

HygroMATIK®

Control Standard



Manual



CST.EN
E-8881174

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Control Standard

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 WARNING

Risk of electrical shock!

Hazardous electrical voltage!

All electrical work to be performed by certified expert staff (electricians or expert personnel with equivalent training) only.

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1. Introduction

Dear Customer,

Thank you for choosing a HygroMatik steam humidifier.

HygroMatik steam humidifiers represent the latest in humidification technology.

In order to operate your HygroMatik steam humidifier safely, properly and efficiently, please read these operating instructions.

Employ your steam humidifier only in sound condition and as directed. Consider potential hazards and safety issues and follow all the recommendations in these instructions.

If you have additional questions, please contact your expert dealer.

For all technical questions or spare parts orders, please be prepared to provide unit type and serial number (see name plate on the unit).

1.1 Typographic Distinctions

- Preceded by a bullet: general specifications
 - » Preceded by an arrow: procedures for servicing or maintenance which should or must be performed in the indicated order
 - ☑ Installation step which must be checked off.
- italics* Terms used with graphics or drawings

1.2 Documentation

Retention

Please retain these operating instructions in a secure, always accessible location. If the product is resold, turn the documentation over to the new operator. If the documentation is lost, please contact HygroMatik.

Versions in Other Languages

These operating instructions are available in several languages. If interested, please contact HygroMatik or your HygroMatik dealer.

1.3 Symbols in Use

1.3.1 Specific Symbols related to Safety Instructions

According to ANSI Z535.6 the following signal words are used within this document:

▲ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

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

▲ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

1.3.2 General Symbols

Please note

This symbol is used whenever a situation requires special attention beyond the scope of safety instructions.

Intended Use

The control described is an integral part of a HygroMatik steam humidifier. Use for other applications is not permitted. All instructions on intended use, which are given in connection with the basic device, apply.

Proper usage also comprises the adherence to the conditions specified by HygroMatik for:

- installation
- dismantling
- reassembly
- commissioning
- operation
- maintenance
- disposal

Only qualified and authorised personnel may operate the unit. Persons transporting or working on the unit must have read and understood the corresponding parts of the Operation and Maintenance Instructions and especially the chapter 2. „Safety Notes“. Additionally, operating personnel must be informed of any possible dangers. You should place a copy of the Operation and Maintenance Instructions at the unit's operational location (or near the unit).

By construction, HygroMatik steam humidifiers are not qualified for exterior application.

▲ WARNING

Risk of scalding!

Steam with a temperature of up to 100 °C is produced.

Do not inhale steam directly!

2. Safety Instructions

These safety instructions are required by law. They promote workplace safety and accident prevention.

2.1 Guidelines for Safe Operation

2.1.1 Scope

Comply with the accident prevention regulation „DGUV Regulation 3“ to prevent injury to yourself and others. Beyond that, national regulations apply without restrictions.

2.1.2 Unit control

Do not perform any work which compromises the safety of the unit. Obey all safety instructions and warnings present on the unit.

In case of a malfunction or electrical power disruption, switch off the unit immediately and prevent a restart. Repair malfunctions promptly.

⚠ WARNING

Restricted use.

IEC 60335-1 stipulates as follows:

This device may be used by children of eight years of age and above as well as by persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge so long as they are supervised or have been instructed regarding the safe use of the device and understand the hazards that may result from it. Cleaning and user maintenance of the unit must not be undertaken by children without supervision.

2.1.3 Unit Operation

⚠ WARNING

Risk of scalding!

Uncontrolled hot steam escape in case of leaking or defective components possible. Switch off unit immediately.

NOTICE

Risk of material damage!

The unit may be damaged if switched on repeatedly following a malfunction without prior repair.

Rectify defects immediately!

The unit must not be operated on a DC power supply.

The unit may only be used connected to a steam pipe that safely transports the steam (not valid for MiniSteam units).

Regularly check that all safety and monitoring devices are functioning normally. Do not remove or disable safety devices.

2.1.4 Mounting, dismantling, maintenance and repair of the unit

NOTICE

The HygroMatik steam humidifier is IP20 protected. Make sure that the unit is not object to dripping water in the mounting location.

Installing a humidifier in a room without water discharge requires safety devices to protect against water leakages.

- Use genuine spare parts only
- After any repair work, have qualified personnel check the safe operation of the unit
- Attaching or installing of **additional components** is permitted only with the **written consent** of the manufacturer

2.1.5 Electrical

⚠ WARNING**Risk of electrical shock!**

Hazardous electrical voltage!

Any work on the electrical system to be performed by certified expert staff (electricians or expert personnel with comparable training) only.

Disconnect unit components from electrical power supply prior to work.

After electrical installation or repair work, test all safety mechanisms (such as grounding resistance).

NOTICE

Use only original fuses with the appropriate amperage rating.

Regularly check the unit's electrical equipment. Promptly repair any damage such as loose connections or burned wiring.

Responsibility for intrinsically safe installation of the HygroMatik steam humidifiers is incumbent on the installing specialist company.

2.2 Disposal after dismantling

NOTICE

The operator is responsible for the disposal of unit components as required by law.

3. Unit Control

3.1 General description

The standard controller can be used for both electrode steam humidifiers and heater type steam humidifiers.

Operation of the HygroMatik steam humidifier is under microprocessor control.

For steam humidifiers with unit housing, a control switch is located on the front panel of the unit featuring two positions besides the „Zero“-position for a switched-off device.

„Pos. I“ : The unit is switched on

„Pos. „II“ : Cylinder water is manually drained



Control switch

For controlling the unit a control panel featuring a 3-digit display and a number of icons plus 4 touch keys is integrated in the unit front panel. Controlling the unit by software using the modbus RTU protocol is also possible. On request, modbus documentation is available from your expert dealer.



Control panel

For control signal processing inputs are available whose properties may be defined by parameter settings. Activating of the intake solenoid valve, the blow-down pump and the main contactor is achieved through relays on the main PCB. Another relay serves for signalling purposes (factory setting is „collective fault“).

As an ordering option, for provision of 2 additional switching functions, a pair of top-head rail relays is available for the pluggable connection to the mainboard.

With heater type steam humidifier, the power is controlled via a single-phase or two-phase solid state relay (for devices with higher power).

With electrode steam humidifier, the electrode current is switched directly via one or two main contactor(s) designed for the respective device power.

Mainboard

The entire control logic, including the relays for basic operation, is implemented on a compact printed circuit board which, in the case of steam humidifiers with device housings, is attached to the vertical partition wall between the housing chambers.

All connections on the PCB are distinctive in order to allow for easy exchange of the board in case of maintenance.

On the main PCB, two vertically mounted fuse holders with bayonet fitting incorporate 1.6 A fast-blow fine wire fuses (F1 and F2 for L and N, s. section „Basis PCB connections“ in this chapter).

