufacturer exclusively. If this is required, it is pointed out separately in the description of the respective faults.
- As a rule, work on the electrical system must only be carried out by certified electricians.
- Work on the hydraulic system must only be carried out by qualified hydraulics technicians.

Personal protective equipment

Wear the following protective equipment for all maintenance/repair work:

- Safety goggles
- Protective gloves
- Safety shoes
- Protective clothing

NOTE!

For specific work, the warning notices in this chapter draw special attention to further protective equipment.

Special dangers

The following dangers exist:

- Danger of fatal injury by electric current.
- Risk of burns due to hot materials.
- Risk of burns due to hot surfaces.
- Danger of crushing due to rolling away or tipping.

Maintenance / repair work carried out improperly

WARNING!

Danger of injury due to maintenance / repair work carried out improperly!

Improper maintenance / repair work can lead to severe personal injury or material damage.

Therefore:

– Before starting work, ensure that there is sufficient space for assembly.

– When assemblies are removed, observe correct assembly, re-assemble all fixing elements and observe screw torque specifications.

9.2 Opening the unit

The unit has to be opened for specific maintenance work.

- Only to be carried out by a specialist or instructed person.
- Necessary tools:
  - Hexagon or flat-bladed screwdriver.

WARNING!
Safety risk due to wrongly mounted or missing insulation!

Wrongly mounted or missing insulation can lead to overheating or total breakdown.

Therefore:

– Remount all insulation correctly.

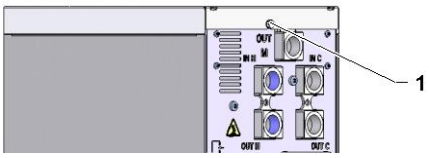


Fig. 60: Loosen screws

1. Use a screwdriver to loosen the screw in the cover plate.

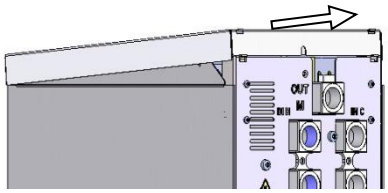


Fig. 61: Remove cover plate

2. Pull the cover plate approx. 1 cm to the rear and lift off by pulling it upwards.

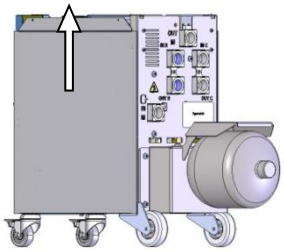


Fig. 62: Pull side plate upwards

3. Pull the side plate slightly upwards.

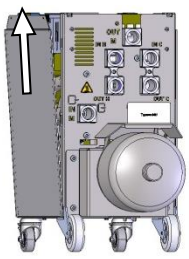


Fig. 63: Pull out the side plate

4. Pull the side plate out of the securing straps at a slightly upward angle and remove it.

Maintenance

9.3 Maintenance schedule

The next paragraphs describe the maintenance work necessary for optimum and trouble-free operation.

If, during regular checks, increased wear is detected, then the required maintenance intervals are to be reduced corresponding to the actual signs of wear.

For questions concerning maintenance work and intervals, please contact the HB-Therm representative (→ www.hb-therm.ch).

The pump, heating and cooler components are subject to the integrated maintenance interval.
The progress of the upcoming maintenance work is displayed under Display \ Actual value in percent. If one of these maintenance intervals reaches 100 %, the symbol in the standard display will indicate that maintenance is required.
After doing maintenance work, reset the corresponding maintenance interval under Display \ Actual value with the OK key.

Interval	Assembly / Component	Maintenance work	Carried out by
quarterly or ~1000 hrs	Screw connectors	Check for firm seating and damage	Operator
		If necessary tighten or replace	Operator
	Seals	Check for damage	Operator
		Replace if necessary	Operator
	Filter electrical part	Check for contamination	Operator
		If necessary clean or replace	Operator
half-yearly or ~2000 hrs	Valves	Check for contamination.	Qualified personnel
		If necessary, clean or replace.	
Every 1½ years or ~6000 hrs	Hydraulic hoses	Check for damage on outer sheath and in the sealing area	Hydraulically skilled person
		Replace if necessary	Hydraulically skilled person
	Electrical wiring	Check electrical wiring for damage to outer sheath.	Electrically skilled person
		Replace if necessary	Electrically skilled person
	Accumulator	Check accumulator preload (→ page 89).	Hydraulically skilled person
	Fan electrical part	Check for contamination	Electrically skilled person
		If necessary clean or replace	Electrically skilled person
		Test functionality	Electrically skilled person

1) The maintenance of external hoses is to be carried out according to the manufacturer's instructions.

