Compact micro-
processor controllers

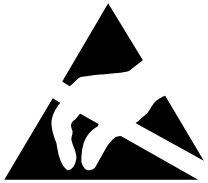
B 70.2040
Operating Instructions

01.04/00357918

Please read these Operating Instructions carefully before starting up the instrument. Keep these operating instructions in a place which is at all times accessible to all users. Please assist us to improve these operating instructions where necessary. Your suggestions will be most welcome.

Phone	in Germany	(02242) 8703-0
	from abroad	(+49) 2242 8703-0
Fax	in Germany	(02242) 8703-20
	abroad	(+49) 2242 8703-20

All necessary settings are described in these operating instructions. However, if any difficulties should still arise during start-up, you are asked not to carry out any unauthorized manipulations on the unit. You could endanger you rights under the instrument warranty! Please contact the nearest subsidiary or the main factory in such a case.



When returning chassis, assemblies or components, the regulations of EN 100 015 “Protection of electrostatically sensitive components” must be observed. Use only the appropriate **ESD** packaging for transport.

Please note that we cannot accept any liability for damage caused by ESD (electrostatic discharge).

Contents

1 Identifying the instrument version

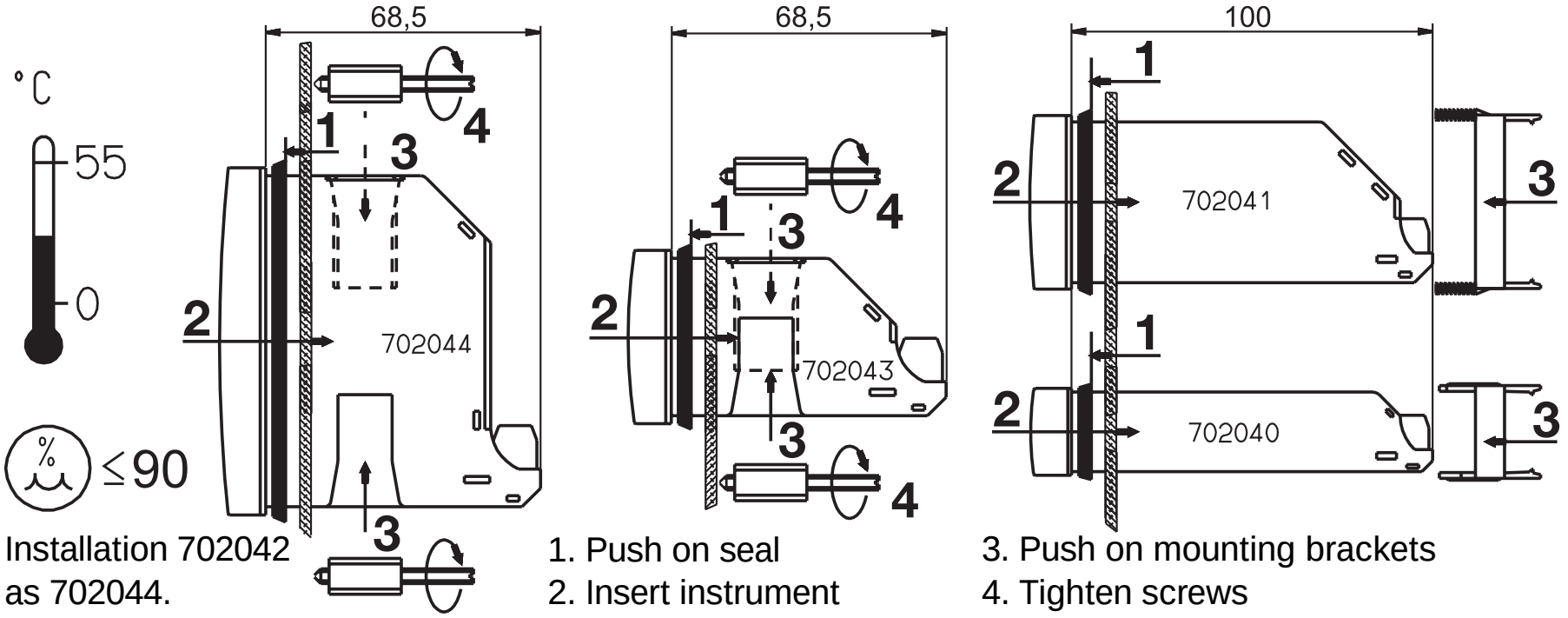
7020 [(1) . .] **/** [(2) . .] **–** [(3) . . .] **–** [(4) . . .] **–** [(5) . .] **/** [(6) . . .] **,...**

(1)	**Basic type** (bezel in mm)	**40** = 48 x 24, **41** = 48 x 48, **42** = 48 x 96 (portrait), **43** = 96 x 48 (landscape), **44** = 96 x 96			
(2)	**Basic type extension**	**88** = controller type configurable[1] **99** = controller type configured to customer specification[2]			
(3)	**Inputs**	**888** = inputs configurable[1] **999** = inputs configured to customer specification[2]			
(4)	**Outputs**	**000** =	**Standard**	Type 702040/41	Type 702042/43/44
			Output 1	relay (n.o. make)	relay (n.o. make)
			Output 2	logic 0/5V, optionally configurable als logic input	logic 0/5V
			Output 3	(not available)	relay (n.o. make)
			Options	Type 702040/41	Type 702042/43/44
		113 =	Output 2 (outputs 1+3 as for Standard)	logic 0/12V, optionally configurable als logic input	logic 0/12V
		101 =	Output 2 (output 1 as for Standard)	relay (n.o. make) (logic input is always available)	not possible

1. single-setpoint controller with limit comparator, see factory settings under configuration and parameter level
2. see customer's ordering text or settings under configuration and parameter level

(**5**)	**Supply**	**16** = 10—18V DC **22** = 20—53V AC/DC, 48—63Hz **23** = 110—240V -15/+10% AC 48— 63Hz		
(6)	**Extra code**	**061** = UL approval (Underwriter Laboratories) **210** = Timer function		
Delivery package			Type 702040/41	Type 702042/43/44
			1 mounting frame	2 mounting brackets
			1 seal, 1 Operating instructions 70.2040	

2 Installation



Installation 702042 as 702044.

