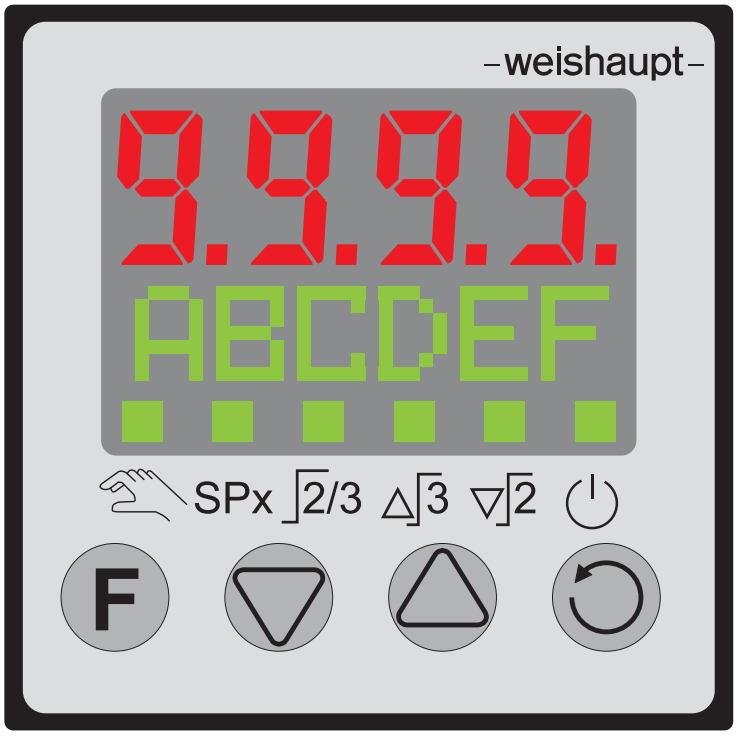
–weishaupt–

manual

Installation and operating instruction



KS 20-1burner industrial controller for Weishaupt burners

83282502 ▪ 1/2012-12

1 User instructions

These installation and operating instructions form part of the unit and must be kept on site at all times. They are supplemented by the installation and operating instructions for combustion manager W-FM 100/200.

1.1 User guide

1.1.1 Symbols

 DANGER	Immediate danger with high risk. Non observance can lead to serious injury or death
 WARNING	Danger with medium risk. Non observance can lead to environmental damage, serious injury or death
 CAUTION	Danger with low risk. Non observance can cause damage to the equipment and injury to personnel
	Important information
▶	Requires direct action
✓	Result after an action
■	Itemisation
…	Range

1.1.2 Target group

These installation and operating instructions are intended for the operator and qualified personnel. They should be observed by all personnel working on the unit.

Work on the unit must only be carried out by personnel who have the relevant training and instruction.

Persons with limited physical, sensory or mental capability may only work on the unit if they are supervised or have been trained by an authorised person.

Children must not play with the unit.

1.2 Guarantee and Liability

Guarantee and liability claims for personal and equipment damage are excluded, if they can be attributed to one or more of the following causes:

- Non approved application of the unit
- Non-observance of the installation and operating instructions
- Operating the unit with faulty safety equipment
- Continual operation despite a fault
- Improper installation, commissioning, operation and servicing of the unit
- Alterations to the unit
- The installation of additional components, which have not been tested with the unit
- The installation of combustion chamber inserts, which impede full flame formation
- Repairs, which have been carried out incorrectly
- The use of non original Weishaupt parts
- Unsuitable fuels
- Defects in the inlet lines
- Acts of God

2 Safety notes

Warning

If the device is damaged to an extent that safe operation can not be guaranteed, it must not be used.

This device was built and tested in compliance with VDE 0411-1 / EN 61010-1 and was delivered in safe condition. The device complies with the European Directive 89/336/EU (EMV) and is provided with CE labelling.
The device was tested before delivery and has passed the tests required by the test schedule. To maintain this condition and to ensure safe operation, the user must follow the instructions and warnings given in this operating manual. The device is intended exclusively for use as a measurement and control instrument for technical installations.

2.1 Commissioning

Prior to switching on the device, ensure that the following points have been observed:
- Ensure that the supply voltage corresponds to the specifications given on the name plate.
- All covers required for contact protection must be fitted.
- If the controller is connected with other devices in the same signal loop, ensure that the equipment in the output circuit is not affected prior to switching on.
- The device must only be operated once it has been installed.
- The temperature restrictions specified for controller operation must be met prior to and during operation.

2.1.1 Electrical connection

For all work carried out on live parts:
- Observe the accident prevention instruction BGV A3 and adhere to local directives
- Use tool in accordance with EN 60900

WARNING

Live parts and terminals may be exposed when opening the device or when removing covers or components. Connection points may also be live.

The device must be disconnected completely from the power supply prior to starting this work.

The electrical wiring must conform to local standards and regulations (e.g. VDE 0100). The input measurement and control cables must be kept separate from signal and power supply cables.

2.2 Alteration to the construction of the equipment

All conversions require written approval from Max Weishaupt GmbH.
- No additional components may be fitted, which have not been tested for use with the equipment
- Do not use combustion chamber inserts, which inhibit flame formation
- Use only original Weishaupt replacement parts

2.3 Shutdown

If the device is to be taken out of operation, the power supply must be switched off at all poles. The device must be secured against inadvertent operation. If the device is interconnected with other devices and / or facilities, the effects on these should be considered and appropriate precautions should be taken prior to switching off the device.

2.4 Maintenance, repair and modification

The devices require no special maintenance.

WARNING

Live parts and terminals may be exposed when opening the device or when removing covers or components. Connection points may also be live.

The device must be disconnected completely from the power supply prior to starting this work.

CAUTION

When opening the device, components which are sensitive to electrostatic discharge (ESD) may be exposed.

The following work may only be carried out at workstations with suitable ESD protection. Modifications, maintenance and repair work may only be carried out by trained and authorised personnel.

The service department is available to carry out this work.

After completing this work, the device should be closed and all covers and components should be refitted.

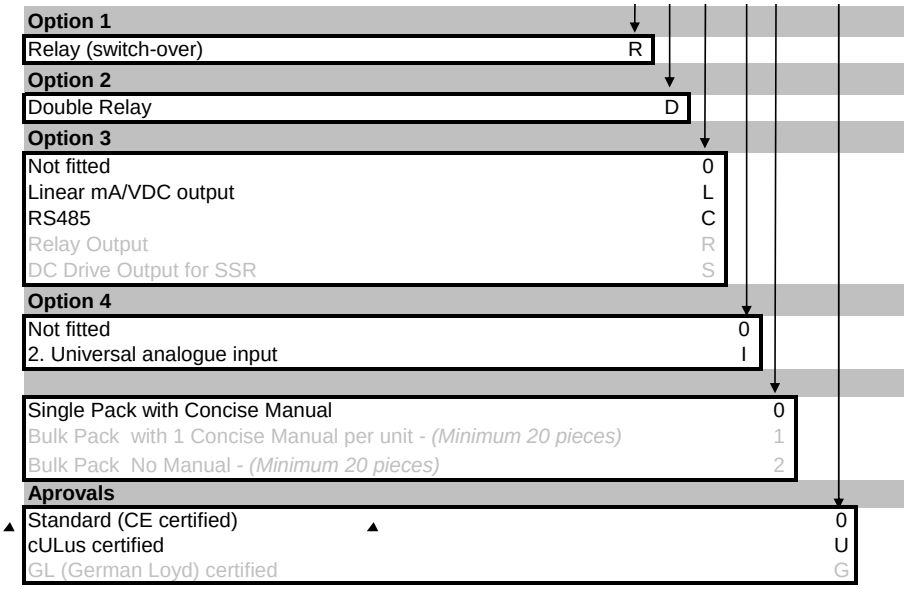
Check, if information given on the name plate has to be changed and correct the information if required.

2.5 Disposal

Dispose of all materials used in a safe and environmentally friendly way. Observe local regulations.

3 Product description

3.1 Type key



Option Modules

Model Code	**KS20**	-	**1**	**O**	**P**	-	*X*

Option 3	
2. Universal analogue input	L
RS485	C
Relay Output	R
DC Drive Output for SSR	S

3.2 Technical data

3.2.1 Inputs

ACTUAL VALUE INPUT INP1	
Resolution:	> 14 Bit (20.000 steps)
Decimal point:	0 to 3 digits behind decimal point
Limit frequency:	2 Hz (analogue)
Digital input filter:	adjustable 0.0...100.0 s
Scanning cycle:	100 ms
Measured value correction:	2-point or offset correction

Thermocouples	
See table 1 (page 13)	
Input resistance:	≥ 1 MΩ
Effect of source resistance:	1 µV/Ω
Temperature compensation:	internal

Sensor break monitoring	
Sensor current:	≤ 1 µA
Output action	can be configured

Resistance thermometer	
See table 2 (page 14)	
Connection:	2- or 3-wire
Cable resistance:	max. 30 Ohm
Input circuit monitoring:	break and short circuit

REMOTE TRANSMITTER 50-30-50 Ω

Current and voltage measuring ranges	
See table 3 (page 14)	
Measurement start, meas. end:	anywhere within the measuring range
Scaling:	optional -1999...9999
Linearisation:	16 segments, adaptable with BlueControl
Decimal point:	adjustable
Input circuit monitoring:	12.5% below meas. start (2mA, 1V)

ADDITIONAL INPUT INP2	
Resolution:	> 14 Bit
Scanning cycle:	100 ms

Current measuring range	
Technical data as INP1	

Potentiometers	
See table 2 (page 14)	
Connection:	3-wire
Cable resistance:	max. 30 Ohm
Input circuit monitoring:	break

Control inputs DI2,DI3	
Can be configured as switch or push button! Connection of a potential-free contact suitable for switching “dry” circuits.	
Switched voltage:	3.3 V
Current:	≤10 mA

TRANSMITTER SUPPLY UT (optional)	
Power:	22 mA / ≥ 18 V

GALVANIC ISOLATION	
Safety isolation	EN 61010
Function isolation	EN 61010
Power supply connections	Actual value input INP1 Additional input INP2 Digital inputs di2,3 Transmitter supply UT
Relay outputs OUT1,2	
Relay outputs OUT3	

3.2.2 Outputs

RELAY OUTPUTS OUT1, OUT2	
Contact type:	2 contacts with common connection
Maximum switching capacity:	500 VA, 250 V, 2A at 48...62 Hz, resistive load
Minimum switching capacity:	6V, 1 mA DC
Electrical operating life:	800.000 switch cycles at max. switching capacity

RELAY OUTPUT OUT3	
Contact type:	Potential-free change-over contact
Maximum switching capacity:	500 VA, 250 V, 2A at 48...62 Hz, resistive load
Minimum switching capacity:	5V, 10 mA AC/DC
Electrical operating life:	600.000 switch cycles at max. switching capacity

When connecting a control contactor to OUT1...OUT3, an RC protective circuit meeting the requirements stipulated by the manufacturer must be fitted to the contactor to prevent high voltage peaks.