9.4 Maintenance tasks

9.4.1 Cleaning

CAUTION!
Risk of burns due to hot surfaces!

Contact with hot parts can cause burns.

Therefore:

– Wait for the unit to cool down, depressurise it and switch it off.

– Before carrying out any work, ensure that all parts have cooled down to ambient temperature.

Clean the unit under the following conditions:

- Only clean the outer parts of the unit with a soft, moist cloth.
- Do not use any aggressive cleaning agents.

9.4.2 Accumulator

Checking the accumulator preload

- Only to be carried out by a specialist.

Necessary equipment

- Accumulator test equipment

Procedure

1. Switch off the system using the Cooling and Mould evacuation functions.
2. The pressure gauges at THn and TCn must indicate 0 bar +0,3 bar.
3. Check if the pressure accumulator has a temperature of 20°C ±5 K.
4. Connect the test equipment to the accumulator to check the preload. Refer to the test equipment operating manual.

→ If the preload is < (value on rating plate – 0,5 bar), the accumulator must be recharged with nitrogen according to the test equipment operating manual.

5. Remove test equipment.

Maintenance

9.4.3 Software update

NOTICE!

The software on the modular unit Thermo-5, flow rate meter Flow-5 or switching unit Vario-5 is automatically brought to the same status as the software on the operating module Panel-5 or the singular unit Thermo-5.

To install a new application program on the connected products Thermo-5 temperature control unit, Flow-5 flow rate meter or Vario-5 switching unit, proceed as follows:

NOTICE!

The "gba03Usr.upd", "SW51-1_xxxx.upd" or "SW51-2_xxxx.upd" software must be in the root of the data carrier. It may not be stored in a folder.

NOTICE!

During the software update, the Thermo-5 unit or the Panel-5 control model and all products connected to them may not be switched off.

Necessary tools:

- USB data carrier with the current software

→ The latest software can be acquired from the HB-Therm representative (→ www.hb-therm.ch).

NOTICE!

Only USB data carriers in FAT32 format are supported.

Run software update

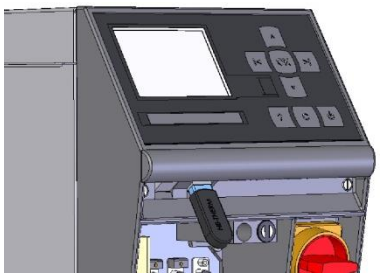


Fig. 64: Connect USB data carrier

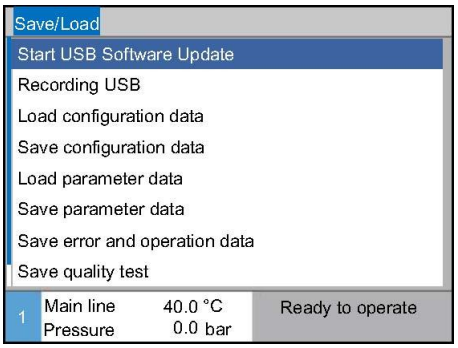


Fig. 65: Start USB software update

1. Switch on main switch.
2. Connect USB data carrier (Fig. 64).
3. Display menu page Profile.
4. Set parameter User profile to "Enhanced".
5. Display menu page Save/Load.
6. Select function Start USB Software Update and confirm with the OK key.

→ The data is loaded from the USB data carrier to the memory in the USR-51. Do not disconnect the USB connection.

→ Conclusion of data transfer is indicated on the display. The USB connection can now be disconnected.

→ The new software is written to the USR-51 flash. On completion, an automatic restart is initiated.

7. If required, the USB connection must be re-established to install further data.

→ If necessary, the new software is written to the connected GIF-51, DFM-51 or VFC-51 after the restart. This process can take a few minutes. On completion, another restart takes place.

→ The message *Ready to operate* appears on the display.

Checking the software version

1. In the basic display, press the ? key.

→ The current software version appears at the top right.

9.4.4 Gain access to components

To gain access to components and to replace these, if necessary, the unit must first be opened (→ page 87).

Electric current

DANGER!
Danger of death by electric current!

Live parts are dangerous. Contact with high voltages causes injury or death. Damaged insulation or components can cause injury or death.