Safety systems

Besides the common external safety interlock (implemented by means of a switching contact or a through a building control system), the following safety is incorporated in the unit:

An electric heater type steam humidifier is thermally controlled at two spots minimum. Besides the thermo switch located on top of the steam cylinder and meant for overheating avoidance of the electrical heater element,

the solid state relay also is equipped with a thermo switch (higher output units feature 2 thermo switches in the cylinder cover). In case of one of the thermo switches being triggered, the main contactor is deenergized. The thermo switches on the steam cylinders may be reset mechanically after cool-down. The thermo switch attached to the solid state relay heatsink, however, is a bi-metal device. As such, it is released automatically after cool-down.

An other safety measure is the steam cylinder minimum water level control. For heater element protection and thermal overload risk avoidance, no heater element drive enabling is issued in case of minimum water level underrun.

Intrinsic safety

HygroMatik steam humidifiers comply with intrinsic safety requirements in that the electrical power supply may be cut by two devices.

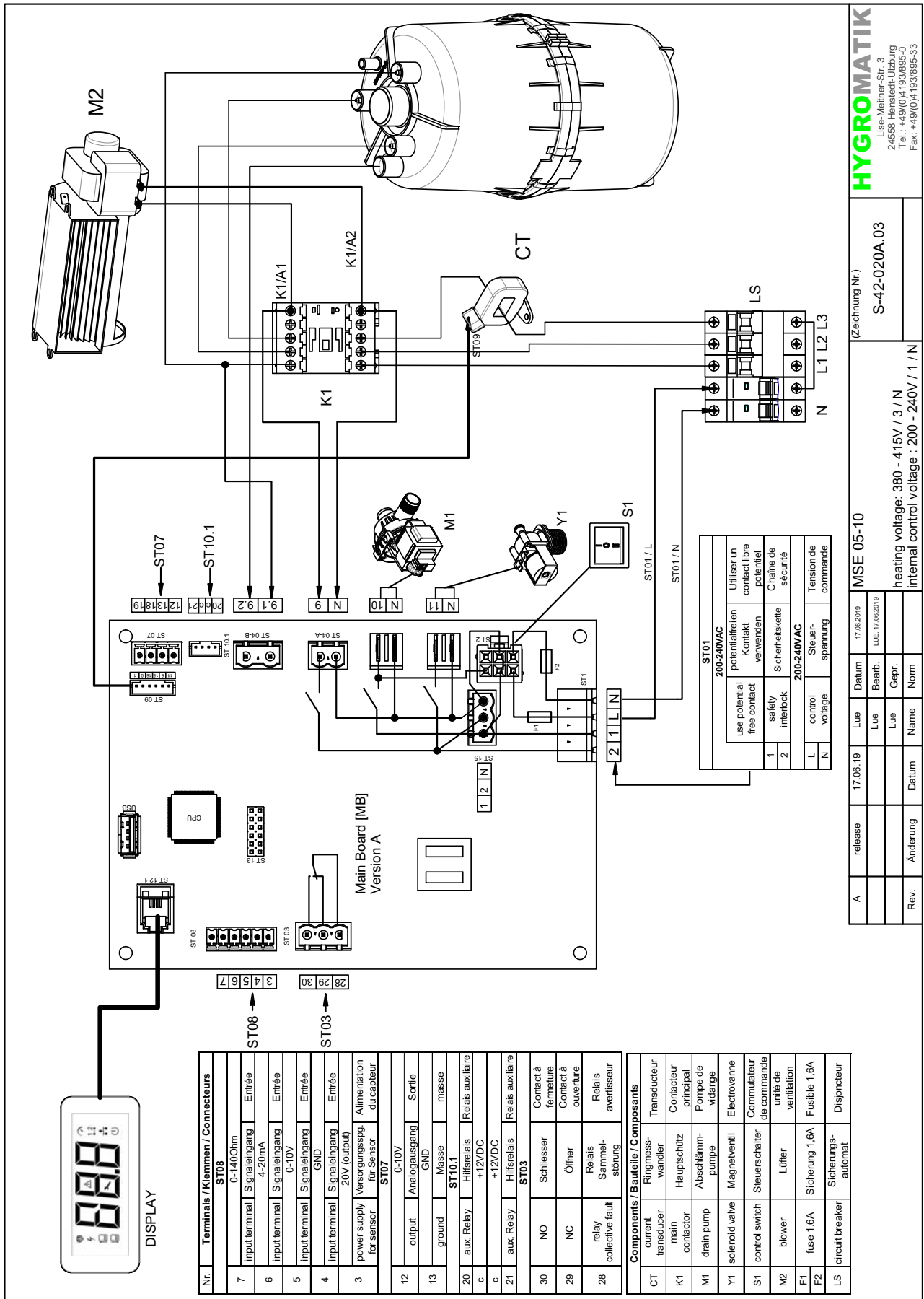
In case of the electric heater type steam humidifier, these devices are the main contactor and the solid state relay.

In addition to the main contactor, an electrode steam humidifier is also equipped with a circuit breaker.

Please note

For electrical connection of the steam humidifier a residual current circuit breaker is recommended.

3.1.1 Wiring Diagrams



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(Zeichnung Nr.) **S-42-020A.03**

MSE 05-10
 17.06.19 Lue Datum
 17.06.2019 Lue Bearb.
 17.06.2019 Lue Gepr.

heating voltage: 380 - 415V / 3 / N
 internal control voltage : 200 - 240V / 1 / N

Rev.	Änderung	Datum	Name	Norm
A	release	17.06.19	Lue	Datum

3.1.2 Mainboard inputs and outputs

3.1.2.1 Customer side interfaces

Inputs

ST08:

- Control signal 0...10 VDC
- Control signal 0...20 mA
- Control signal 0...140 Ω

Outputs

ST03:

- Potential-free programmable NC and NO contacts, (factory assignment is „collective fault“)

ST10.1:

- Connection option für 2 additional relays of the top head type (K20, K21) (ordering option).

ST07:

Control signal 0...10 VDC (max. 8 mA)

ST08:

- +20 VDC humidity sensor supply voltage (max. 20 mA)

Bidirectional

ST12.1:

- Control panel serial interface

ST 13:

- RS485 interface adapter PCB socket

3.1.2.2 System interfaces

Power supply and safety interlock

ST01:

- 4-pin plug connection with screw terminal adaptor for L and N power connection and safety interlock („Terminals 1/2“)

Inputs

ST09 (only for heater steam humidifiers):

- Filling level sensor

ST09 (only for electrode steam humidifiers):

Current transducer connection

ST04-B (only for heater steam humidifiers):

- Galvanically isolated thermo switch input (via optical coupler)
- Dielectric strength 600 VAC

ST04-B (only for electrode steam humidifiers):

- Galvanically isolated sensor electrode input (via optical coupler)

Dielectric strength 600 VAC

Outputs

ST04-A:

- Main contactor(s)

ST05:

- Blow-down pump

ST06:

- Inlet solenoid valve

ST07 (only for heater steam humidifiers):

- Solid state relay control signal (PWM), 20 mA max.