3.2.3 Power supply

AC VOLTAGE

Voltage:	100...240 VAC +/-10%
Frequency:	50...60 Hz
Power consumption, approx.	11 VA

BEHAVIOUR AT POWER FAILURE

Configuration, parameters and setpoints set, operating mode:	Permanent storage in EEPROM

AMBIENT CONDITIONS

Type of protection

Device front:	IP 65 (NEMA 4X)
Housing:	IP 20
Connections:	IP 00

Permissible temperatures

Operation:	0...55°C
Start-up time: ε	15 minutes
Limit for operation:	-20...60°C
Storage:	-20...70°C

Humidity

75% annual average, no condensation

Shock and vibration

Vibration Fc (DIN 68-2-6)	
Frequency:	10...150 Hz
Device in operation:	1g or 0.075 mm
device not operating:	2g or 0.15 mm
Shock test Ea (DIN IEC 68-2-27)	Shock: 15g / duration: 11ms

Electromagnetic compatibility

Complies with EN 61 326-1 (for continuous, non-monitored operation)

GENERAL

Housing

Material:	ABSAF 305
Flammability Class:	UL 94 VO, self-extinguishing
Plug-in module, inserted form the front	

Safety	
Complies with EN 61010-1 (VDE 0411-1):	Overvoltage Category II Contamination Class 2 Operating Voltage Range 300 V Protection Class II

Electrical connections
Plug-in screw terminals

Installation
Panel mounted, close proximity mounting possible, Mounting position: optional, weight: 0.2 kg

Accessories supplied with the device
Operating manual

Table 1 Thermocouple measuring ranges

Thermocouple type		Measuring range		Accuracy	Resolution (Ø)
L	Fe-CuNi (DIN)	-100...900°C	-148...1652°F	≤ 2K	0.1 K
J	Fe-CuNi	-100...1200°C	-148...2192°F	≤ 2K	0.1 K
K	NiCr-Ni	-100...1350°C	-148...2462°F	≤ 2K	0.2 K
N	Nicrosil/Nisil	-100...1300°C	-148...2372°F	≤ 2K	0.2 K
S	PtRh-Pt 10%	0...1760°C	32...3200°F	≤ 2K	0.2 K
R	PtRh-Pt 13%	0...1760°C	32...3200°F	≤ 2K	0.2 K
T	Cu-CuNi	-200...400°C	-328...752°F	≤ 2K	0.05 K
C	W5%Re-W26%Re	0...2315°C	32...4199°F	≤ 2K	0.4 K
D	W3%Re-W25%Re	0...2315°C	32...4199°F	≤ 2K	0.4 K
E	NiCr-CuNi	-100...1000°C	-148...1832°F	≤ 2K	0.1 K
B *	PtRh-Pt6%	0(100)...1820°C	32(212)...3308°F	≤ 2K	0.3 K

* Specifications valid from 100°C

Table 2 Resistance transducer measuring ranges

Type	Meas. current	Measuring range		Accuracy	Resolution (Ø)
Pt100	0.2mA	-200...100°C	-140...212°F	≤ 1K	0.1K
Pt100	0.2mA	-200...850°C	-140...1562°F	≤ 1K	0.1K
Pt1000		-200...200°C	-140...392°F	≤ 2K	0.1K
KTY 11-6 *		-50...150°C	-58...302°F	≤ 2K	0.05K
Special		0...4500		≤ 0.1 %	0.01 %
Special		0...450			
Potentiometer		0...160			
Potentiometer		0...450			
Potentiometer		0...1600			

* Or Special

Table 3 Current and voltage measuring ranges

Measuring range	Input resistance	Accuracy	Resolution (Ø)
0-10 Volt	~ 110 kW	≤ 0.1 %	0.6 mV
0-20 mA	49 W (voltage requirement ß 2.5 V)	≤ 0.1 %	1.5 mA

4 Installation

CAUTION

Please ensure that the inside oft he mounting plate corresponds to the operating temperature of the device and sufficient ventilation is provided to prevent overheating.

Please DO NOT remove the safeguard/seal from the mounting plate as this can lead to the device becoming jammed in the mounting plate.

The mounting plate must be solid and up to 6.0 mm thick. The required cut-out is shown below. Several devices with the following dimensions can be installed side by side:
Devices: (48n - 4) mm or (1.89n - 0.16) inches.

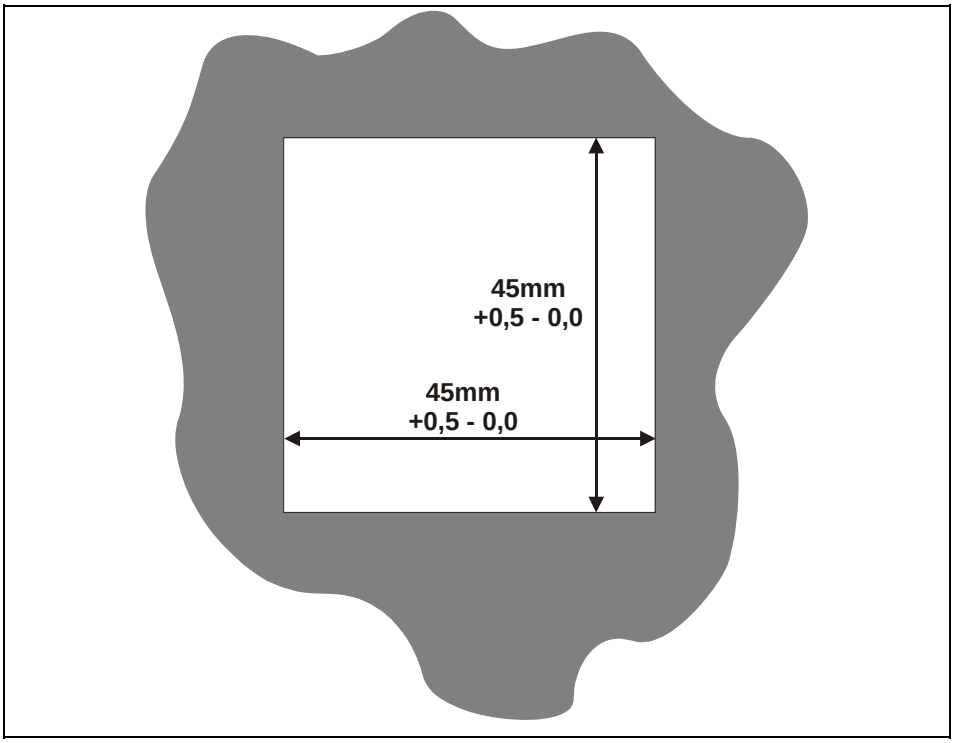


Fig. 1: Installation dimension

Installation dimensions

The installation depth with terminals plugged in is 110mm.
Hold the device firmly in position (applying pressure only to the front bezel)

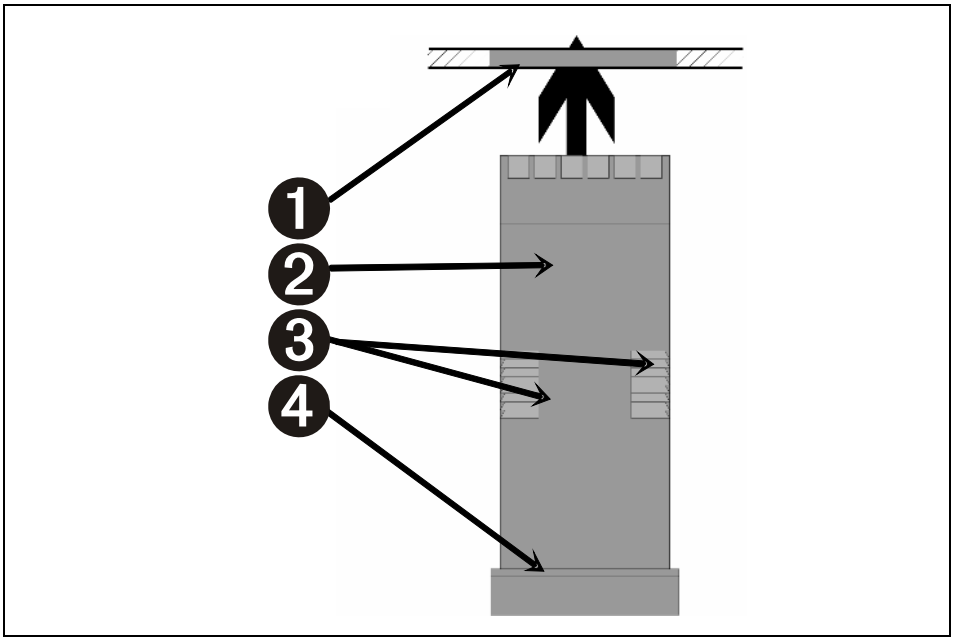


Fig. 2 : Orientation

❶ Mounting plate
❷ Device housing
❸ Locking groove
❹ Seal

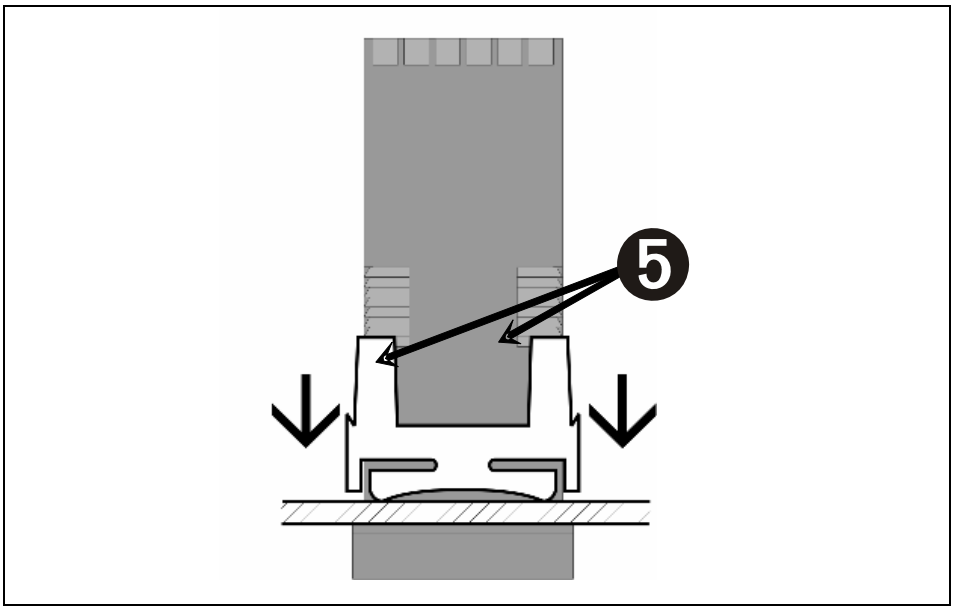


Fig. 3: Mounting bracket

❺ Slide the mounting bracket over the back of the device housing, until the spring tongue engages in the locking groove

After installing the device in the mounting plate, it can be removed from its housing if required (see “Fitting and removing optional modules”).

The lugs of the mounting bracket will lock on both sides or on the top / bottom of the device housing. If you are installing multiple units side by side, use the locking grooves on the top / bottom.

5 Electrical connection

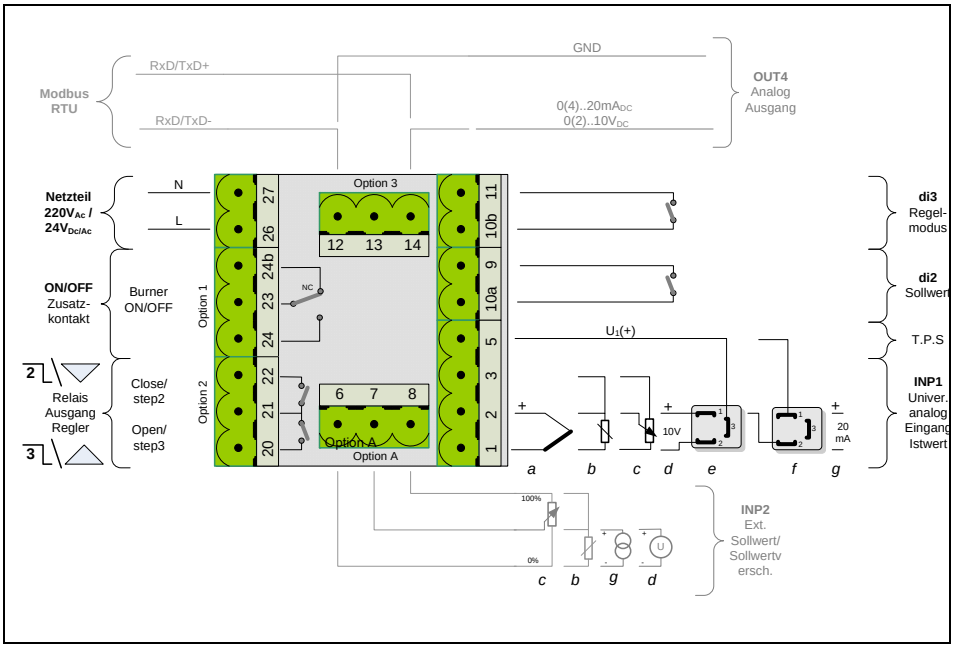


Fig. 4: Electrical connection

Connection of input INP1

Input for variable x1 (actual value).

a Thermocouple

b Resistance thermometer (Pt 100/Pt1000/KTY)

c Remote transmitter 50-30-50 Ω

d Voltage 0..10V (* : see wiring diagram)

e Pressure transducer (3-wire connection)

f Pressure transducer (2-wire connection)

g Current 0..20mA (** : see wiring diagram)

Connection of input INP2

See input INP1.

Connection of input s di2/di3

Digital input di2 for external change-over switching between **SP** and **SP.2/SP.e** (SP/SP.2).

Digital input di3, ext. change-over switching 3-point step controller/signalling device (DPS/SG).