Therefore:

- In case of damage of the insulation of the power supply, switch off immediately and arrange repair.
- Work on the electrical system must only be carried out by certified electricians.
- For all work on the electrical system, for maintenance, cleaning or repair work, disconnect from the mains or disconnect all phases of the external power supply and secure them against being switched on again. Check unit is isolated from power supply.
- Do not by-pass or disable fuses. Comply with the correct ampere when changing fuses.
- Keep away humidity from live parts. This could cause a short circuit.

Circuit board VFC-51

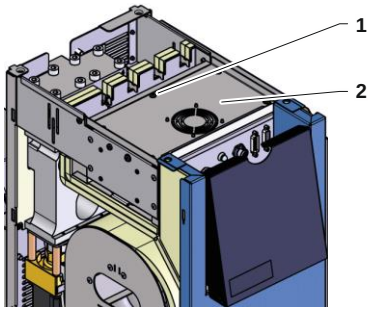


Fig. 66: Access board

1. Disconnect the mains plug from the mains supply.
2. Remove the screws (1) from the electrical part and then lift the cover (2).
3. Disconnect fan cable from VFC-51 and remove cover (2).

Filter electrical part

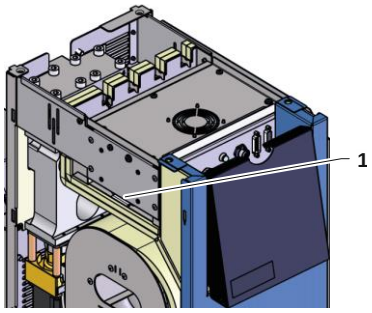


Fig. 67: Access filter

1. Extend retaining plate (1) with filter sideways.
2. Remove filter from retaining plate.

10 Faults

The following chapter describes possible causes of malfunctions and what to do to remove them.

In the case of increased disturbances, reduce the maintenance intervals according to the actual burden.

In the case of faults, which can not be remedied by the following instructions, contact the HB-Therm representative (→ www.hb-therm.ch). For error diagnoses, service information can be saved to a USB data carrier and sent to the HB-Therm representative (→ page 82).

10.1 Safety

Personnel

- Tasks for troubleshooting described here can be performed by the operator, unless otherwise indicated.
- Some tasks must only be carried out by qualified personnel or by the manufacturer exclusively. If this is required, it is pointed out separately in the description of the respective faults.
- As a rule, work on the electrical system must only be carried out by certified electricians.
- Work on the hydraulic system must only be carried out by qualified hydraulics technicians.

Personal protective equipment

Wear the following protective equipment for all maintenance/repair work:

- Safety goggles
- Protective gloves
- Safety shoes
- Protective clothing

NOTE!

For specific work, the warning notices in this chapter draw special attention to further protective equipment.

Special dangers

The following dangers exist:

- Danger of fatal injury by electric current.
- Risk of burns due to hot materials.
- Risk of burns due to hot surfaces.
- Danger of crushing due to rolling away or tipping.

Maintenance / repair work carried out improperly

WARNING!

Danger of injury due to maintenance / repair work carried out improperly!

Improper maintenance / repair work can lead to severe personal injury or material damage.

Therefore:

– Before starting work, ensure that there is sufficient space for assembly.
– When assemblies are removed, observe correct assembly, re-assemble all fixing elements and observe screw torque specifications.

In case of faults:

The following general rules apply:

1. In the event of faults that pose immediate danger to man or machine, activate the emergency shutoff function immediately.
2. Determine cause of fault.
3. If elimination of the fault requires working in the danger zone, switch off unit and secure against being switched on again.
4. Immediately inform the person in charge at the equipment location of the fault.
5. Depending on the type of fault, eliminate the fault or have it eliminated by an authorized specialist.

NOTE!

The chapter "Troubleshooting" below provides information on who is authorised to eliminate the fault.

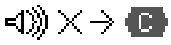
10.2 Fault indications

10.2.1 Fault indication display

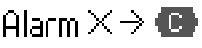
Level	Characteristic	Display	Acknowledgement
1	Limit values have been exceeded. This has no influence on the operational safety of the unit.	yellow	not compulsory
3	Limit values have been exceeded. This has a direct influence on the operational safety of the unit.	red	compulsory

On faults of alarm levels 3:

→ Horn and alarm contact (additional equipment ZB) are activated.

→  is displayed in the symbol field.

1. Acknowledge horn with the  key.

→  is displayed in the symbol field.