3.2 Control operation

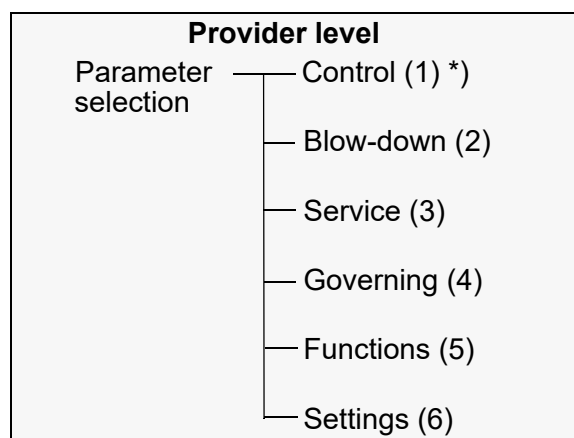
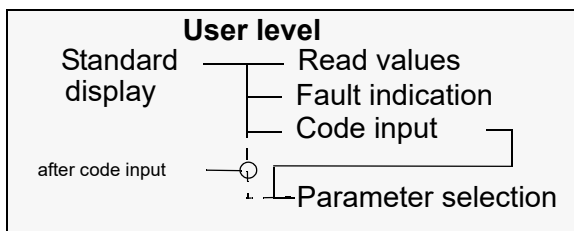
3.2.1 Principal user guidance

On powering up the steam humidifier, the software version is shown in the display for a few seconds. In normal operation the display then shows actual steam output as a standard display. When a key is pressed the first reading in a list of reading and input values is output. The complete list may be visualized by scrolling using the keys. Controlwise, the unit is in „user level“ (see next section).

By means of inputting a 2-digit code, access to „Provider level“ is possible (for input code, see table in section „Provider level submenus and relating parameters“). The provider level parameters are functionally grouped in submenus (1) to (6). The code input is reset to its standard („000“), should no keystroke occur within 3 minutes.

3.2.2 Menu structure

Overview on menu structure



*) numbers in parenthesis are group numbers

User level

From standard display (actual steam output), user level may be accessed by pressing any key on the control panel. On user level, among other information, reading values r01 to r15 are available. After a certain time span with no keystroke, control switches the display back to standard display. Factory setting for this timeout is „10 minutes“.

Besides showing the reading values, user level also features „P00“ for code input allowing provider level access (s. „Menu tree section“).

Provider level

On provider level, the control parameters of functional groups (1) to (6) (s. „Overview on menu structure“) may be individually changed. A tabular list of the provider level parameters and a more detailed description may be found in the sections „Provider level submenus and their parameters“ and „Detailed parameter descriptions“, respectively, further down in this chapter.

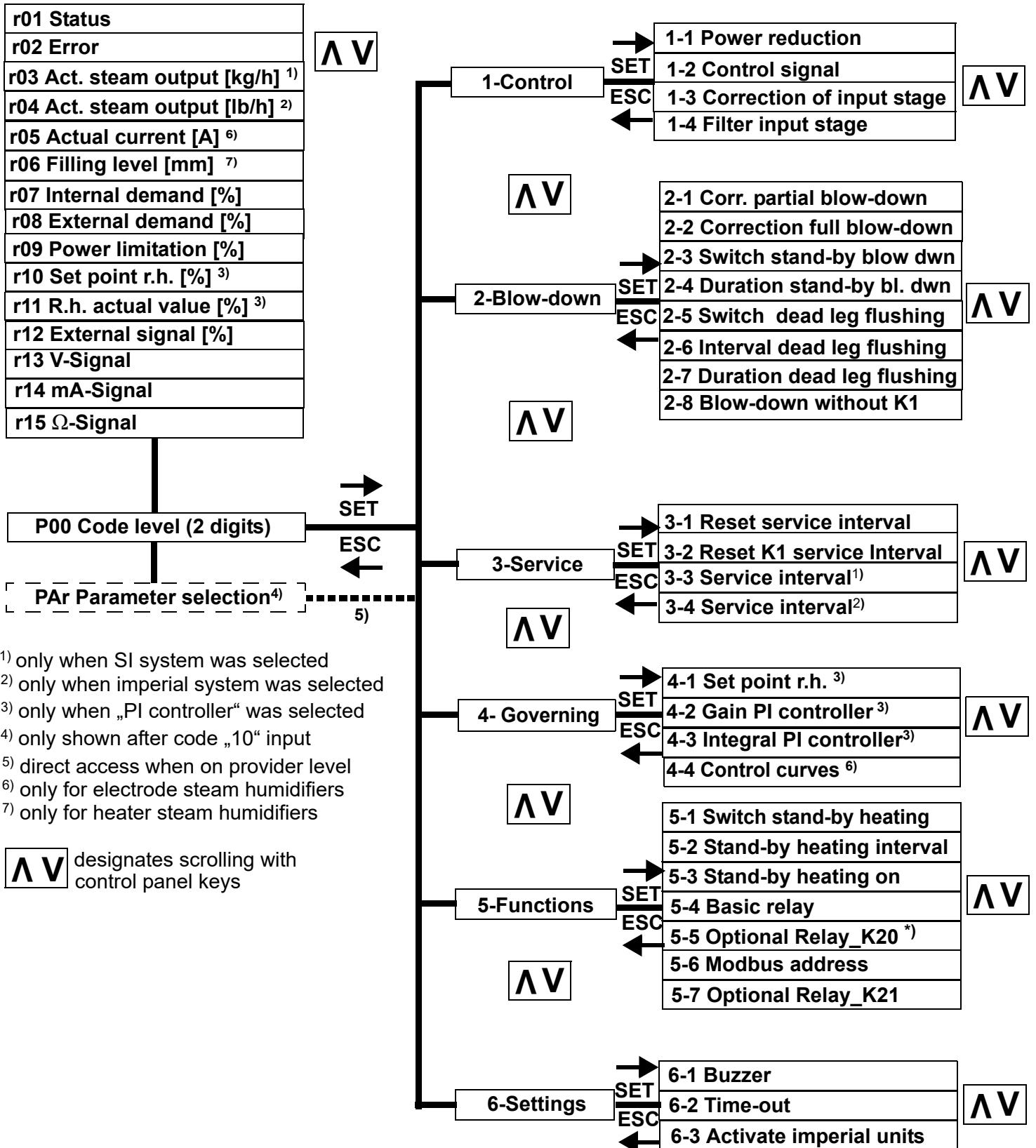
Menu tree

The detailed menu tree with all of the reading values and settable values as well as all of the parameters is depicted in the next section.

3.2.3 Menu tree

User level

Provider level⁴⁾



3.3 The control panel



The control panel comprises 3 sections:

- the ESC, SET, **Λ**, **V** control keys
- the 3-digit 7-segment display
- dedicated icons for operating status indication

Please note

A flashing icon always indicates a faulty situation!

Exception: When switching the unit on, the complete display flashes 4 times. Then, the power-on-LED blinks while the device self test is run.

The **control keys** enable navigation in the menus and submenus. Their function is as follows:

„ESC“: cancellation or return to previous level

„**Λ**/**V**“: move up/down within a menu, submenu or selection list.

„SET“: accept and store a selected setting.

The 3-digit **7-segment-display** serves for outputting of operational and input data as well as error code presentation. When control software expects an input the digits are blinked. Display semantics are determined by lightening-up of one or more icons related to a specific operational situation or device control environment.