6 Operation

6.1 Front view

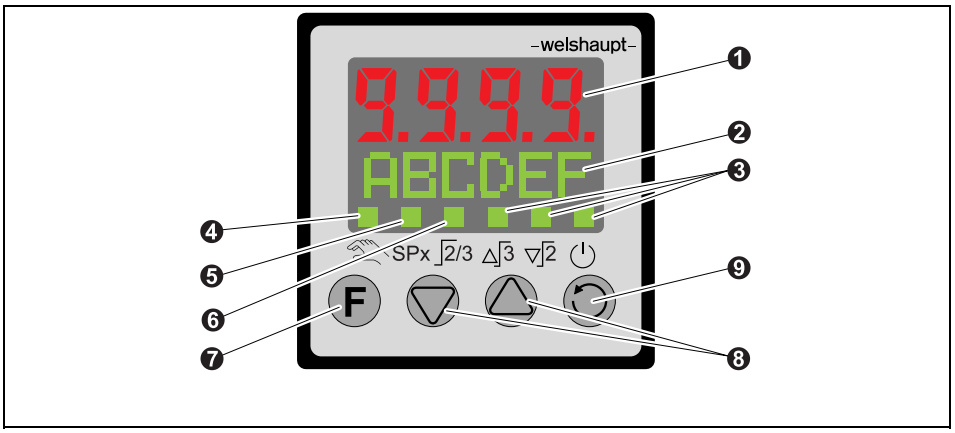


Fig. 5: Front view

❶ Actual value display
❷ Setpoint, variable, parameters
❸ Status of switching outputs
❹ Manual operation
❺ Setpoint **SP.2** or **SP.e** is effective
❻ Controller operates as signalling device
❼ Function key
❽ Changing the setpoint value in automatic or in manual operation
❾ Acknowledges value changes or shows the next parameter/value

The actual value is always displayed in the upper display. In the parameter and configuration level and in the Error list the bottom display changes cyclically between the parameter to be set and the parameter value.

6.2 Operating level

The operating level comprises two views for setpoint and controller output value. It can be extended with two further levels:

- Extended operating level
- Function level

The content of the extended operating level and the function level is determined means of the Engineering Tool. Parameters, which are used frequently or the display of which is important, can be copied to the extended operating level.

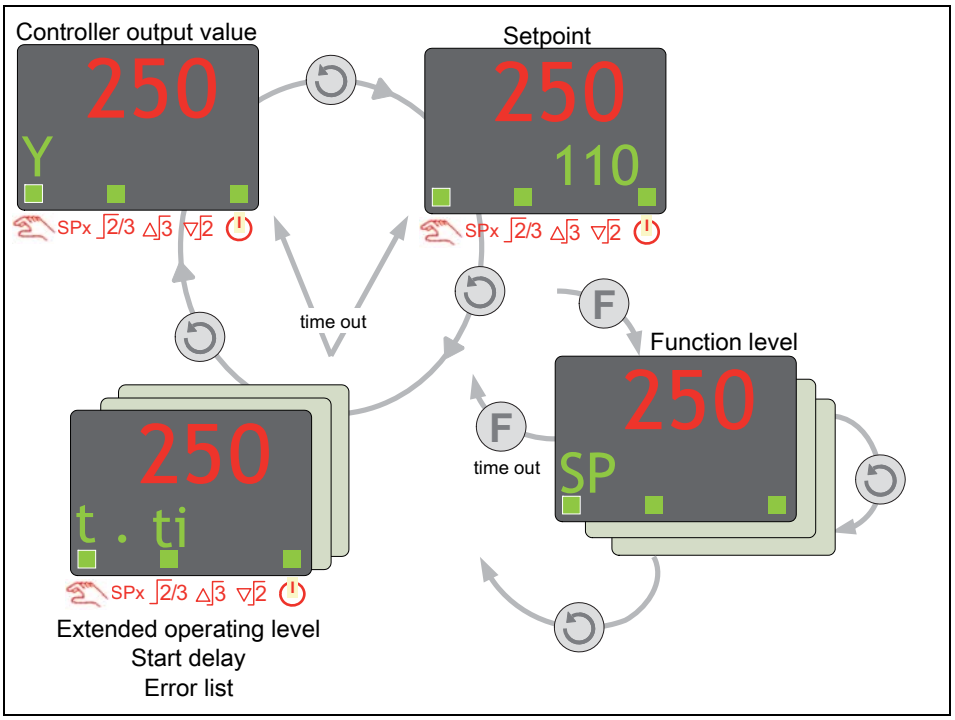


Fig. 6: Operating level

The error list is visible only if an error entry is present. An active entry in the error list is displayed in the second row of the display which flashes red/green.

Err status	Significance	Proceed as follows
2. row flashes red	error present	- determine the error type in the error list via the error number - rectify error
.. is red	error rectified	- acknowledge the alarm in the error list by pressing △ - or ▽ key - the alarm entry is deleted
.. is green	no error	

All errors can also be reset in the function level with **Err** △ **rSET** (if configured).

6.3 Error list

Name	Description	Cause	Possible remedial action
E.1	Internal error, unrecoverable	e.g. defective EEPROM	- Contact PMA Service - Return device
E.2	Internal error, recoverable	e.g. EMC interference	- Briefly disconnect device from mains - Run test and power cables separately - Use contactor suppression
E.4	Internal error, optional modules	HW coding does not match current HW configuration	- Contact PMA Service - Return device or check optional modules
FBF.1/2	Sensor break input 1/2	Sensor defective wiring fault	Replace INP1 / 2 sensor Check INP1 / 2 connection
Sht.1/2	Short circuit input 1/2	Sensor defective wiring fault	Replace INP1 / 2 sensor Check INP1 / 2 connection
POL.1	Polarity error input 1	Wiring fault	Interchange INP1 wiring
AdA.H	Adaption alarm heating (ADAH)	see error list status Heating Adaption	see error list status Heating Adaption

6.4 Error status (error status 3 - 9 only with error AdA.H):

Err status	Significance	Reaction
1	Stored error	Entry is deleted once acknowledged
2	Existing error	Change to error status 1 after error has been rectified
3	Faulty control action	Reconfigure controller (inverse/direct)
4	No reaction of the control variable	Perhaps the control circuit is not closed: check sensor, connections and process
5	Low reversal point	Let process cool down and start new adaption attempt
6	Danger of exceeding setpoint (parameter determined)	If necessary increase (inverse) or decrease (direct) setpoint
7	Output step change too small	Let process cool down and start new adaption attempt
8	Setpoint reversal too small	Increase (inverse) or decrease (direct) setpoint
9	Impulse attempt failed	Perhaps the control circuit is not closed: check sensor, connections and process

The function level serves for the enhanced operation oft he device. Its content is determined by configuration (LOGI):

- **Err** No resetting of error list
- **Erst** Resetting of error list
- **SP** Internal setpoint active
- **SP.E** External setpoint active
- **SP.2** 2. setpoint activate active
- **On** Controller/signalling device and Limit 1are switched on
- **Off** Controller/signalling device and Limit 1are switched off
- **Auto** Automatic operation
- **Man** Manual operation
- **Loc** Local operation, adjustment possible via front panel
- **rem** Remote operation, adjustment possible via front panel not possible
- **blc.P** Configuration, parameter and calibration levels are blocked
- **blc.C** Configuration level is blocked
- **u.blc** All blocking cancelled

You can move through the list in the above sequence using the ↺ key. Values are changed using △ ▽ keys. The value is accepted using ↺ key or automatically no more than 2 seconds after the change was made.

Return to normal operation by pressing the F key.

6.5 Self-optimisation (automatic adaption of control parameters)

ti and **td** are only taken into account during the adaption, if they were not set to **OFF** previously.

When started by the operator, the controller initiates an adaptation attempt. During this attempt it calculates the parameters for fast control without overshoot to the setpoint using the characteristics of the control system.

Start of adaption:

The operator can start self-optimisation at any time. To do this, keys ↺ and △ are pressed simultaneously. In the second row, the active adaption is displayed flashing **Ad:PIR**. The controller outputs 0% control value, waits until the process has come to rest and begins the adaptation: **Ad:Stp**

The adaptation attempt is started by the controller when the following conditions are met:

- The difference between actual value / setpoint must be ± 10% of the setpoint range (**SP.Hi - SP.LO**) (with inverse operation: actual value below setpoint, with direct operation: actual value above setpoint). If the adaption was successful, the AdA-LED is off and the controller continuous operating with the new control parameters.

Adaption cancelled by the operator:

The operator can cancel self-optimisation at any time. To do this, keys ↺ and △ are pressed simultaneously. The controller then continuous to operate in automatic mode with the old parameter values.

Adaption cancelled by the controller:

If an error is detected during the adaptation, technical control conditions exist which prevent a successful adaption.

In this case the adaption was cancelled by the controller. The controller switches off its outputs (control variable 0%), to avoid exceeding the setpoint. The operator has two possibilities to acknowledge a failed adaption:

1. Simultaneously pressing the ↺ and △ keys:

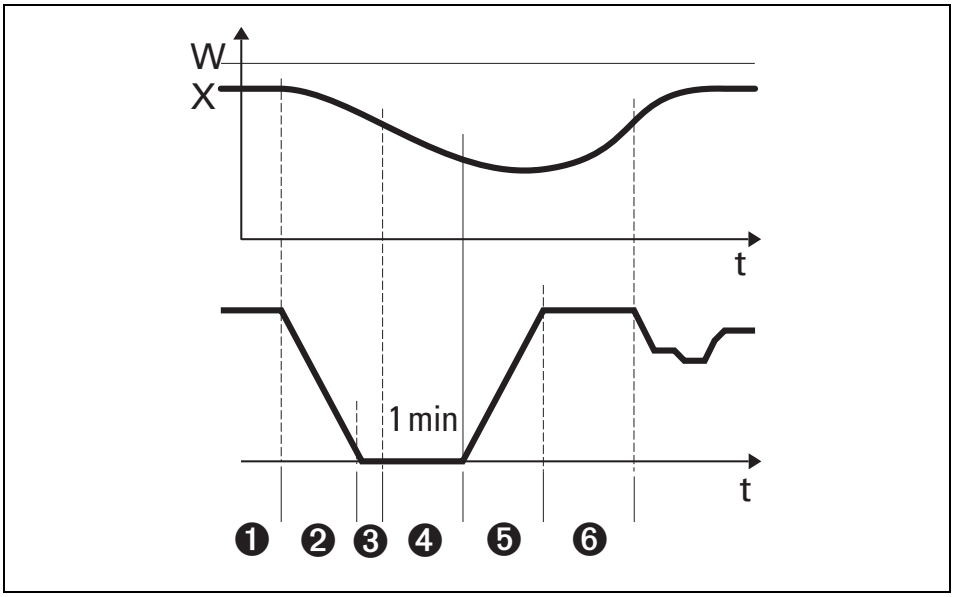
The controller continuous controlling in automatic mode using the old parameters. The adaption error must be acknowledged in the error list.

2. Pressing the ↺ key:

Display of error list in extended operating level. Once the error message has been acknowledged, the controller continuous controlling in automatic mode using the old parameters

Cause of cancellation: See page 21 "Error status"

Examples for adaption attempts 3 point step controller



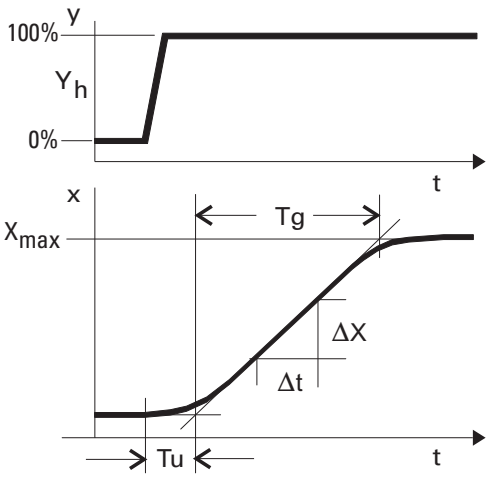
After the start ❶, the controller closes the correcting element (❷ **`Out.2`**). Once the difference between actual value and setpoint is sufficient ❸, the change of the actual value is monitored for 1 minute ❹. The correcting element is then opened (❺ **`Out.1`**). If the reversal point is reached ❻ or sufficient measurements have been taken, the parameters are determined and adopted.

6.6 Optimisation aid for manual optimisation

The optimisation aid should be used on devices, where the control parameters are to be set without self-optimisation.

The response of control variable x after a step change of correcting variable y can be used for this. It is often not possible to plot the complete response curve (0 to 100%), as the control variable must not exceed defined values.

Values T_g and x_{max} (step change from 0 to 100 %) or. Δt and Δx (partial step response) can be used to determine the maximum rate of increase v_{max} .