2. Identify the cause of the fault. If required, contact the HB-THERM representative (→ www.hb-therm.ch).

3. Press the  key to acknowledge the alarm.

10.3 Determine the cause of a fault

Cause of a fault

Proceed as follows to identify the possible causes for a current fault indication:

1. Press the  key to display the online help for the pending fault indication.

Fault overview

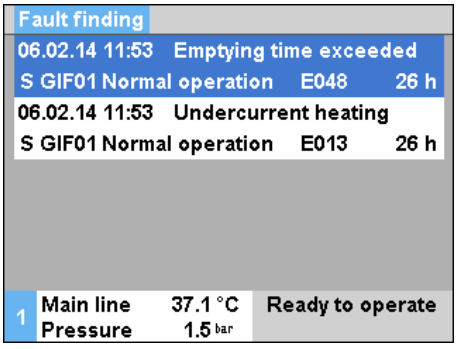


Fig. 68: Logbook Alarms

You can display the last 10 fault indications that occurred as follows:

1. Open the Fault finding menu page.

→ The fault indications overview is displayed. Fault indications marked with "S" occurred during the start-up phase of the temperature control unit.

2. Select desired fault indication.

3. Press the  key.

→ The online help is displayed for the selected fault indication.

10.4 Troubleshooting chart

Fault	Possible cause	Rectification	Rectified by
Upper temperature deviation	Upper dev. nominal/actual parameter too low	Increase Upper dev. nominal/actual parameter.	Operator
	Regulation parameter not optimally set.	Optimise regulation parameter.	Qualified personnel
	Cooling valve 1 or cooling valve 2 at Thermo-5 defective	Check cooling valve 1 or cooling valve 2 at Thermo-5. Replace, if necessary.	Qualified personnel
Lower temperature deviation	Parameter Lower dev. nominal/actual set too low.	Increase parameter Lower dev. nominal/actual.	Operator
	Regulation parameter not optimally set	Optimise regulation parameter.	Qualified personnel
	Heating capacity is insufficient.	Check required heating capacity at Thermo-5.	Qualified personnel
		Check heater at Thermo-5. Replace, if necessary.	
Main line temperature deviation	Units assigned incorrectly	Correct unit assignment.	Operator
	Units connected incorrectly	Connect units correctly to switching unit	Qualified personnel
	Filter in main or return line contaminated	Clean filter in main or return line.	Qualified personnel
Flow rate too low	Flow rate min. parameter set too high.	Reduce Flow rate min. parameter.	Operator
	Filter in main or return line at Thermo-5 contaminated	Clean filter in main or return line at Thermo-5.	Qualified personnel
	Consumer blocked	Check consumer. Clean as necessary.	Qualified personnel
Flow rate too high	Flow rate max. parameter too low	Increase Flow rate max. parameter.	Operator
Overtemperature electronic part	Ambient temperature too high	Control ambient temperature	Operator
	Filter electrical part soiled	Clean filter electrical part	Operator
	Ventilator cable unplugged or ventilator defective	Plug in ventilator cable or replace ventilator	Electrically skilled person
	Circuit board VFC-51 or compensation sensor defective	Replace circuit board VFC-51 or compensation sensor	Electrically skilled person
Communication disrupted module	Control cable disconnected or defective	Connect or replace control cable	Operator
	Mains supply switching unit interrupted	Check mains supply	Electrically skilled person

10.5 Startup after eliminating fault

After remedying the fault, the following steps should be taken to re-start the system:

1. Reset the Emergency Off devices.
2. Acknowledge the fault at the control unit.
3. Ensure that no one is in the danger zone.
4. Start up in accordance with the instructions in the "Operating" chapter.

11 Disposal

11.1 Safety

Personnel

- Disposal must only be carried out by qualified personnel.
- Work on the electrical system must only be carried out by certified electricians.
- Work on the hydraulic system must only be carried out by qualified hydraulics technicians.

11.2 Disposal of materials

Once the end of the useful life has been reached, the unit must be disposed of in an environmentally compatible manner.

As long as no return or disposal agreement was made, dismantled constituent parts are to be recycled:

- Metals should be scrapped.
- Plastic elements should be passed on for recycling.
- Other materials should be sorted and disposed of according to material composition.

ATTENTION!
Environmental pollution on wrong disposal!

Electrical waste, electronic components, grease and other additives are subject to the treatment of special refuse and may only be disposed of by approved specialised companies.

The local authority or specialised disposal companies can give information on environmentally compatible disposal.

12 Spare parts

WARNING!
Safety risk due to wrong spare parts!

Wrong or defective spare parts can impair safety as well as leading to damage, malfunctions or total breakdown.