Icons state table

	permanently lit	flashing
	Steam production active	Cylinder full <u>In conjunction with error icon:</u> Fault steam production
	Main contactor active	Fault main contactor
	Filling active	Fault filling
	Blow-down active	Fault blow-down
	(State not possible)	Error s. error codes
	Maintenance required	(State not possible)
	Demand	Fault control signal
	Safety interlock closed	(State not possible)
	Virtual safety interlock closed by software enabling	(State not possible)
	Control active	Control self test after unit start

3.4 Navigation within a menu

User level entry

Standard display during normal operation is actual steam output in the selected dimension ([kg/h] or [lbs/h], respectively). By pressing any key, user level comprising a reading value index (pointer) selection level and the reading values as such is entered.

„r01“ is displayed indexing the first reading value.

Reading value display

By scrolling using the „**▲/▼**“ keys, the reading value indexes „r01“ to „r15“ , code entry „P00“ (s. below) and parameter selection „PAr“*) may be addressed. The actual reading value content is output on pressing the SET key after selection of one of the reading value pointers r01 to r15.

Use the ESC key for return to the reading value index level that allows for addressing further reading values.

„P00“ allows for inputting a code for provider level entry that supports changing of the parameters (s. next section). This function is not meant for usage by the steam humidifier user.

*) „PAr“ ist only presented when a „10“ was input as the „P00“ setting value for access to provider level. When „PAr“ is confirmed with the SET key, parameter group selection is supported without the need for inputting the access code again.

Provider level code entry and setting a parameter

- » Using the „**▲/▼**“ keys, scroll until „P00“ is displayed and confirm with the SET key. „00“ is displayed.
- » Increase the display to „10“ using the „**▲/▼**“ keys and confirm with the SET key („10“ is the access code for the provider level). „1- “ is now displayed for selection of one of the parameter groups (1) to (6).
- » Confirm parameter group (1) with the SET key or make an other selection with the „**▲/▼**“ keys and then confirm. The display will now show a „1“ in the right digit position for addressing the parameter index (e.g., „2-1“).
- » Confirm selection with the SET key or vary selection with the „**▲/▼**“ keys and then confirm.

Use the ESC key for return to the previous input level.

3.5 Tabular representation of reading value list and provider level submenus

For a detailed description, pls. refer to the respective sections within this chapter.

3.5.1 The reading value list

From normal operation, the user may access the reading value index „r01“ (Status) by pressing any key.

By scrolling using the „**▲/▼**“ keys the reading and setting values indicated in the table below may be addressed. To output the value content, the SET key must be pressed first.

Reading value index	Description
r01	Status
r02	Fault
r03	Actual steam output [kg/h]
r04	Actual steam outpt [lb/h] (only when imperial units were selected)
r05	Actual current [A] (only for electrode steam humidifiers)
r06	Filling level [mm] (only for heater steam humidifiers)
r07	Internal demand [%]
r08	External demand [%]
r09	Power limitation [%]
r10	Set value r.h. [%] (only when PI controller was selected)
r11	Actual value r.h. [%] (only when PI controller was selected)
r12	External signal [%]
r13	V-Signal
r14	mA-Signal
r15	Ω-Signal
P00	Code level („0“, „10“)
PAr	Parameter group selection

3.5.2 Provider level submenus and relating parameters

Detailed parameter descriptions may be found in the section „Detailed parameter description“ further down in this chapter. The „Setting options“ column indicates the presettings available or the range of values to be chosen from. „Fs“ stands for „Factory setting“.

Submenu „Control“ (Group1)

Par.	Denomination	Setting options	Code
1-1	Steam output max. [%]	25 ... 100 Fs*) = 100	10
1-2	Control signal	0= not valid 1= ext. controller, 0 ... 10 V 2= ext. controller, 0 ... 20 mA 3= ext. controller, 0..140 Ω 4= PI controller, 0 ... 10 V 5= PI controller, 4 ... 20 mA 6= PI controller, 0 ...140 Ω 7= 1-step 8= Modbus Fs = 1	10
1-3	Correction input stages [%]	-5.0 ... +5.0 Fs = 0	10
1-4	Filter input stage	0=light, 1=strong Fs = 0	

*) Fs = Factory setting

Submenu „Blow-down“ (Group 2)

Par.	Denomination	Setting options	Code
2-1	Correction partial blow-down	-5...+5 Fs = 0	10
2-2	Correction full blow-down	-5...+5 Fs = 0	10
2-3	Switch stand-by blow-down	0=off, 1=on Fs = 1	10
2-4	Waiting time stand-by blow-down [h]	0.1...48.0 Fs = 24.0	10
2-5	Switch dead leg flushing	0=off, 1=on Fs = 0	10
2-6	Interval dead leg flushing [h]	0.1...96.0 Fs = 24.0	10
2-7	Duration deadleg flushing [s]	1...600 Fs = 90	10
2-8	Blow-down without K1 (only for electrode steam humidifiers)	0=no, 1=yes Fs = 0	10
2-9	Steam-down time (only for heater steam humidifiers)	0...250 WV=240	10

Submenu „Service“ (Group 3)

Par.	Denomination	Setting options	Code
3-1	Reset service interval steam amount	0=no, 1=yes Fs = 0	10
3-2	Reset K1 service interval	0=no, 1=yes Fs = 0	10
3-3	Service interval [t]	0...90.0 Fs = device dependant	10
3-4	Service interval [tn. sh.]	0 ...90.0 Fs = device dependant	10

Submenu „Governing“ (Group 4)

Par.	Denomination	Setting options	Code
4-1	Set point r.h. [%] (PI controller only)	5...99.9 Fs = 50.0	10
4-2	Gain [%] (PI controller only)	0.1...99.9 Fs = 5.0	10
4-3	Integral [%] (PI controller only)	0...100.0 Fs = 10	10
4-4	Control curve (only for electrode steam humidifiers)	0 = energy optimisation 1 = load optimisation Fs = 1	10

Submenu „Functions“ (Group 5)

Par.	Denomination	Setting options	Code
5-1	Switch stand-by heating	0=off, 1=on Fs = 0	10
5-2	Interval stand-by heating [min]	1...999 Fs = device dependant	10
5-3	Stand-by heating [s]	1...999 Fs = device dependant	10
5-4	Basic relay	0 = collective fault 1 = stand-by 2 = no demand 3 = humidifying 5 = remote off 30 = filling off 31 = filling on 37 = HyCool 60 = Blow-down off 61 = Blow-down on 62 = Partial blow-down 63 = Full blow-down 66 = max. level 67 = Stand-by blow-down 68 = Dead leg flushing 69 = Start-up blow-down 270 = Collectice Service Fs = 0	
5-5	Relay_K20	same as for basic relay Fs = 270	10
5-6	Modbus address	0..255 Fs = 1	10
5-7	Relay_K21	same as for basic relay Fs = 270	

Submenu „Settings“ (Group 6)

Par.	Denomination	Setting options	Code
6-1	Buzzer	0=off, 1=on Fs = 0	10
6-2	Time-Out (return to standard display) [min]	0 ... 60 Fs = 2	10
6-3	Activate imperial units	0 = SI units 1 = imperial units Fs = 0	10

3.6 Exemplary variation of a parameter setting

Example: Control signal is to be changed from „Ext. controller, 0 ...10V“ („1-2“ = „1“) to „PI controller, 0 ...10V“ („1-2“ = „4“).