Y = Correcting variable

Yh = Setting range

Tu = Delay time (s)

Tg = Recovery time (s)

X_{max} = Maximum value of control range

$V_{max} = \frac{X_{max}}{Tg} = \frac{\Delta x}{\Delta t}$ = max. rate of increase of control variable

The control parameters can be determined from the values calculated for the delay time Tu, the maximum rate of increase V_{max} and the characteristic K according to the formulas given.

If the inlet to the setpoint is oscillating, Pb must be increased.

Adjustment aids

Parameter	Control procedure	Fault condition	Start-up behaviour
Pb greater	increased damping	slower compensation	slower reduction of energy
less	decreased damping	faster compensation	faster reduction of energy
td greater	decreased damping	stronger reaction	earlier reduction of energy
less	increased damping	weaker reaction	later reduction of energy
ti greater	increased damping	slower compensation	slower reduction of energy
less	decreased damping	faster compensation	faster reduction of energy

Formulas

K = Vmax * Tu

With 2- and 3-point controllers the cycle time must be set to **t1** ≤ 0.25 * Tu.

Control behaviour	Pb [phys. units]	td [s]	ti [s]
PID	1.7 * K	2 * Tu	2 * Tu
PD	0.5 * K	Tu	**OFF**
PI	2.6 * K	**OFF**	6 * Tu
P	K	**OFF**	**OFF**
3-point step controller	1.7 * K	Tu	2 * Tu

6.7 Manual operation

Depending on the controller currently in operation, the output of the controller can be adjusted manually.

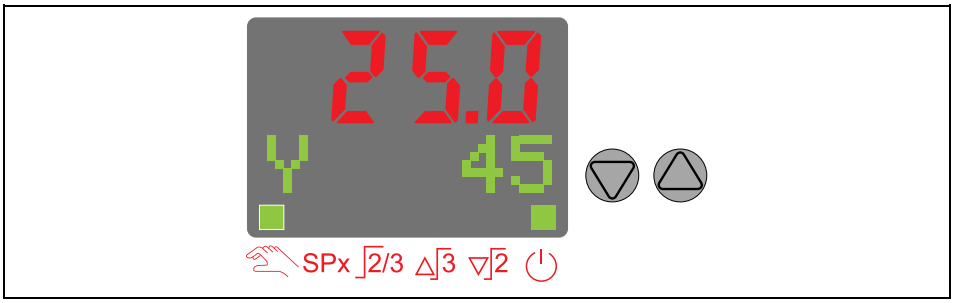


Fig. 7: Continuous or switching controller

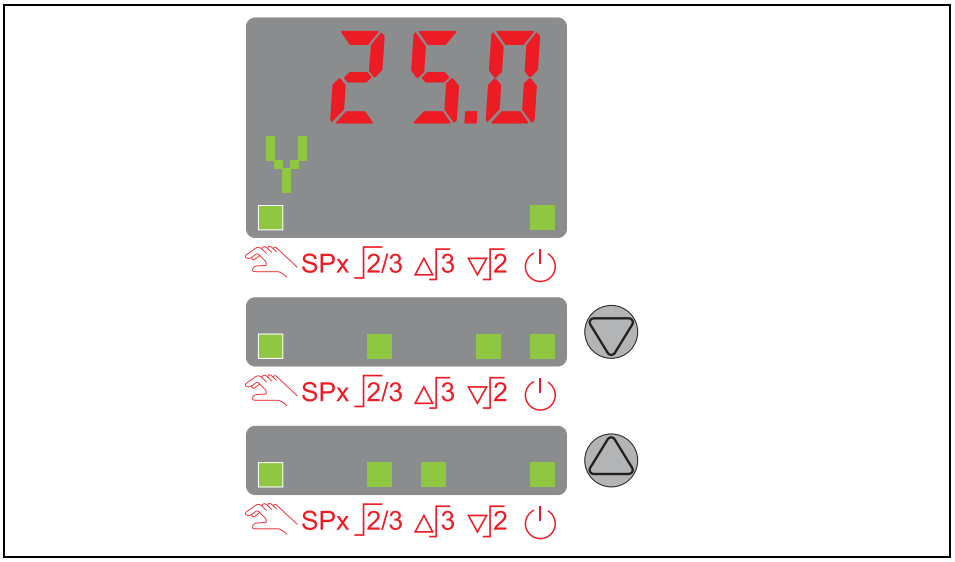


Fig. 8: 3-point step controller

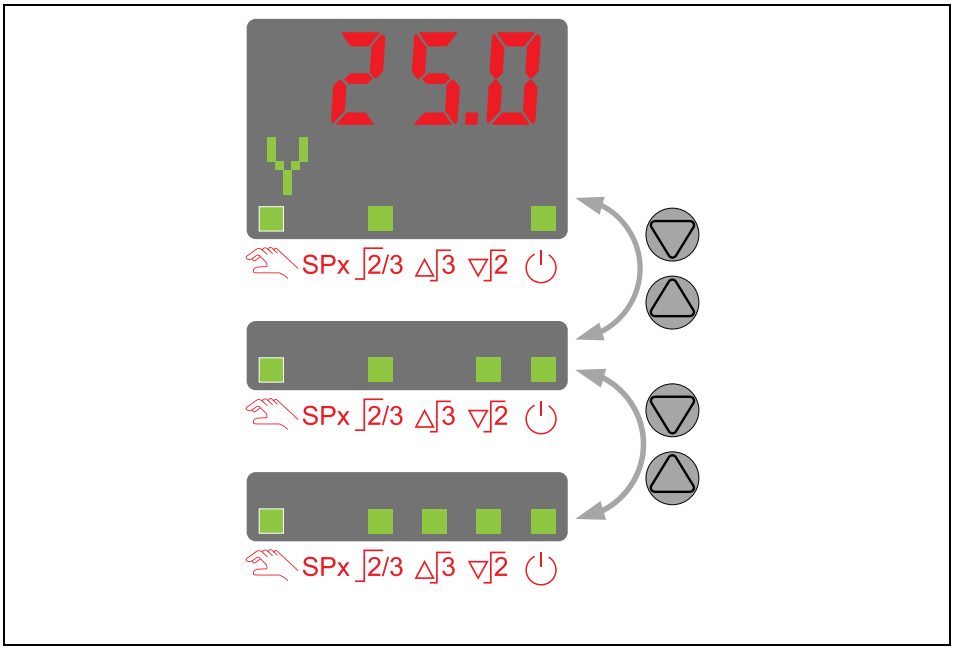


Fig. 9: Stepping controller

6.8 Parameter setting and configuration

After switching on the power supply the device starts up with the **Operating Level**. The operating mode that was active prior to the restart is adopted.

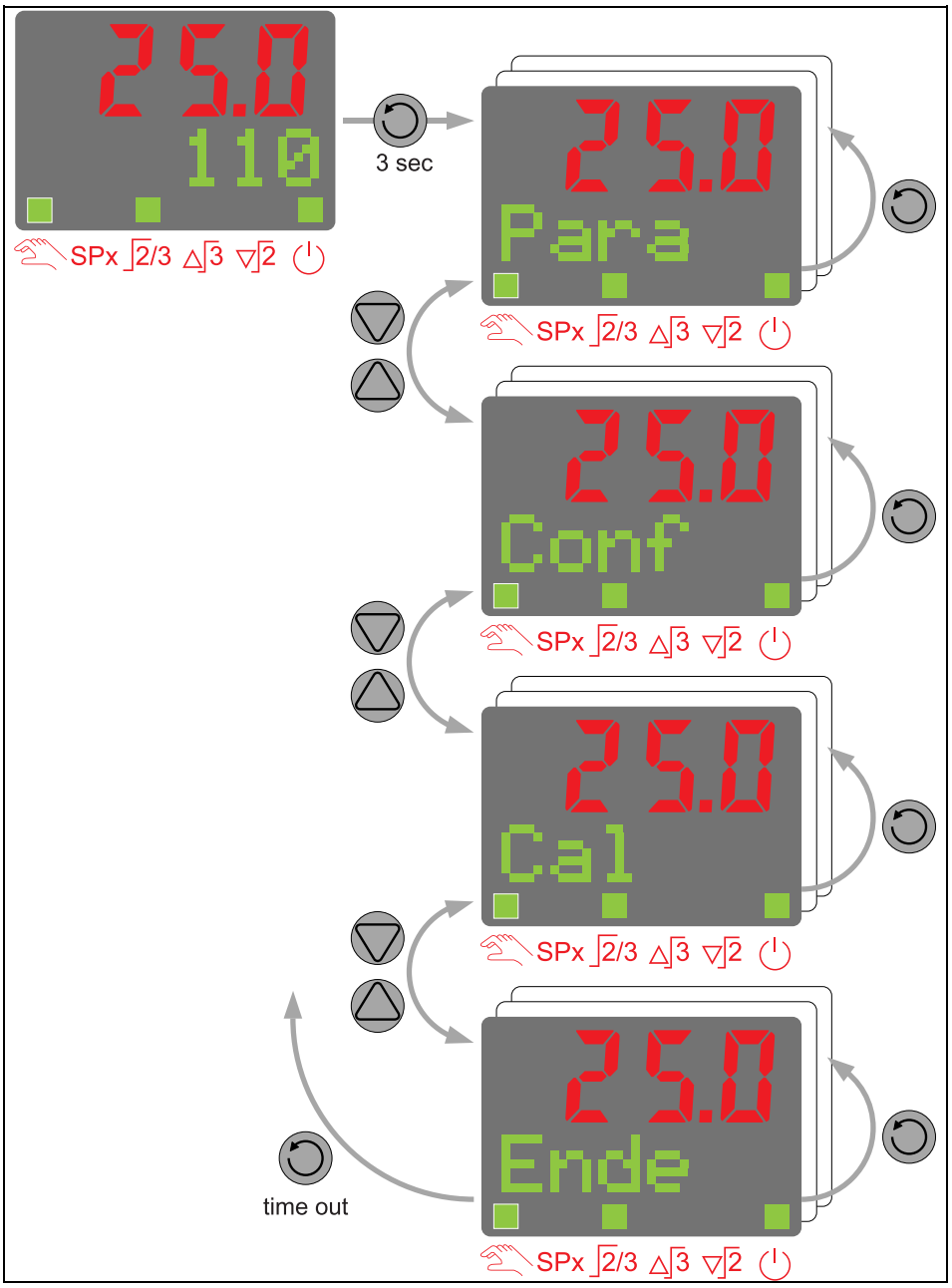


Fig. 10: Overview operating level

7 Configuration level

7.1 Configuration with **Quick**

CAUTION

After exiting the configuration level (see page 27) the controller automatically undergoes a re-initialisation(all elements of the display are illuminated) and changes over to normal operation (operating level).

In the configuration level the function of the controller is stipulated by changing the configuration word **Conf**. In the lower display **Conf** and the code set are displayed alternately. Leading zeros are not displayed

Fig. 11: Configuration level

7 Configuration level

Code significance:

A		Reaction at sensor break
	0	.. as actual value greater than setpoint
	1	.. as actual value less than setpoint
	2	P30/Ω connection .. as actual value less than setpoint)[1]
B		Configuring actual value input
	0	Remote transmitter 50-30-50Ω/ pressure transducer 0..10V, display range 0.0...100.0 (%)
	1	display range 0.00...1.00 (bar)
	2	display range 00...16.0 (bar)
	3	display range 0.0...40.0 (bar)
	4	Resistance thermometer Pt100, range 0...200°C
	5	Resistance thermometer Pt100, range 0...400°C
	6	Thermocouple type L, range 0...900°C
	7	Thermocouple type K, range 0...1350°C
C		Control function
	0	Signalling device with change-over switch (SG)
	1	3-point step controller (DPS)
	2	Continuous controller (PID)
	3	Switchable: (DPS) i (SG)
	4	(PID) i (SG)
	5	Switching controller (SR)
	6	Switchable: (DPS) i (SR)
	7	(PID) i (SR)
D		Configuration OUT4 (analogue output)
	0	No output
	1	Control output for continuous controller)[2]
	2	Control variable (INP1)
	3	Effective setpoint
	4	Control deviation
	5	2nd analogue input
)[1] with A = 2 only B = 0…3 possible		
)[2] fixed for continuous controller (Func C = 2 | 4 | 7)		

Configuration example 1 (Code 0400):

Signalling device with change-over switch for two stage burners:
- Measuring range 0...200°C, resistance thermometer Pt 100,
- Reaction at sensor break as actual value greater than setpoint.

Configuration example 2 (Code 2120):

3-point step controller:
- Connection to pressure measurement transducer P30/Ω, measuring range 0.00...1.00 bar,
- Reaction at sensor break as actual value less than setpoint.