Therefore:

– Only use original spare parts from the manufacturer.

Purchase spare parts through the HB-Therm representative (→ www.hb-therm.ch).

The spare parts list can be found in Appendix B of this operating manual.

On use of non-approved spare parts, any guarantee or service claims are forfeited.

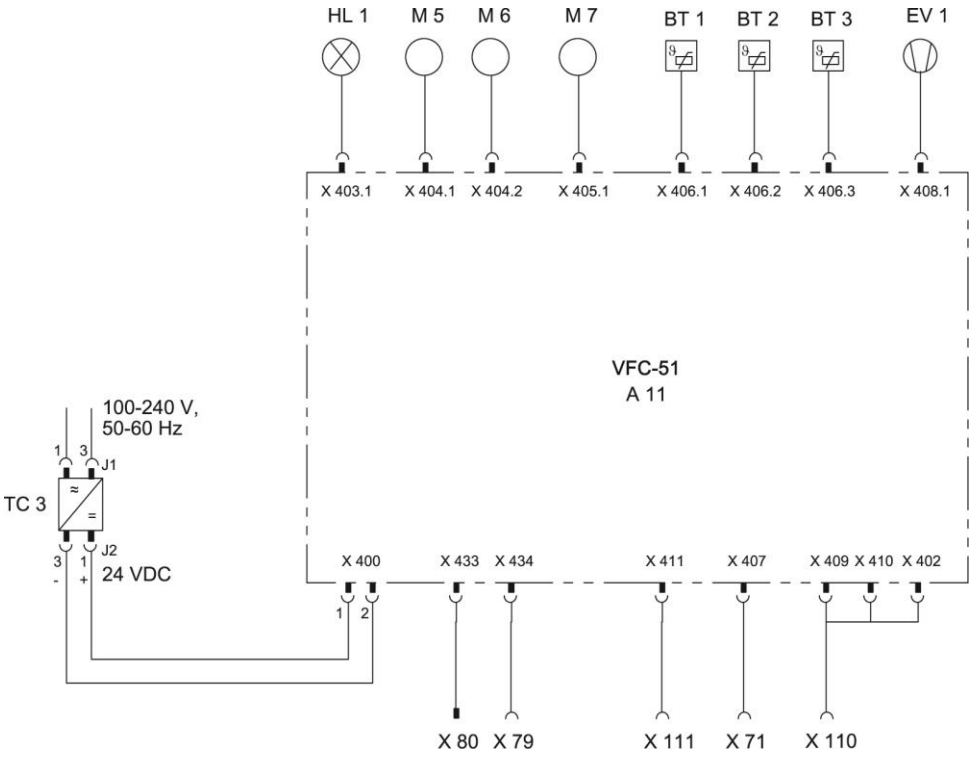
12.1 Ordering spare parts

When ordering spare parts, always indicate:

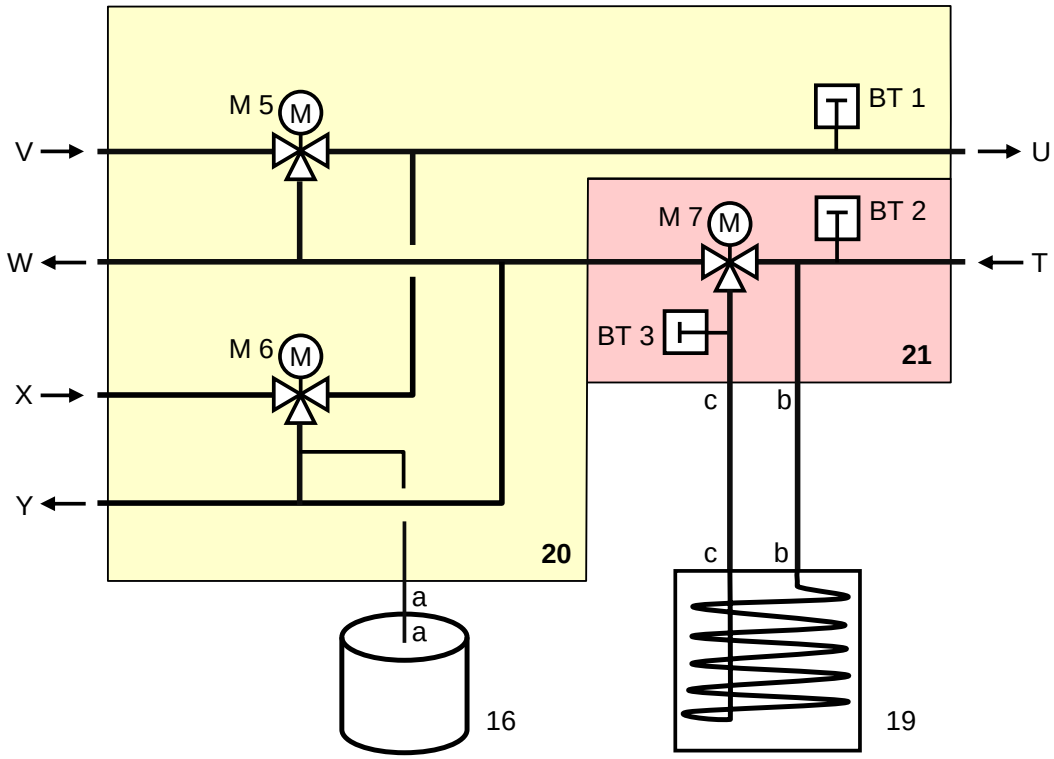
- The designation and ID No. of the spare part.
- Amount and unit.