Please note

The steps below make an essential change to a control parameter. If this is not intended, be sure to reestablish the original setting after changing it for exercising purposes.

(PI controller, 0...10 V) with the keys **▲/▼** confirm with the SET key.

- » Pressing the ESC key twice brings the display back to standard display (i.e. actual steam output).

These steps are exemplary. In the same way, selection and variation of all of the other parameters may be accomplished.

- » In normal operation, press any key to access the reading value list. „r01“ is displayed.
- » Scroll from „r01“ to „P00“ (Code input).
- » Press SET key. Display now shows a flashing „Zero“ for code level „0“ (user level) and input readiness.
- » Using the **▲/▼** keys, change the display to „10“.
- » Press the SET key. Provider level is now entered. „1-“ is displayed as the first parameter group to be changed.
- » Since the parameter to be changed is in this group already, group confirmation can be made immediately with the SET key.
- » Scroll with the keys to the „1-2“ position and confirm with the SET key. The parameter setting „1“ (external controller, 0...10 V) is displayed and may be changed.
- » Change the setting to „4“

3.7 Detailed description of the user level reading values and settings

Reading value		Explanation	
r01 Status	Code	Denomination	Description
Main functions category	00	Start	Humidifier is in startup phase after a cold start. The Power-ON-LED flashes.
	01	Stand-by	Safety interlock is open (safety interlock icon in display is not lit). No steam is produced. In case of the safety interlock being opened by software, status „05“ (Remote off) is displayed instead of „01“.
	02	No demand	Demand from external controller or active humidity sensor is below switch-on threshold of the steam humidifier. No steam is produced (while the safety interlock is closed). The demand icon in the display is not lit.
	03	Humidify	Steam is produced when demand is generated by a Hygrostat or an external controller. With a PI controller setting, an input signal from the active humidity sensor is required. (Safety interlock must be closed).
	05	Remote off	Safety interlock was opened via Modbus (e.g. by a building control system instruction).
	06	No Modbus	When 1-2 = „Modbus“ is selected, demand messages are required on a regular base. In case of no demand within a 20 s time frame, „No Modbus“ is shown as the device status and steam production is stopped (for details, see dedicated Modbus documentation available from HygroMatik GmbH).
	07	Stand-by heating interval	When in stand-by heating mode, status code 07 is displayed during steam production.
	08	Stand-by heating pause	When in stand-by heating mode, status code 08 is displayed when no steam is produced.
Filling category	30	Filling	Filling is active via solenoid valve. The filling icon in the display is lit.
Blow-down category	60	Initial blow-down	After switching the device on, a blow-down sequence is run with the parameter set for partial blow-down.
	61	Partial blow-down	A partial blow-down is run in order to achieve cylinder water concentration reduction. The blow-down icon in the display is lit.

Reading value		Explanation	
Blow-down category (contd.)	62	Full blow-down	Full blow-down is run (steam cylinder is completely drained). The blow-down icon in the display is lit.
	63	Dilution (only for electrode steam humidifiers)	A partial blow-down is run (with the parameter set for partial blow-down) due to a water conductivity too high. The blow-down icon in the display is lit.
	64	Overcurrent blow-down (only for electrode steam humidifiers)	An overcurrent blow-down is run since an electrode current too high was detected by the device. Reducing water level also reduces electrode current. The blow-down icon in the display is lit.
	65	Max. level (only for heater steam humidifiers)	Max. allowable water level in steam cylinder was overrun.
	66	Stand-by blow-down	In case of a safety interlock open for a longer period of time, a full blow-down is run automatically after a time preset in order to avoid stagnant water in the steam cylinder. The blow-down icon in the display is lit.
	67	Dead leg flushing	Special blow-down mode for flushing dead leg tubing. Solenoid valve and blow-down pump are activated simultaneously in case of a no demand situation for a certain period of time. The blow-down icon in the display is lit.
	80	Partial blow-down waiting	Device will start partial blow-down with next filling step.
	81	Full blow-down waiting	Device will start full blow-down with next filling step.
Monitoring category	90	Cylinder full (only for electrode steam humidifiers)	On detection of a an electrical potential at the sensor electrode, cylinder full is reported. In this situation cylinder water level is so high that an electrical bridge between one of the power electrodes and the sensor electrode has built up. The steam icon in the display flashes.

Reading value		Explanation	
Service category	271	Service steam amount	The service threshold for the steam amount produced as preset in 3-3 (SI units) or 3-4 (imperial units) was exceeded. The service icon in the display is permanently lit for the time the message is active. The status message may be reset by setting parameter 3-1 to „1“.
	272	Service main contactor K1 switching cycles	The number of main contactor switching cycles predefined by the manufacturer was met. A main contactor replacement is advisable. The service icon in the display is permanently lit for the time the message is active. For resetting the status message, parameter 3-2 must be set to „1“.
Fault category	999	Fault	A fault was detected. Operation has ceased. An error code may be read out. Some certain faults also make an icon in the display blink.
r02 Error (only shown when a fault has occurred)		The error code related to the fault is displayed (steam production is stopped whenever a fault occurs). Error codes are described in the „Trouble shooting“ chapter of this manual.	
r03 Actual steam output (SI units)		Amount of current steam production value [kg/h]	
r04 Actual steam output (imperial units)		Amount of current steam production value [lb/h]	
r05 Actual current (only for electrode steam humidifiers)		Current electrode amperage value [A]	
r06 Filling level (only for heater steam humidifiers)		Filling level [mm] measured by the water level sensor	
r07 Internal control signal		The internal signal for controlling the steam humidifier electrical power delivery is displayed. [%]. This reading is influenced by the control curve and a power limitation preset	
r08 External demand (only with ext. controller)		External controller control signal is displayed [%]	
r09 Power limitation		Power limitation as a percentage of max. output as preset in parameter „1-1“ is displayed [%]	
r10 Set point r.H. (only when PI controller was preset)		R.h. nominal value as preset in parameter 4-1 is displayed [%]	
r11 Actual value r.h. (only when PI controller was preset)		Actual value of r.h. is displayed [%].	
r12 External signal		External signal [%]	
r13 V-Signal		Input signal measured at terminal ST805 [V]	

Reading value	Explanation
r14 mA-Signal	Input signal measured at terminal ST806 [mA]
r15 Ω-Signal	Input signal measured at terminal ST807 [Ω]

Set value	Explanation
P00 Code level	Allows provider level access by code input (Code „10“) or limitation to user level (Code „0“). Provider level is exited automatically after 10 mins without a keystroke.
PAr Parameter selection	Allows selection of parameter group and of a specific parameter within a group.