7.1.1 Function: Signalling device with change-over switch

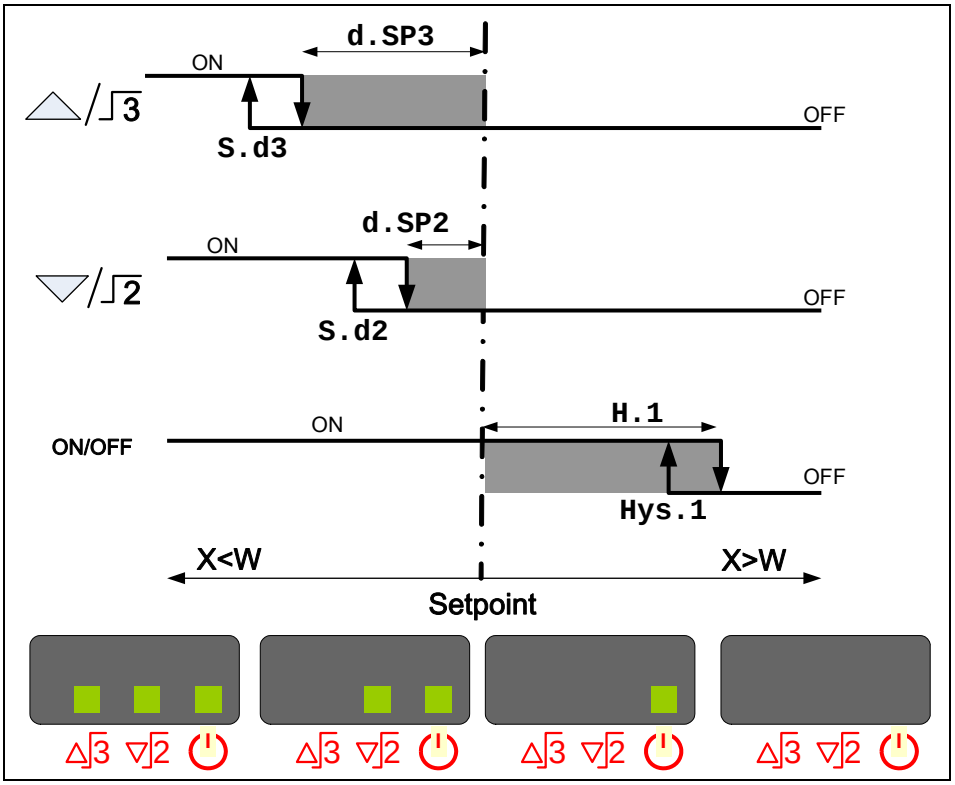


Fig. 12: Signalling device with change-over switch

Settings (all parameters in physical values):

Limit value **d.SP3**:	If the limit value is exceeded, the relay is de-energised.
Limit value **d.SP2**:	If the limit value is exceeded, the relay is de-energised.
Switch diff.: **S.d3** / **S.d2**:	If not maintained, the relay is re-energised.
Upper limit value **H.1**:	If the limit value is exceeded, the relay is de-energised.
Switch differential **HYS.1**:	If not maintained, the relay is re-energised.

Condition without power applied: all relays are de-energised, contacts open

Parameters: see chapter 8 “Parameter level”

7.1.2 Function: 3-point step controller

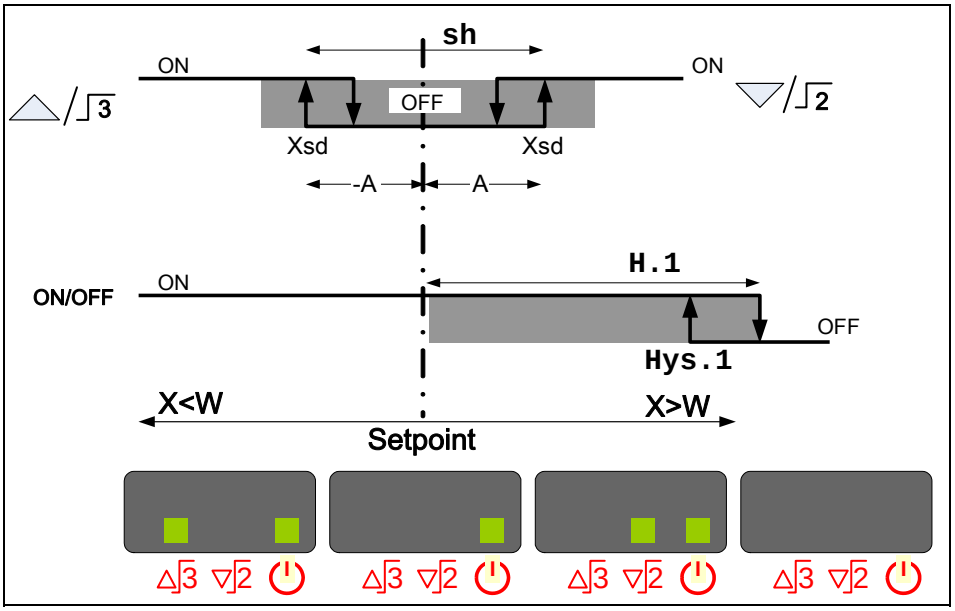


Fig. 13: 3-point step controller

Settings (in physical values):

Controller:

sh: Response threshold A = 0.5 * **sh**
Switch differential XSd = 0.06 * **sh** + 0.08

tt : Runtime of actuator between burner partial load and full load: 3...9999 s
Minimum activation time: fixed, TEmin = 100 ms

Control parameters: Pb1 = 0.01...9999 : in physical values °C or °F
(number of digits behind the decimal point is determined by CON1)

Ti = 1...9999 s (OFF = no I portion)

td = 1...9999 s (OFF = no D portion)

Upper limit value **H.1**: If the limit value is exceeded, the relay is de-energised.

Switch differential **HYS.1**: If not maintained, the relay is re-energised.

Condition without power applied: all relays are de-energised, contacts open

Parameters: see chapter 8 “Parameter level”

7.1.3 Function: Switching controller

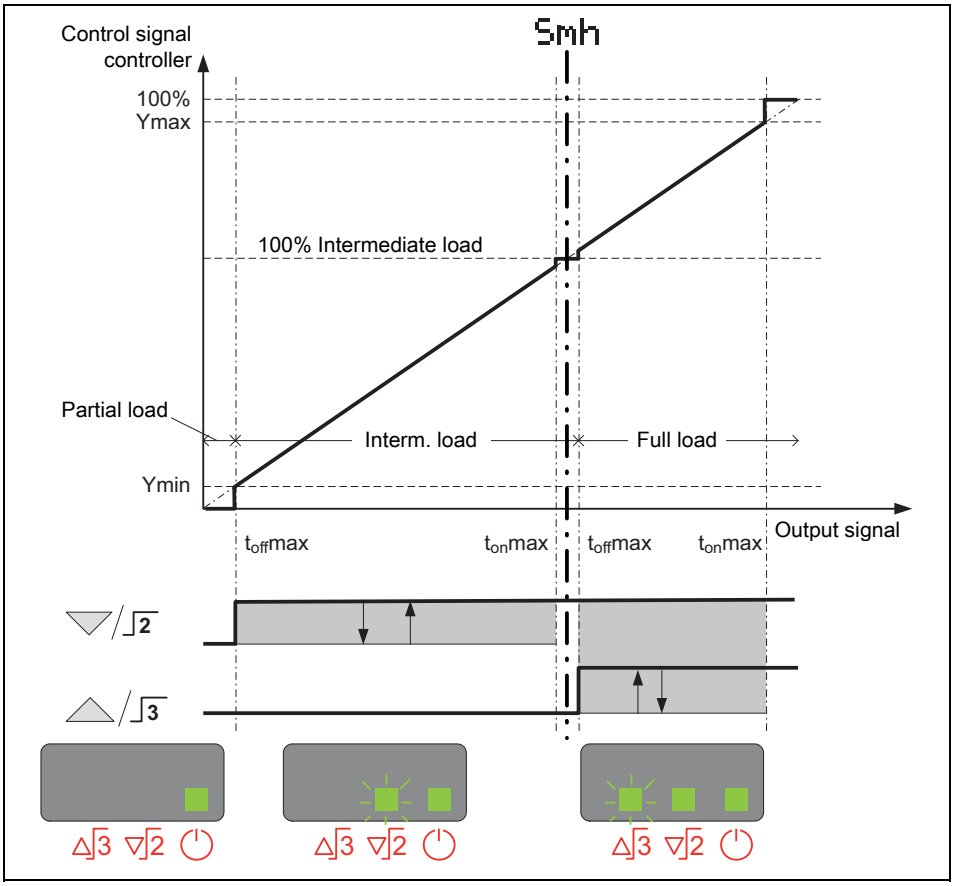


Fig. 14: Switching controller

Settings (in physical values):

Controller:

Smh: Switch on value full load (= 100% partial load)
t1: Minimum period at 50% switch signal
Minimum switch on duration: fixed, TEmin = 100 ms

Control parameters: Pb1 = 0.01...9999 : in physical values °C or °F
(number of digits behind the decimal point is determined by CON1)

Ti = 1...9999 s (OFF = no I portion)

td = 1...9999 s (OFF = no D portion)

Upper limit value **H.1**: If the limit value is exceeded, the relay is de-energised.

Switch differential **HYS.1**: If not maintained, the relay is re-energised.

Condition without power applied: all relays are de-energised, contacts open

Parameters: see chapter 8 “Parameter level”

7.2 Configuration without **Quick** (**Quick** = OFF)


CAUTION

This resets the controller to its default factory settings!

If, when powering up the controller the ↩-key is pressed and held down, the configuration with **Quick** is switched off. Now all configuration settings are available to the user. To switch back to configuration with **Quick**, the △ ▽ keys must be pressed and held down when powering up the controller.

Overview of configuration:

Cntr

Name	Value range	Description	Default	Own settings
SP.Fn		**Basic configuration of setpoint processing**	0	
	0	Setpoint controller switchable to external setpoint (**SP.E**)		
	8	Setpoint controller with external offset (**SP.E**)		
C.Fnc		**Control behaviour (algorithm)**	7	
	1	PID controller (2-point and continuous)		
	4	3-point step controller		
	7	3-point signalling device		
	9	3-point step controller switchable to 3-point signalling device		
	12	Continuous controller switchable to 3-point signalling device		
	13	Switching controller with intermediate load		
	14	3-point step controller switchable to switching controller with intermediate load		
	15	Continuous controller switchable to switching controller with intermediate load		
Man		**Manual adjustment permitted**	1	
	0	non		
	1	yes (see also **LOGI** / **man**)		
C.Act		**Operating mode of controller**	0	
	0	Inverse, e.g. heating		
	1	Direct, e.g. cooling		
Fail		**Behaviour at sensor break**	1	
	0	Controller outputs switch off		
	1	y = Y2		
	2	y = mean output. The maximum permissible output can be set with parameter **Ym.H**. To prevent unacceptable values being determined, averaging is only carried out if the control deviation is less than parameter **L.Ym** (only with **C.Fnc** = 2)		
rnG.L	-1999...9999	**X0 (lower control range limit)**(1	0	
rnG.H	-1999...9999	**X100 (upper control range limit)**(1	100	

(1 **rnG.L** and **rnG.H** indicate the control range, which relates to self-optimisation for example.

InP.1

Name	Value range	Description	Default	Own settings
S.tYP		**Sensor type**	50	
	0	Thermocouple type L (-100...900°C) , Fe-CuNi DIN		
	1	Thermocouple type J (-100...1200°C) , Fe-CuNi		
	2	Thermocouple type K (-100...1350°C), NiCr-Ni		
	3	Thermocouple type N (-100...1300°C), Nicrosil-Nisil		
	4	Thermocouple type S (0...1760°C), PtRh-Pt10%		
	5	Thermocouple type R (0...1760°C), PtRh-Pt13%		
	18	Special thermocouple		
	20	Pt100 (-200.0 ... 100.0 °C)		
	21	Pt100 (-200.0 ... 850.0 °C)		
	22	Pt1000 (-200.0...200.0 °C)		
	23	KTY 11-6 (Special 0...4500 Ohm)		
	30	0...20mA / 4...20mA(2		
	40	0...10V / 2...10V 2		
	50	Potentiometer 0...160 Ohm(2		
	51	Potentiometer 0...450 Ohm(2		
	52	Potentiometer 0...1600 Ohm(2		
S.Lin		**Linearisation (only at S.tYP = 30 (0..20mA) and 40 (0..10V) adjustable)**	0	
	0	None		
	1	Special linearisation. Creation of linearisation table with BlueControl (Engineering Tool) possible. The characteristics curve for KTY 11-6 temperature sensors is preset.		
Corr		**Measured value correction / scaling**	2	
	0	Without scaling		
	1	Offset correction (in **CAL** level)		
	2	2-point correction (in **CAL** level)		
	3	Scaling (in **Para** level)		

(2 With current, voltage or potentiometer input signals scaling is required.