13 Technical information

13.1 Electrical circuit diagram



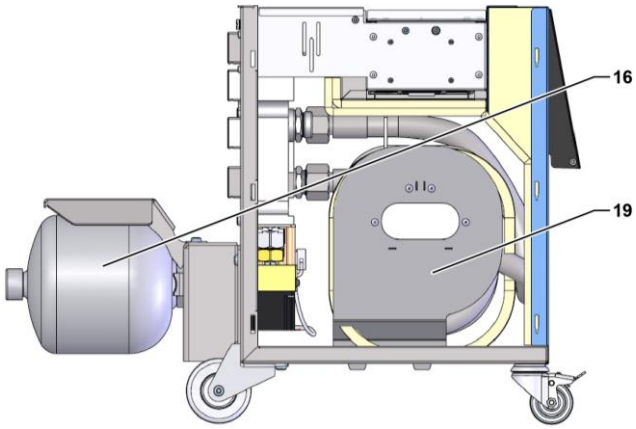
13.2 Hydraulic scheme



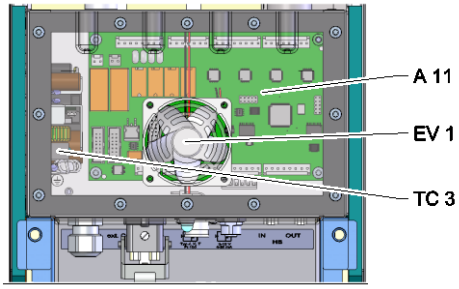
Technical information

13.3 Item location

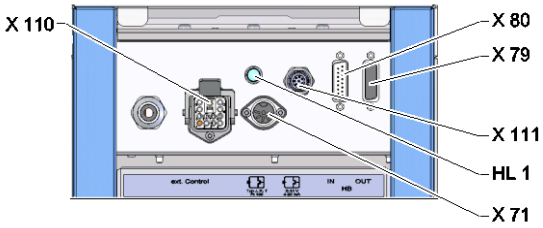
Side view left



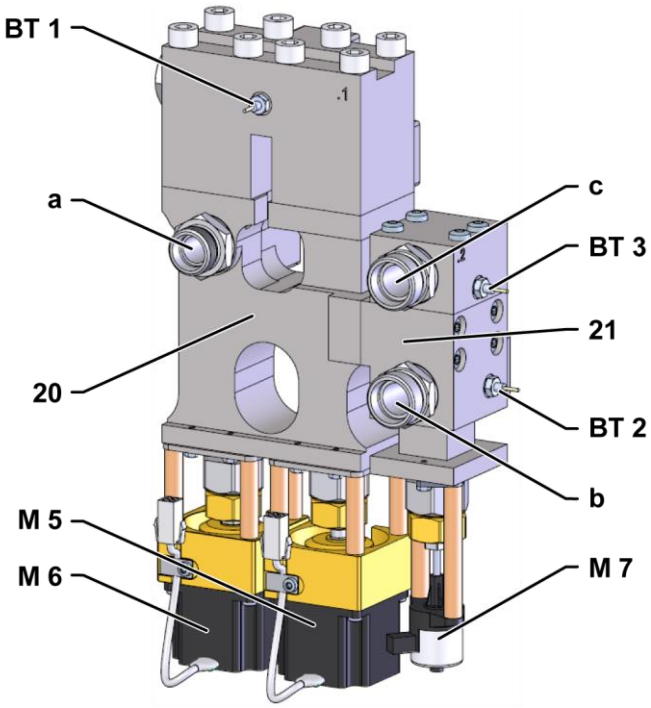
Electric components



Front



Switching-, buffer module



Technical information

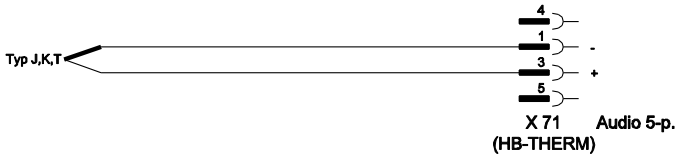
13.4 Legend

KZ	Designation	only with version
T	Mould circuit input (from mould)	
U	Mould circuit output (to mould)	
V	Hot water circuit input	
W	Hot water circuit output	
X	Cold water circuit input	
Y	Cold water circuit output	
16	Accumulator	
19	Switching unit buffer	
20	Switching module	
21	Buffer module	
A 11	VFC-51 board	
BT 1	Heat sensor main line	
BT 2	Temperature sensor return line	
BT 3	Buffer temperature sensor	