3.8 Detailed parameter descriptions

Group	Par.	Denomination	Description
Control	1-1	Steam output limitation	Steam output limitation allows scaling down the max. (steam) output within a range of 25 to 100 %, which may be necessary for a better control performance. The actual steam output is determined by the control signal.
	1-2	Control signal	This parameter tells the unit control software what kind of control signal is wired. Also, the control characteristic is defined. These are the setting options: 1 = external controller, 0...10 V 2 = external controller, 0...20 mA 3 = external controller, 0...140 Ω 4 = PI controller, 0...10 V 5 = PI controller, 4...20 mA 6 = PI controller, 0...140 Ω 7 = 1-step 8 = Modbus
	1-3	Correction of input stages	This parameter allows for an active humidity sensor calibration in the range from -5% r.h. to +5% r.h. .
	1-4	Filter input stage	This parameter allows for switching the damping of the input low pass filter from „light“ to „strong“. With a capacitive humidity sensor, increasing the input damping is meaningful for improving the signal-to-noise ration and for reducing the oscillating tendency.
Blow-down	2-1	Correction partial blow-down	In case of high electrical conductivity of water or excessive maintenance effort, increasing the blow-down frequency may be meaningful. When conductivity is low, however, a lower blow-down frequency may be adequate. To cope with different water qualities, blow-down rates may be adapted within a range of 10 stages (factory presetting is „0“). Increase blow-down rate: settings up to +5. Decrease blow-down rate: settings up to - 5. A blow-down rate too low will lead to significant wear and tear and will also increase the maintenance effort required. Pls. note: a „-5“ setting will shut off blow-down completely!

Group	Par.	Denomina-tion	Description
Blow-down (contd.)	2-2	Correction full blowdown	see correction partial blow-down
	2-3	Switch stand-by blow-down	Should steam humidifier operation be prospectively halted for a longer period of time, blowing-down the cylinder water is advisable in order to comply with the VDI 6022 hygiene regulations prescribing the prevention of microbial contamination of residual water. Parameter 2-3 is the switch to activate and de-activate the stand-by blow-down function. When activated, a full blow-down is run after a waiting time that was determined by setting parameter 2-4 to the value in question. For stand-by blow-down to become effective, the unit control switch must remain in the „On“- position („I“).
	2-4	Waiting time stand-by blow-down	Determines the waiting time until the cylinder water is fully drained to counteract contamination when no steam is produced for a lengthy period of time (factory setting is 24 hours).
	2-5	Switch dead leg flushing	When parameter 2-5 = „1“, for flushing of the supply line, solenoid valve and blow-down pump are simultaneously activated after the time preset in parameter 2-6 and for the duration of time preset in 2-7. In order for this to work, the safety interlock must be closed.
	2-6	Interval dead leg flushing	Waiting time [h] when there is no steam production until dead leg flushing is activated; only valid if switch 2-5 = „1“.
	2-7	Duration dead leg flushing	Duration of dead leg flushing [s].
	2-8	Blow-down without main contactor K1 (only for electrode steam humidifiers)	During blow-down, leakage currents may flow towards ground through cylinder water. In order to avoid the activation of the leakage sensor circuit-breaker, the main contactor K1 may be switched off during pumping (2-8 = „1“ is designated to „main contactor is switched off during pumping“).
	2-9	Steam-down time	This parameter serves for monitoring proper unit functioning. When steam production is called-for by the control software, a cylinder filling variation must be detectable within the timespan defined by „2-9“. Should this not be registered, the unit enters error state „123“ (error steam-down time) and cuts steam production.

Group	Par.	Denomination	Description
Service	3-1	Reset steam-service interval	On finishing maintenance work, the service interval is to be reset (the service icon is blanked if it was illuminated before).
	3-2	Reset K1 service interval	Main contactor switching cycles are monitored and compared to the life expectancy figure supplied by the part's manufacturer. On a match, reading value r01 is set to „270“ (and the service icon LED flashes). After changing the main contactor, parameter 3-2 must be set to „1“ for a reset of the status message.
	3-3	Steam service interval	Unit control monitors the actual steam amount produced and compares it with the service steam amount that was determined by the parameter 3-3 setting. When the two data match, the service icon is lit. Steam humidifier operation is not disrupted. Service rate highly depends on water quality (conductivity, hardness) and on the amount of steam produced since the last service. By varying parameter 3-3, the service interval may be adjusted to water quality.
Governing These parameters are only effective when parameter 1-2 (control signal) holds a setting incorporating the PI controller.	4-1	Set point r.h.	Parameter 4-1 determines the r.h. set point for control.
	4-2	Gain PI controller	Sets the PI controller gain (Xp) [%].
	4-3	Integral PI controller	Sets the PI controller resetting time (Xn).
	4-4	Control curves (only for electrode steam humidifiers)	By setting this parameter, electrode driving may be varied between energy-optimised (4-4 = „0“) and load-optimised (4-4 = „1“). In the first case, when a cold start is run, current is increased to 1.28 times the nominal current. When „load-optimised“ was selected, the increasing factor is only 1.1 in order to not overload the power supply.


Group	Par.	Denomina- tion	Description
Functions	5-1	Switch stand-by heating	Stand-by heating is enabled or not (0= off, 1=on).
	5-2	Interval stand-by heating	Parameter 5-2 determines the interval time between heating phases when stand-by heating was enabled.
	5-3	On-time Stand-by heating	Parameter 5-3 sets the heating on-time when stand-by heating was enabled.
	5-4	Basic relay allocation	<p>The basic relay features potential-free NC and NO contacts across terminals 28,29 and 29,30, respectively (contact capacity is 250 VAC/8A).</p> <p>The relay is activated when a certain operating status is achieved. Parameter 5-4 allows for allocating a logical function, i.e. the relay is energized when a certain operating status occurs. Factory setting is „0“ defined as „collective fault“</p> <p>The following allocations are supported:</p> <p>(0) Collective fault: Relay is energized in case of any fault.</p> <p>(1) Stand-by: Relay is energized when the unit is in stand-by.</p> <p>(2) No demand: Relay is energized when input signal creates no demand.</p> <p>(3) Humidifying: Relay is energized when humidifying is active.</p> <p>(5) Remote off: Relay is energized when safety interlock was opened under software by means of the building control system.</p> <p>(30) Filling off: Relay is energized when filling is not active.</p> <p>(31) Filling on: Relay is energized when filling.</p>

Group	Par.	Denomination	Description
Functions	5-4	Basic relay allocation (contd.)	<p>(60) Blow-down off: Relay is energized when not pumping.</p> <p>(61) Blow-down on: Relay is energized when pumping takes place.</p> <p>(62) Partial blow-down: Relay is energized when a partial blow-down is run.</p> <p>(63) Full blow-down: Relay is energized when a full blow-down is run.</p> <p>(66) Max. level: Relay is energized when the max. allowable water level is overrun.</p> <p>(67) Stand-by blow down: Relay is energized when a stand-by blow-down is run.</p> <p>(68) Dead leg blow-down: Relay is energized when a dead leg blow-down is run.</p> <p>(69) Start-up blow-down: relay is energized when a start-up blow-down is run.</p> <p>(270) Collective Service: Relay is energized when a service message status („Service steam amount“, „Service main contactor K1 switching cycles“) is active.</p>
	5-5	Relay_K20 allocation (connected to the ST10.1 connector on the main-board)	<p>Defines logical function of the optional relay K20 (in the same way as 5-4 does for the basic relay). Factory preset is „270“ (Collective service).</p> <p>E</p>
	5-6	Modbus address	<p>The control electronic may optionally be equipped with a RS485 serial interface for running data communication with the Modbus RTU protocol. 5-6 then holds the Modbus RTU address.</p>
	5-7	Relay_K21 allocation (connected to the ST10.1 connector on the main-board)	<p>Defines logical function of the optional relay K21 (in the same way as 5-4 does for the basic relay). Factory preset is „270“ (Collective service).</p>