InP.2 (Option A)

Name	Value range	Description	Default	Own settings
I.Fnc		**Function selection of INP2**	0	
	0	No function (the following Inp. data is skipped)		
	2	External setpoint (switch-over -> **LOGI/SP.E**)		
S.tYP		**Sensor type**	30	
	20	Pt100 (-200.0 ... 100.0 °C)		
	21	Pt100 (-200.0 ... 850.0 °C)		
	22	Pt1000 (-200.0...200.0 °C)		
	23	KTY11-6 (Special 0...4500 Ohm)		
	30	0...20mA / 4...20mA(1		
	50	Potentiometer (0...160 Ohm)(1		
	51	Potentiometer (0...450 Ohm)(1		
	52	Potentiometer (0...1600 Ohm)(1		
Corr		**Measured value correction / scaling**	0	
	0	Without scaling		
	1	Offset correction (in **CAL** level)		
	2	2-point correction (in **CAL** level)		
	3	Scaling (in **Para** level)		
In.F	-1999…9999	**Replacement value of INP2**	off	

(1 With current, voltage or potentiometer input signals scaling is required (see Chapter 8.1)

Lim (Option 1) (values can not be changed)

Name	Value range	Description	Default	Own settings
Fnc.1		Function of limit value	1	
	1	*Measured value monitoring*		
Fnc.2		Function of limit value	0	
Fnc.3		Function of limit value	0	
	0	*Switched off*		
Src.1		Source for limit value	1	
	1	*Control deviation Xw (actual value - setpoint) = relative alarm*		

Out.1/2 (Option 2)

Name	Value range	Description	Default	Own settings
O.Act		Operating mode of output	**Out.1= 0 Out.2= 0**	
	0	Direct / open circuit principle		
	1	Inverse / closed circuit principle		
Y.1		Controller / signalling device output	**Out.1= 1 Out.2= 0**	
Y.2		Controller / signalling device output	**Out.1= 0 Out.2= 1**	
Lim.1		Limit value signal	0	
FAi.1FAi.2		INP1 / INP2 error signal	0	
	0	*not active*		
	1	*active*		

(Values can not be changed)

Out.3 (Option 1)

Name	Value range	Description	Default	Own settings
O.Act		Operating mode of output	1	
	0	Direct / open circuit principle		
	1	Inverse / closed circuit principle		
Y.1 Y.2		Controller / signalling device output	0	
Lim.1		Limit value 1signal	1	
FAi.1 FAi.2		INP1 / INP2 error signal	0	
	0	*not active*		
	1	*active*		

(Values can not be changed)

Out.4 (Option A)

Name	Value range	Description	Default	Own settings
O.typ		Signaltyp	3	
	0	*Relay / Logic*		
	1	0..20mA continuous		
	2	4..20mA continuous		
	3	0..10V continuous		
	4	2..10V continuous		
	5	*Transmitter power supply*		
Out.0		Scaling 0%	0	
Out.1		Scaling 100%	100	
O.Src		Source for signal output	3	
	0	No output		
	1	Control output for continuous controller		
	3	Control variable (INP1)		
	4	Effective setpoint		
	5	Control deviation		
	8	2nd analogue input		

LOGI

Name	Value range	Description	Default	Own settings
L_r		Local / Remote change-over (Remote: Adjustment of values via front panel is blocked)	0	
	0	No function		
	1	Always active		
	5	Ⓕ-key menu		
SP.2		Change-over to second setpoint SP.2	3	
	0	No function		
	3	DI2 switches		
	5	Ⓕ-key menu		
SP.E		Change-over to external setpoint SP.E	0	
	0	No function		
	1	Always active		
	3	DI2 switches		
	5	Ⓕ-key menu		
man		Automatic/Manual change-over	0	
	0	No function		
	5	Ⓕ-key menu		
C.off		Switches off the controller	0	
	0	No function		
	5	Ⓕ-key menu		
Err.r		Resets all error list entries	0	
	0	No function		
	5	Ⓕ-key menu		
di.Fn		Function of digital inputs (valid for all inputs)	0	
	0	Direct		
	1	Inverse		
	2	Key function		

othr

Name	Value range	Description	Default	Own settings
Baud		Baudrate	2	
	0	2400		
	1	4800		
	2	9600		
	3	19200		
Addr	1..247	Device address	1	
Prty		Parity	1	
	0	None 2 Stop bits		
	1	Even		
	2	Odd		
	3	None 1 Stop bit		
Delay	0.. 200	Response delay [ms]		
Unit		Unit	1	
	0	No unit		
	1	°C		
	2	°F		
dP		Decimal point (max. number of digits)	0	
	0	No digit behind decimal point		
	1	1 digit behind decimal point		
	2	2 digit behind decimal point		
	3	3 digit behind decimal point		
C.dEL	0...200	Modem delay [ms]	0	

8 Parameter level

Cntr

Bei `Quick` sichtbar	Name	Value range	Description	Default	Own settings
×	**Pb**	1...9999	Proportional range 1 (heating) in phys. unit (e.g. °C)	10	
×	**ti**	1...9999	Integral action time 1 (heating) [s]	10	
×	**td**	1...9999	Derivative action time 1 (heating) [s]	10	
	t1	0.4...9999	Minimum cycle duration [s]. Minimum impulse = **`t1`** / 4	10	
×	**SH**	0...9999	Neutral zone, or switch differential signalling device [phys. unit]	1	
×	**Sd2**	0.0...9999	Switch differential intermediate load for signalling device	0.1	
×	**d.SP2**	-1999...9999	Switch point distance intermediate load	0	
×	**Sd3**	0.0...9999	Switch differential full load for signalling device	0.1	
×	**d.SP3**	-1999...9999	Switch point distance full load	0	
×	**tP**	0.1...9999	Minimum impulse duration [s]	OFF	
×	**tt**	3...9999	Actuator run time [s]	60	
×	**S.mH**	0…100%	Capacity at 100% intermediate load	70	
	Y.Lo	-105...105	Lower control variable limit [%]	0	
	Y.Hi	-105...105	Upper control variable limit [%]	100	
	Y2	-100...100	Second control value [%]	0	
	Y.0	-105...105	Operating point for control variable [%]	0	
	Ym.H	-105...105	Limit of the mean value Ym [%]	5	
	L.Ym	1...9999	Max. deviation xw, at the start of mean value calculation [phys. unit]	8	

SEtP

Visible with `Quick`	Name	Value range	Description	Default	Own settings
	SP.LO	-1999...9999	Lower setpoint limit for Weff	0	
	SP.Hi	-1999...9999	Upper setpoint limit for Weff	100	
×	**SP.2**	-1999...9999	Second setpoint	10	
	r.SP	0...9999	Setpoint gradient [/min]	OFF	
	t.SP	0...9999	Start-up hold time	5.0	

InP.1

Visible with `Quick`	Name	Value range	Description	Default	Own settings
	InL.1	-1999...9999	Input value of lower scaling point	38.5	
	OuL.1	-1999...9999	Display value of lower scaling point	0	
	InH.1	-1999...9999	Input value of upper scaling point	61.5	
	OuH.1	-1999...9999	Display value of upper scaling point	100	
	t.F1	0.0...100.0	Filter time constant [s]	0.5	

InP.2

Visible with Quick	Name	Value range	Description	Default	Own settings
	InL.2	-1999...9999	Input value of lower scaling point	0	
	OuL.2	-1999...9999	Display value of lower scaling point	0	
	InH.2	-1999...9999	Input value of upper scaling point	100	
	OuH.2	-1999...9999	Display value of upper scaling point	100	
	t.F2	0.0...100.0	Filter time constant [s]	0.5	

Lim

Visible with Quick	Name	Value range	Description	Default	Own settings
×	**H.1**	-1999...9999	Upper limit value 1	20	
×	**HYS.1**	0...9999	Hysteresis of limit value 1	0.1	

8.1 Input scaling (only visible with Quick= OFF)

When using current or voltage signals as input variables for **InP.1** or **InP.2,** scaling of input and display values is required in the parameter setting level. The specification of the input value of the lower and upper scaling point is indicated in the respective electrical size (mA/ V).

8.1.1 Input Inp.1

Parameters **InL.1**, **OuL.1**, **InH.1 a**nd **OuH.1** are only visible, if **ConF** / **InP.1** / **Corr = 3** was selected.

S.tYP	Input signal	InL.1	OuL.1	InH.1	OuH.1
30	0 … 20 mA	0	optional	20	optional
(0...20mA)	4 … 20 mA	4	optional	20	optional
40	0 … 10 V	0	optional	10	optional
(0...10V)	2 … 10 V	2	optional	10	optional

In addition to these settings, **InL.1** and **InH.1** can be adjusted in the range (0...20mA / 0...10V) stipulated by selecting **S.tYP**.

If standard scaling is to be applied when using thermocouples and resistance thermometers (Pt100), the settings of **InL.1** and **OuL.1** as well as **InH.1** and **OuH.1** must correspond. If changes of the input scaling were made in the calibration level (page 43), these are shown in the input scaling in the parameter level. If the calibration is reset (**OFF**), the scaling parameters are reset to the default setting.

8.1.2 Input InP.2

As input **InP.1**, but only if **S.Typ = 30** is set!

9 Calibration level

Measured value correction (**CAL**) only visible if
ConF / **InP.n** / **Corr** = **1** or **2** and **Quick** = **OFF** were selected.

An adjustment of the measured value can be made in the calibration menu (**CAL**).
Two methods are available:
- Offset correction
- 2-point correction

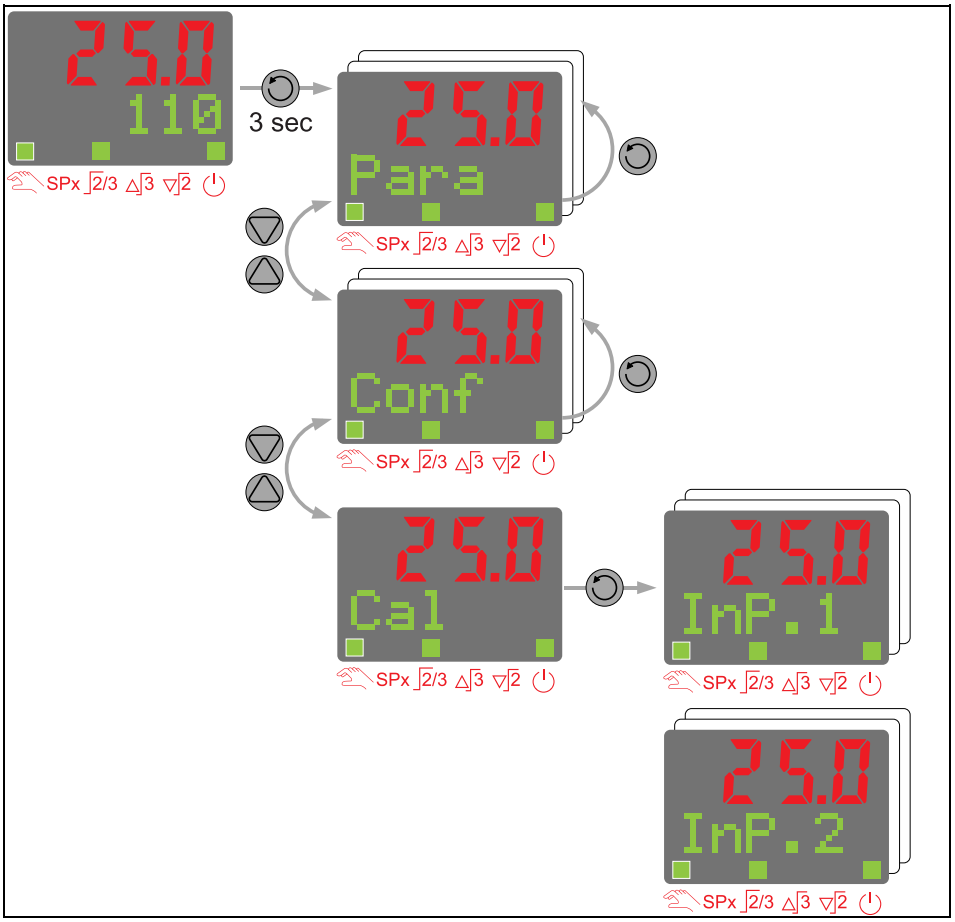
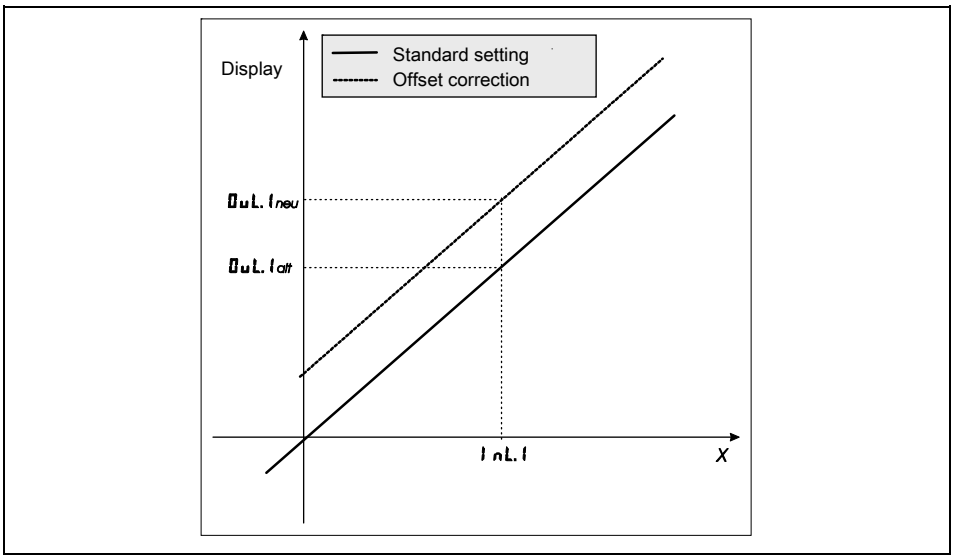