EV 1	Fan electrical part	
HL 1	Status light	
M 5	Heating switching valve	
M 6	Cooling switching valve	
M 7	Buffer valve	
TC 3	Power supply 100-240 VAC, 50-60 Hz, 24 VDC, 60 W	
X 71	Socket external sensor	
X 79	Socket HB OUT	
X 80	Socket HB IN	
X 110	External control socket	
X 111	Socket external sensor 0–10 V, 4–20 mA	

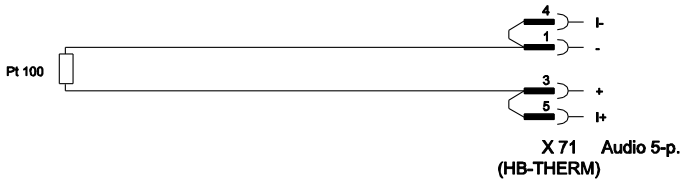
14 Interface cables

14.1 External sensor

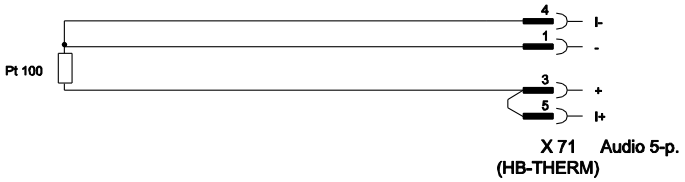
Sensor type thermocouple (type J, K, T)



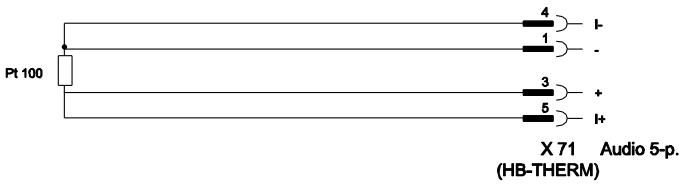
Sensor type Pt 100 (2-wire design)



Sensor type Pt 100 (3-wire design)

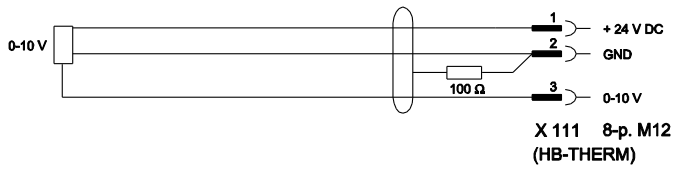


Sensor type Pt 100 (4-wire design)

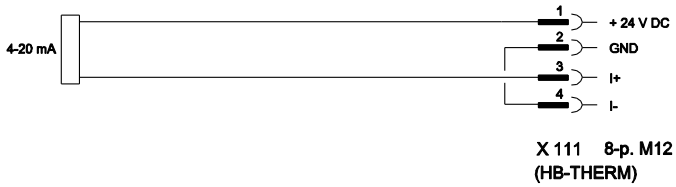


Interface cables

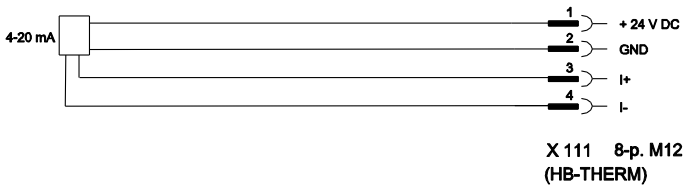
Sensor type 0–10 V



Sensor type 4–20 mA (2-wire design)