Group	Par.	Denomina- tion	Description
Settings	6-1	Buzzer	The control panel features a buzzer for prompting key strokes. Parameter 6-1 allows for muting the prompt.
	6-2	Time-Out	Unit control switches the display back to actual steam output presentation after the time set in 6-2. Factory setting is „2 minutes“
	6-3	Imperial units	This parameter enables a switch between SI units and imperial units. Actual steam output e.g. will then be in „lb/h“ instead of „kg/h“.




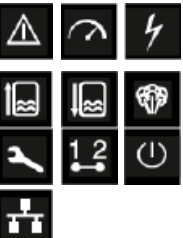
4. Trouble shooting


4.1 Error handling










On occurrence of a fault, steam production is stopped. The control panel display is switched to error code output. In the same instance, the general fault icon  starts flashing.




On „Steam production“, „Main contactor“, „Filling“ and „Blow-down“ faults, the respective icon is additionally blinked.




4.1.1 Table of possible faults and related error codes


Icons	Code	Error message	Possible cause	Counter measure
	000	No error		
	001	Sensor plug (ST09)	<ul style="list-style-type: none"> • Plug not attached or loose 	<ul style="list-style-type: none"> • Check plug
	022	Input_current_min The min. value of the input signal is no plausibel	<ul style="list-style-type: none"> • Sensor, wiring or signal source defective • Input stage defective 	<ul style="list-style-type: none"> • Check sensor, wiring and signal source, if relevant • Replace mainboard
	024 025 *)	Input_resistance_OC Input_resistance_SC The resistance measured is not correct („infinite“ or „zero“, resp.)	<ul style="list-style-type: none"> • Sensor, input wiring or signal source not correct • Input stage defective 	<ul style="list-style-type: none"> • Check sensor, signal cable and signal source, if applicable • Replace main PCB
*) When a PI controller is in use, errors 022-025 relate to the sensor output signals. With an external controller the controller output signal is concerned.				
	027	System failure	<ul style="list-style-type: none"> • Main PCB is defective 	<ul style="list-style-type: none"> • Replace main PCB

Icons	Code	Error message	Possible cause	Counter measure
	<p>030</p>	<p>Filling</p> <p>Filling was not successful, i.e. , after 30 mins of filling time the expected level was not achieved.</p>	<ul style="list-style-type: none"> • Solenoid valve or water supply line contaminated or defective • Solenoid valve defective • Water supply not opened • Solenoid valve electrically not driven <ul style="list-style-type: none"> - electrical cabling not o.k. - Main PCB relay not energized • Steam hose not laid with sufficient incline/ decline resulting in a water bag obstructing steam flow. Steam builds up pressure in steam cylinder and pushes water towards drain 	<ul style="list-style-type: none"> • Clean water supply line and/or solenoid valve; replace solenoid valve, if defective • Make measurement on solenoid; replace solenoid valve, if defective • Open water supply -Check electrical cable and replace, if required - Measure voltage on main PCB terminal 11 against N; replace PCB, if required • Check steam hose layout. Eliminate water bag.

Icons	Code	Error message	Possible cause	Counter measure
 	<p>061 062 063 064 065 066 067</p>	<p>Blow-down fault, relates to:</p> <p>Partial blow-down Full blow-down Dilution (only for electrode steam humidifiers) Overcurrent blow-down (only for electrode steam humidifiers) Max level blow-down (only for heater steam humidifiers) Stand-by blow-down Start_blow-down (only for electrode steam humidifiers)</p> <p>Indicated blow-down was not successful</p>	<ul style="list-style-type: none"> • Blow-down pump not driven <ul style="list-style-type: none"> - electrical wiring not o.k. - Main PCB relay not energized • Blow-down pump defective • Blow-down pump working but water is not drained (i.e. cylinder drain is blocked) • Blow-down pump blocked by hardeners 	<ul style="list-style-type: none"> - Check wiring and replace, if required - Measure voltage on main PCB terminal 10 against N; replace PCB, if required • Replace blow-down pump • Clean cylinder and cylinder base carefully to ensure that no blocking will occur in the near future • Check blow-down pump, drainage system and steam cylinder for hardeners and clean
 	<p>090</p>	<p>Cylinder full Sensor electrode continuously signals full cylinder for 60 mins (only for electrode steam humidifiers)</p>	<ul style="list-style-type: none"> • Check blow-down pump, drainage system and steam cylinder for hardeners and clean • Electrodes used up • No electrode cable run through current transducer • Salt bridges in steam-cylinder upper part • Foaming (when softened water is used) 	<ul style="list-style-type: none"> • Check feed water quality • Replace electrodes • Run one phase through current transducer • Clean • Increase blending rate
  	<p>091</p>	<p>Current measurement Current transducer supplies faulty measurement (only for electrode steam humidifiers)</p>	<ul style="list-style-type: none"> • Plug is not seated properly on main PCB • Current transducer defective 	<ul style="list-style-type: none"> • Check plug seating • Replace current transducer
 	<p>092</p>	<p>Main contactor current Current measured though the main contactor is not driven (only for electrode steam humidifiers)</p>	<ul style="list-style-type: none"> • Main contactor contact sticks 	<ul style="list-style-type: none"> • Replace main contactor

Icons	Code	Error message	Possible cause	Counter measure
	093	Main contactor cylinder full „Cylinder full“ is detected though main contactor is not driven (only for electrode steam humidifiers)	<ul style="list-style-type: none"> • Main contactor contact sticks 	<ul style="list-style-type: none"> • Replace main contactor
	120	Thermo switch One of the thermo switches has triggered (only for heater steam humidifiers)	<ul style="list-style-type: none"> • Thermo switch on steam cylinder cover has triggered due to lime coating on heating element • Capillary tube defective • Thermo switch on solid state relay has triggered due to blocked ventilation 	<ul style="list-style-type: none"> • Switch off power supply. Remove lime coating. Allow cool-down of steam cylinder. Push-back unblocking pin on thermo switch with needle-nose pliers or a screwdriver • Replace thermo switch • Switch off unit. Allow cool-down of heat sink. Restart humidifier operation.
	121	Water sensor Water sensor output signal not plausible (only for heater steam humidifiers)	<ul style="list-style-type: none"> • Water sensor is defective • Connecting hoses blocked 	<ul style="list-style-type: none"> • Replace water sensor • Clean hoses