Fig. 15: Calibration level

The parameters (**OuL.n**, **OuH.n**) changed in the **CAL** level can be reset by setting the parameters below the lowest setting value using the △ key (**OFF**).

9.1 Offset correction

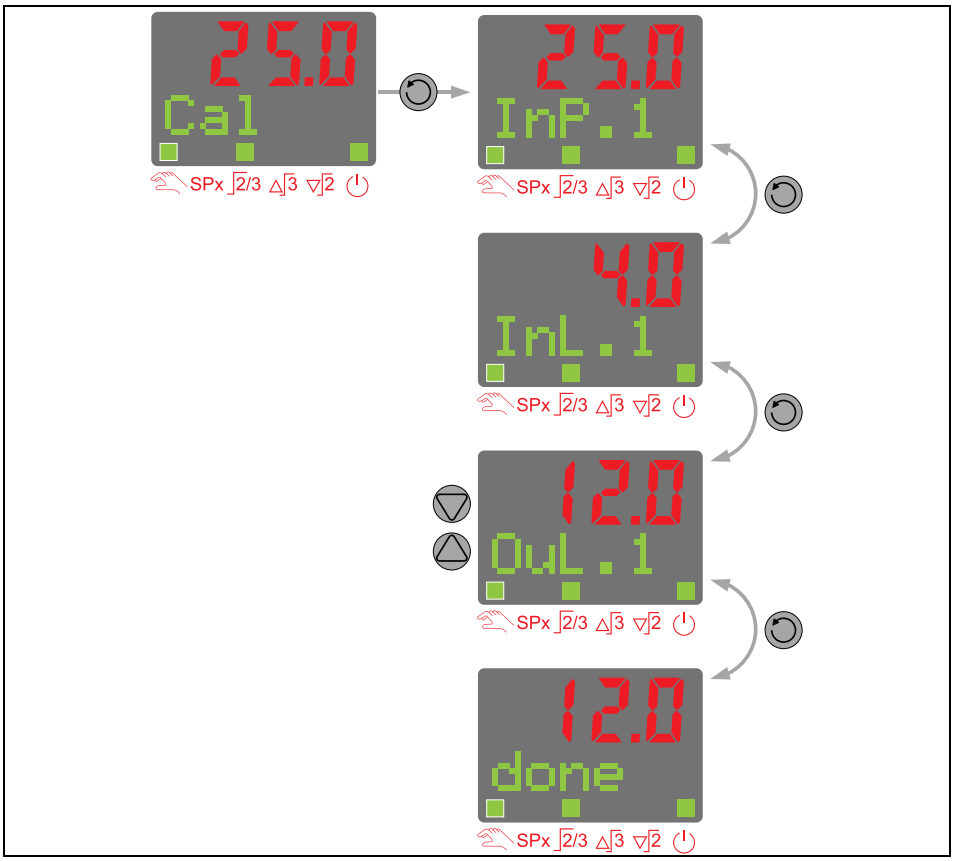
(**ConF** / **InP.n** / **Corr** = **1**):
- can be made online at the process



9 Calibration level

InL.n: Here, the input value of the scaling point is displayed.
The operator must wait until the process is at rest. Subsequently, the operator acknowledges the input value by pressing the ↺-key.

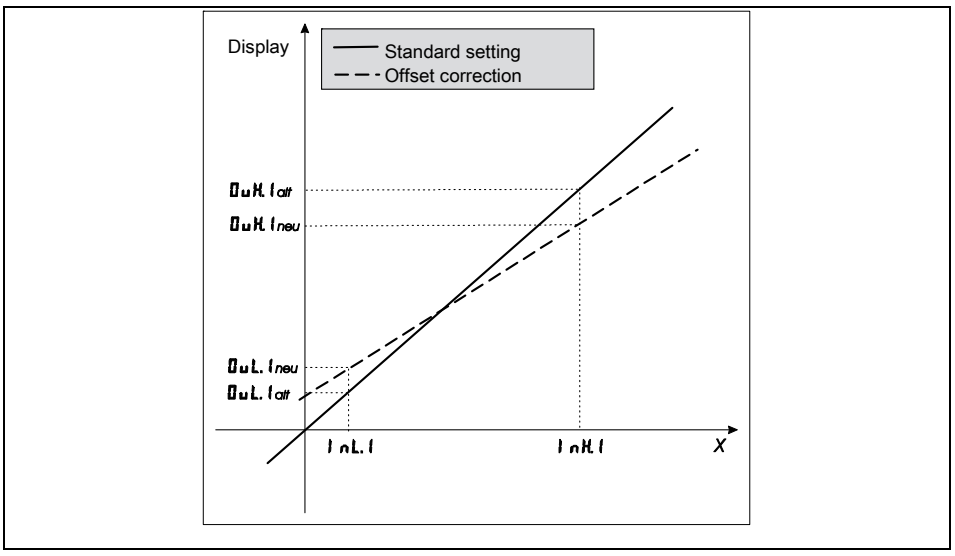
OuL.n: Here, the display value of the scaling point is displayed.
Prior to calibration **OuL.n** is equal to **InL.n**. The operator can correct the display by pressing the △▽-keys. The display value is confirmed by pressing the ↺-key.



9.2 2-point correction

(ConF / InP.n / Corr = 2):

- can be made offline using actual value generator or
- online in 2 steps, by initially correcting the first value and then subsequently, the second value, for example once the oven has heated up.

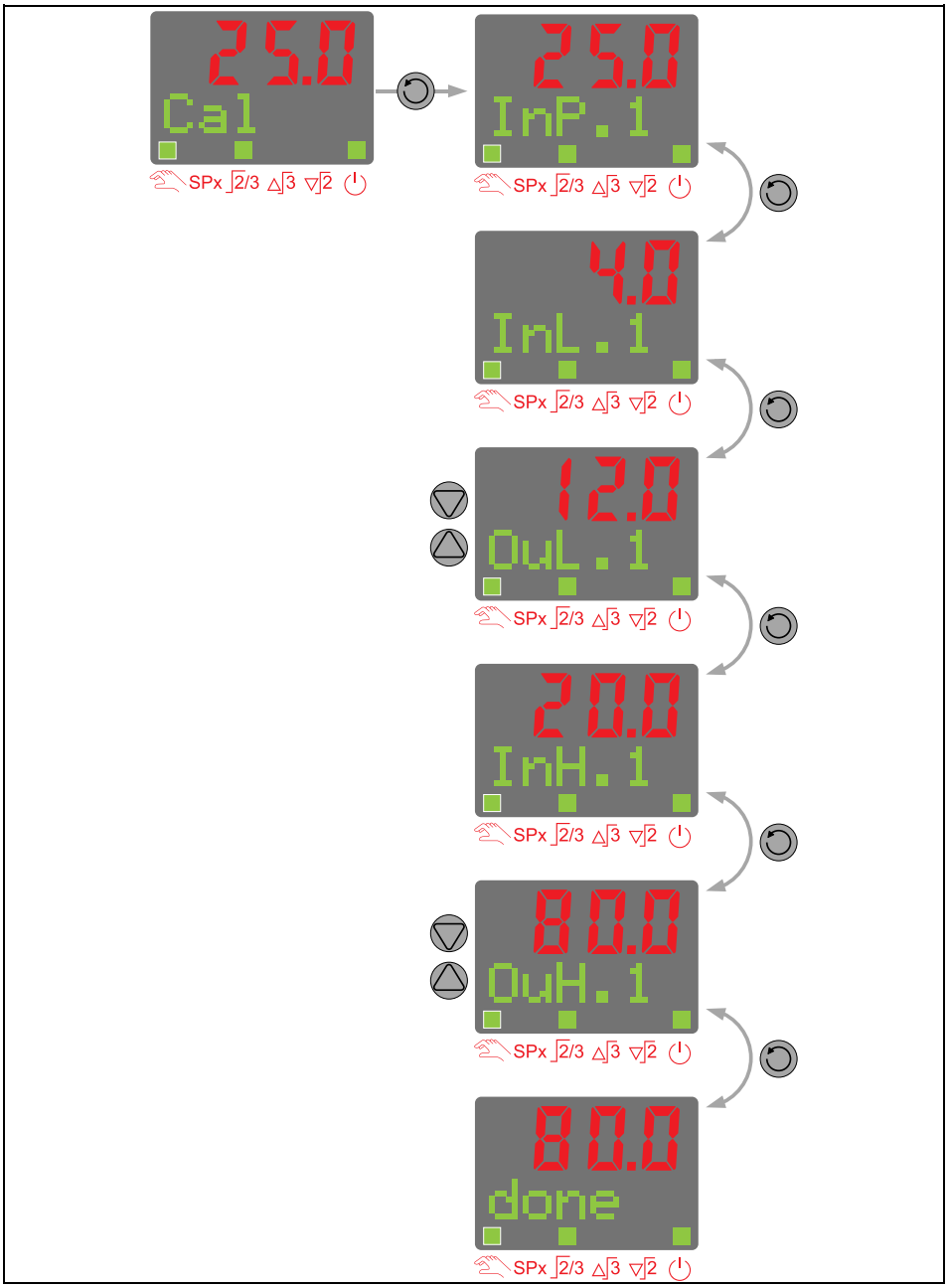


InL.n: The input value of the lower scaling point is displayed.
The operator must wait until the process is at rest. Subsequently, the operator acknowledges the input value by pressing the ↺-key.

OuL.n: The display value of the lower scaling point is displayed.
Prior to calibration **OuL.n** is equal to **InL.n**. The operator can correct the lower display value by pressing the △▽-keys. The display value is confirmed by pressing the ↺-key.

InH.n: The input value of the upper scaling point is displayed. The operator must wait until the process is at rest. Subsequently, the operator acknowledges the input value by pressing the ↺-key.

OuH.n: The display value of the upper scaling point is displayed. Prior to calibration **OuH.1** is equal to **InH.1**. The operator can correct the upper display value by pressing the △▽-keys. The display value is confirmed by pressing the ↺-key..



10 Optional plug-in modules

10.1 Optional modules and their function

Modules for socket 1-3 can not be fitted to socket A. Only modules for socket A can be fitted to this socket. Please refer to table 1 – Optional Modules for more details.

Various optional plug-in modules are available for additional input, output and communication functions. These modules are installed during production or retrofitted to devices already delivered.