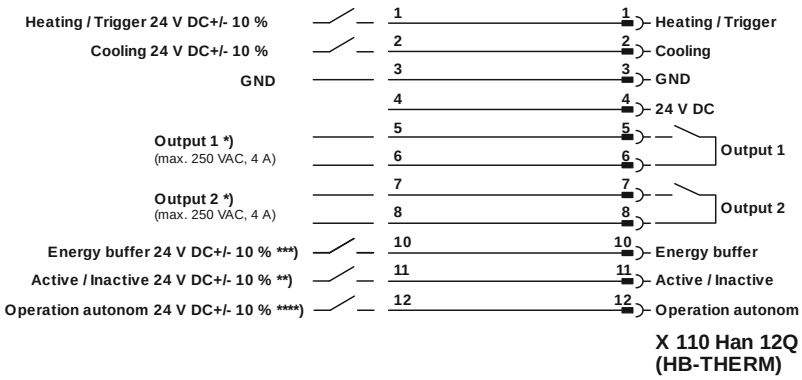


Sensor type 4–20 mA (4-wire design)



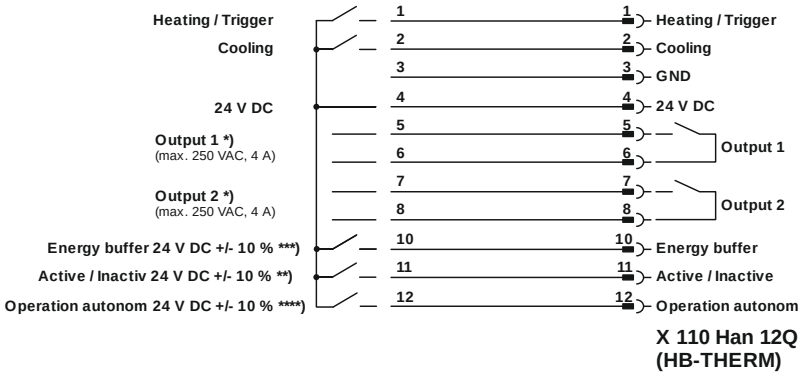
14.2 External control interface

Active 24 V DC signal



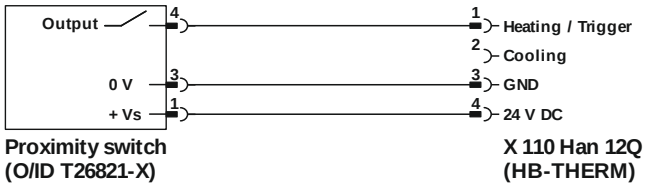
*) → chapter 8.8.3 on page 73
**) → chapter 8.8.4 on page 74
***) → Instruction Manual Autonomous operation

Potential-free contacts



*) → chapter 8.8.3 on page 73
**) → chapter 8.8.4 on page 74
***) → Instruction Manual Autonomous operation

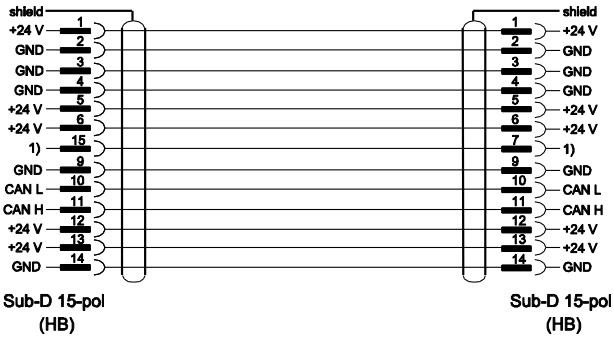
Proximity Switch



Interface cables

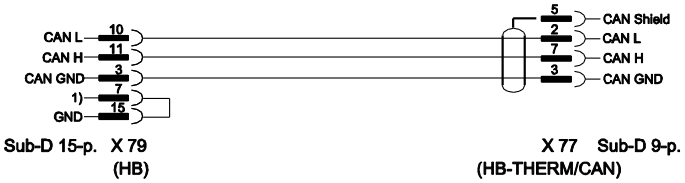
14.3 Interface HB

HB



1) An automatic terminal resistance is connected over this contact.

HB/CAN



1) An automatic terminal resistance is connected over this contact.

Connection cable CAN