Icons	Code	Error message	Possible cause	Counter measure
	122	<p>Max. level Maximum water level was achieved 5 times (only for heater steam humidifiers)</p>	<ul style="list-style-type: none"> •Excessive air pressure in duct has impact on water in steam cylinder via steam hose. Water is pressed into drainage •Solenoid valve closing action imperfect. Cylinder water level rises though solenoid valve is not energized •Solenoid valve is permanently energized (water intake stops when unit is switched off) •Large amounts of residues influence or restrict cyclic blow-down. The additional water introduction caused by the optional SuperFlush rinse device may cause the max. level fault 	<ul style="list-style-type: none"> •Reduce air pressure •Check solenoid valve •Relay on main PCB stuck. Measure voltage across terminal 11 and N. Replace PCB, if required •Clean steam cylinder, cylinder base, water sensor tubing and drainage system
	123	<p>Steam down time Heater element (s) is/are driven but water level remains constant</p>	<ul style="list-style-type: none"> • Heater element is defective • Phase loss (external circuit breaker has tripped or is defective) • No voltage supplied to heater element(s) • No proper main contactor switching action • Main contactor is not energized by PCB 	<ul style="list-style-type: none"> • Measure heater element resistance, replace heater element, if required. Typical resistance values are: • Check circuit breaker, find reason for tripping • Check wiring, measure voltage • Check and replace main contactor, if required • Verify voltage across PCB terminal 9 and N
	124	<p>Main contactor coil Voltage detected across coil though main contactor is not driven by control logic</p>	<ul style="list-style-type: none"> •Relay K4 on main PCB is stuck 	<ul style="list-style-type: none"> •Replace relay

Icons	Code	Error message	Possible cause	Counter measure
	210	R.h. sensor Humidity sensor signal implausibility	<ul style="list-style-type: none"> • Sensor cable defective • Sensor defective 	<ul style="list-style-type: none"> • Check sensor cable • Replace sensor
	ErL	Error Link no communication between mainboard and display	<ul style="list-style-type: none"> • Mainboard or display unit defective 	<ul style="list-style-type: none"> • Replace mainboard or display unit

4.2 Table of functional disruptions

Problem	Possible cause for faulty situation	Counter measure
Set humidity level not reached	<ul style="list-style-type: none"> • Output limitation parameter setting impedes full power output • Nominal unit output insufficient • Phase failure or defective heater element(s) • Thermo switch has triggered • Lengthy steam hose layout crossing cold and drafty rooms may lead to increased condensate formation • Improper steam manifold installation may cause condensate formation within air duct • Control signal not properly selected or software setting mismatch • Excessive pressure in duct system caused by e.g. water bags or partly blocked steam pipes (max. overpressure is 1200 Pa) 	<ul style="list-style-type: none"> • Check 1-1 parameter setting • Check unit technical data, airflow and secondary airflow • Check circuit breakers and heater element(s) • Switch off power supply. Push-back unblocking pin on thermo switch with needle-nose pliers or a screwdriver • Change unit installation location allowing for shorter steam hose. Insulate steam hose • Check steam manifold position within total system and installation correctness • Check control signal and „1-2“ parameter setting • Eliminate particular cause(s)
	<ul style="list-style-type: none"> • Water quality requires water concentration for full steam output (only for electrode steam humidifiers) 	<ul style="list-style-type: none"> • Wait
Excessive humidity	<ul style="list-style-type: none"> • A steam output limitation setting that is too high may result in poor control performance and even condensate formation in ducts • Control signal not properly selected or software setting mismatch 	<ul style="list-style-type: none"> • Check „1-1“ parameter setting • Check control signal and „1-2“ parameter setting

Problem	Possible cause for faulty situation	Counter measure
Water collects on bottom plate	<ul style="list-style-type: none"> • Cylinder improperly reassembled following maintenance: <ul style="list-style-type: none"> - O-ring not replaced, defective or not in place - Flange (tongue and groove) damaged - Flange improperly composed - Mineral deposits in flange area • Cylinder improperly inserted in cylinder base • Water cannot drain freely when pumped from cylinder 	<ul style="list-style-type: none"> • Clean cylinder and assemble / install properly • Using moistened new O-ring, insert steam cylinder properly into cylinder base • Make sure drain is unobstructed
Water leaks from steam cylinder upper part	<ul style="list-style-type: none"> • Hose clamps on steam and/or condensate hose not tightened • Steam hose adapter not properly fit or o-ring not replaced 	<ul style="list-style-type: none"> • Tighten clamps • Replace O-ring (if required) and ensure proper adapter installation
No steam production despite the steam humidifier being switched on. Display not illuminated.	<ul style="list-style-type: none"> • Defective F1 and/or F2 fuses (1.6 A each) • L3 phase failure (ext. circuit breaker has tripped or is defective) • device load circuit breaker has tripped 	<ul style="list-style-type: none"> • Check micro fuses and replace, if required • Replace breaker and investigate possible causes • Switch on breaker. If problem persists, check for reason
Blow-down pump works but not water is drained	<ul style="list-style-type: none"> • Steam cylinder and/or drainage system blocked 	<ul style="list-style-type: none"> • Clean cylinder base and/or drainage system, respectively
Cylinder is fully drained after partial blow-down despite switched-off pump	<ul style="list-style-type: none"> • Vent pipe is blocked 	<ul style="list-style-type: none"> • Clean venting bore or replace vent pipe adapter

Problem	Possible cause for faulty situation	Counter measure
<p>No steam exit from steam manifold</p> <p>Water exits periodically from drain hose without pump switched on</p>	<ul style="list-style-type: none"> • Steam pipe improperly laid (water bag). • Excess pressure in duct system (max. overpressure is 1200 Pa/.17 psi) 	<ul style="list-style-type: none"> • Rerun steam hose according to guide lines • Consult your expert dealer if problem persists
<p>Uneven electrode wear</p>	<p>(only for electrode steam humidifiers)</p> <ul style="list-style-type: none"> • One or more electrodes not supplied with power • Circuit breaker tripped • Main contactor contact not functional • Phase loading not symmetric • Electrode immersion depth differs. Unit not mounted plumb 	<ul style="list-style-type: none"> • Check power supply and wiring • Check circuit breaker. Replace, if required • Check main contactor. Replace, if required • Ensure power supply phase balance by measurement • Check installation and correct positioning, if required
<p>Flashover/sparks in cylinder</p>	<p>(only for electrode steam humidifiers)</p> <ul style="list-style-type: none"> • Very high water conductivity resulting in massive electrode burn-off as indicated by brown-black deposits • Blow-down pump not working properly or defective 	<ul style="list-style-type: none"> • Deactivate unit immediately to prevent material damage <p>Perform maintenance:</p> <ul style="list-style-type: none"> - replace electrodes - clean steam cylinder - check water quality and conductivity (also s. „Intended use“ section) <p>If problem persists, increase blow-down frequency and/or blow-down volume</p> <p>Consult your expert dealer, if required</p> <p>Check blow-down pump functioning and replace pump, if required. See also „Blow down fault“ error message</p>

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