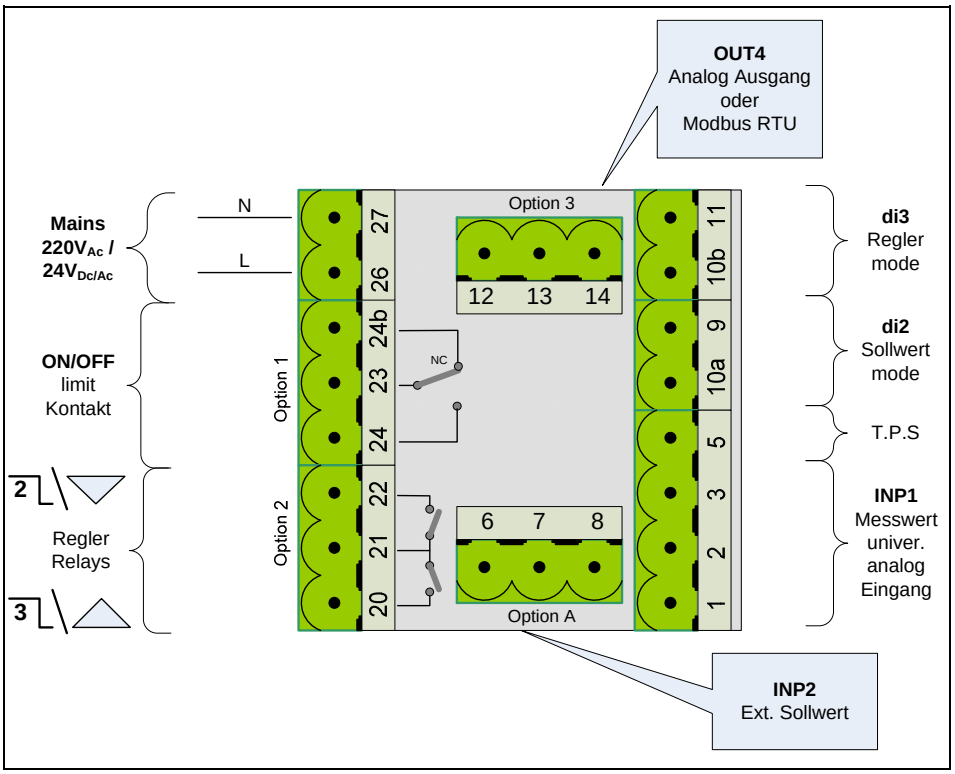


Fig. 16: Sockets

The modules are fitted to the four optional sockets between the main circuit boards of the device. The designations for these sockets are 1,2,3, and A.
The installation is shown in figure 17.

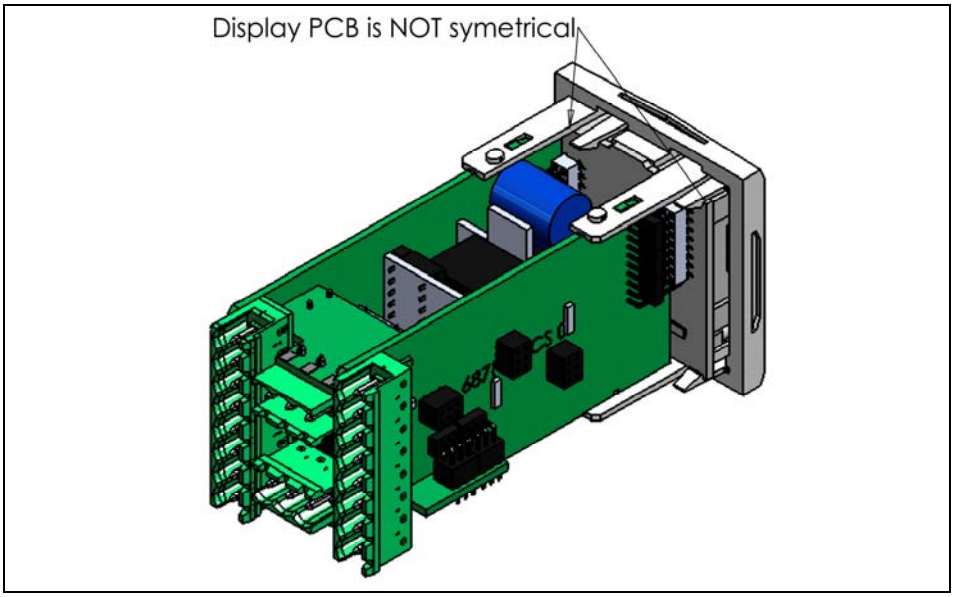


Fig. 17: View of the open device with PCB position

10.1.1 Automatic recognition of optional modules

The device automatically recognises, which optional module is fitted to which socket. If this recognition detects a discrepancy to the HW-Code (factory setting) set, the error message **E.4** is displayed.

Table 1 – optional modules available

Optional modules		
Model code	KS20 - 1 O P -	x
Option 3		↓
Linear output mA/VDC		L
RS485		C
Relay output		R
DC control output for SSR		S

10.1.2 Preparation for installing or removing optional modules

CAUTION

Ensure that all connections on the rear of the device have been removed and isolated prior to removing the device from the housing.

Remove the device from the housing by gripping the sides of the front plate (a recessed handle is located on each side) and pulling the device forward and out. The device is released from the fixture on the rear and the circuit boards become accessible.

Memorise the installation position of the device for refitting to the housing. The positions for the main and optional circuit boards in the device are shown in figure 18.

10.1.3 Removing/replacing optional modules

After removing the device from the housing, proceed as follows:

To remove or replace the modules in the optional socket 1-3, carefully disconnect the CPU and PSU circuit boards from the front plate.

- 1 Remove the main circuit boards (PSU and CPU) from the front plate.
- 2 Lift the top and then the bottom mounting clamp to remove the circuit boards from the front plate.
  If only the optional socket A has to be replaced, this step is not necessary (in this case, the circuit boards are accessible without disconnecting the main circuit boards from the front pate).

Now you can start installing or removing the modules. The connections are shown below. The fixing lugs of the optional modules fit into the cut-outs of the main circuit board (either opposite or next to the connections).

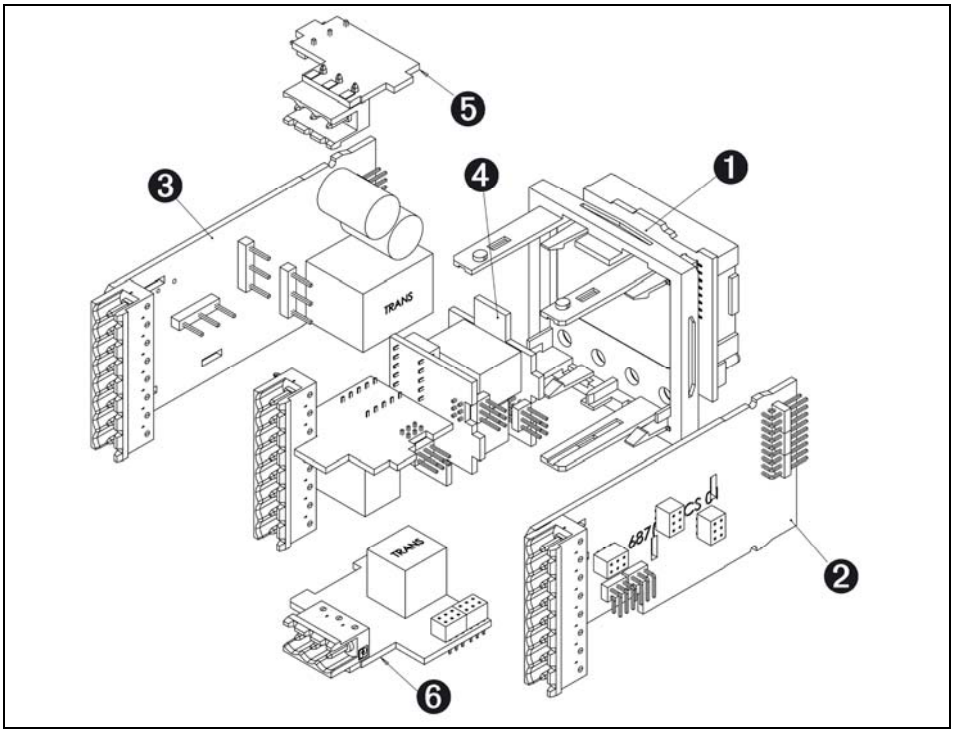


Abb. 18: Mounting position of the optional modules

❶ Display PCB
❷ Control PCB
❸ Power supply PCB
❹ Optional modules 1…3
❺ Adapter module
❻ Optional module 4

The adapter module must always be fitted when using optional module 3.

Pay attention to the correct mounting position of the modules and make sure that the connector pins are fully inserted.

CAUTION

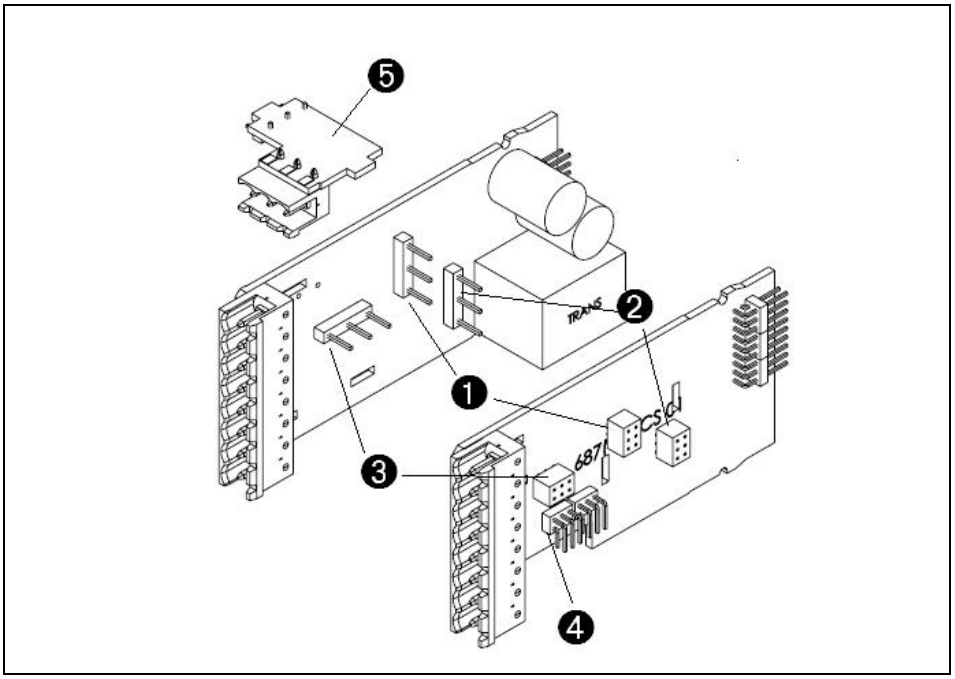


Fig. 19: Sockets for optional modules

❶❷❸❹ Optional modules

❺ Adapter module

10.1.4 Inserting the device into the housing

Once the desired optional module is correctly installed in the appropriate position, the device can be inserted into the housing:

1 Carefully push together the CPU and PSU circuit boards and ensure that the fixing lugs of the optional modules lock into the opposite slots. Hold the circuit boards together and reinsert them into the front plate mounting.

2 Insert the two circuit boards into the guides and re-establish the connection to the housing. Ensure the modules are mounted in the correct position and ensure that the connection pins are fully inserted into the front plate.

3 Carefully push the device into the correct position.

11 Maintenance

DANGER

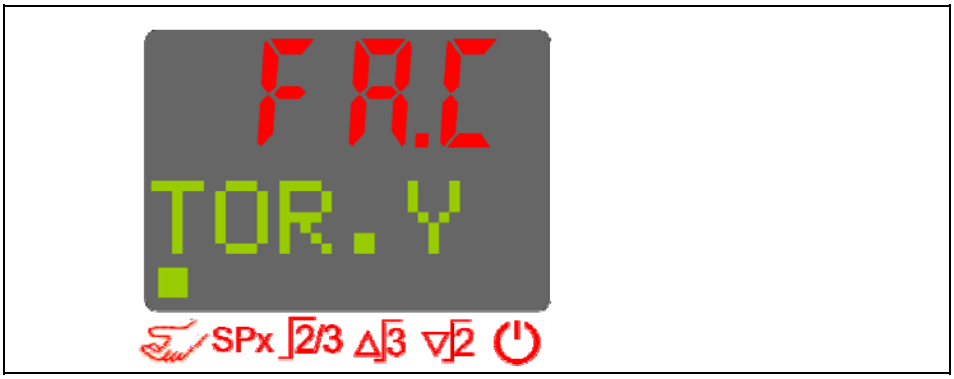
Live parts and terminals may be exposed when opening the device or when removing covers or components. Connection points may also be live.

The device must be disconnected completely from the power supply prior to starting this work.

The devices require no special maintenance.

11.1 Reset to factory setting

Press and hold the following keys during power-on:



12 Notes

Key word index

–weishaupt–

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