1. Push on seal
2. Insert instrument

3. Push on mounting brackets
4. Tighten screws

Type (bezel)	Panel cut-out (WxH) in mm	Edge-to-edge-mounting (minimum spacings of panel cut-outs)	
		horizontal	vertical
702040 (48mm x 24mm)	$45^{+0.6}$ x $22.2^{+0.3}$	> 8mm	> 8mm
702041 (48mm x 48mm)	$45^{+0.6}$ x $45^{+0.6}$	> 8mm	> 8mm
702042 (48mm x 96mm)	$45^{+0.6}$ x $92^{+0.8}$	> 10mm	> 10mm
702043 (96mm x 48mm)	$92^{+0.8}$ x $45^{+0.6}$	> 10mm	> 10mm
702044 (96mm x 96mm)	$92^{+0.8}$ x $92^{+0.8}$	> 10mm	> 10mm

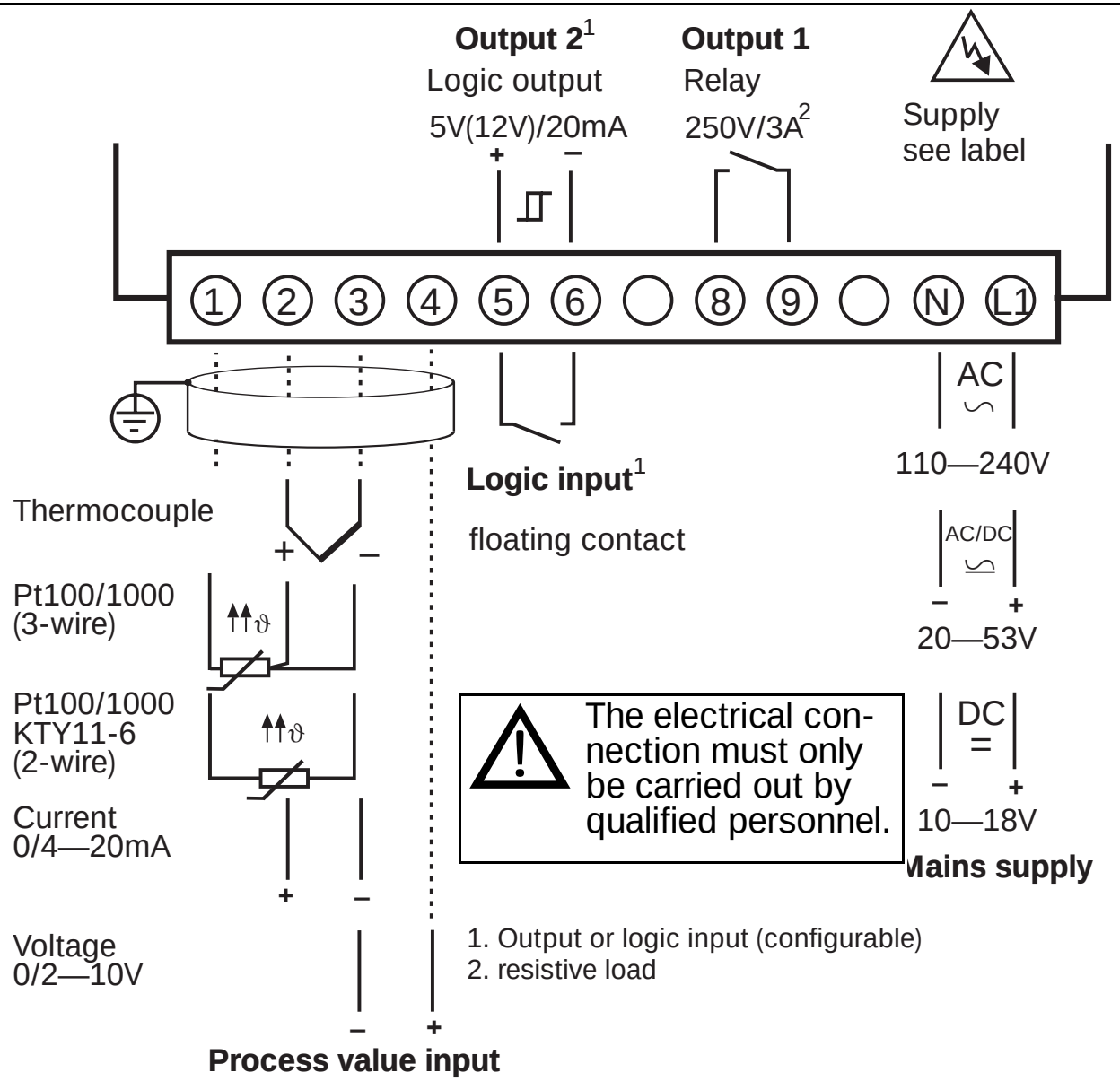
3 Electrical connection

Installation notes

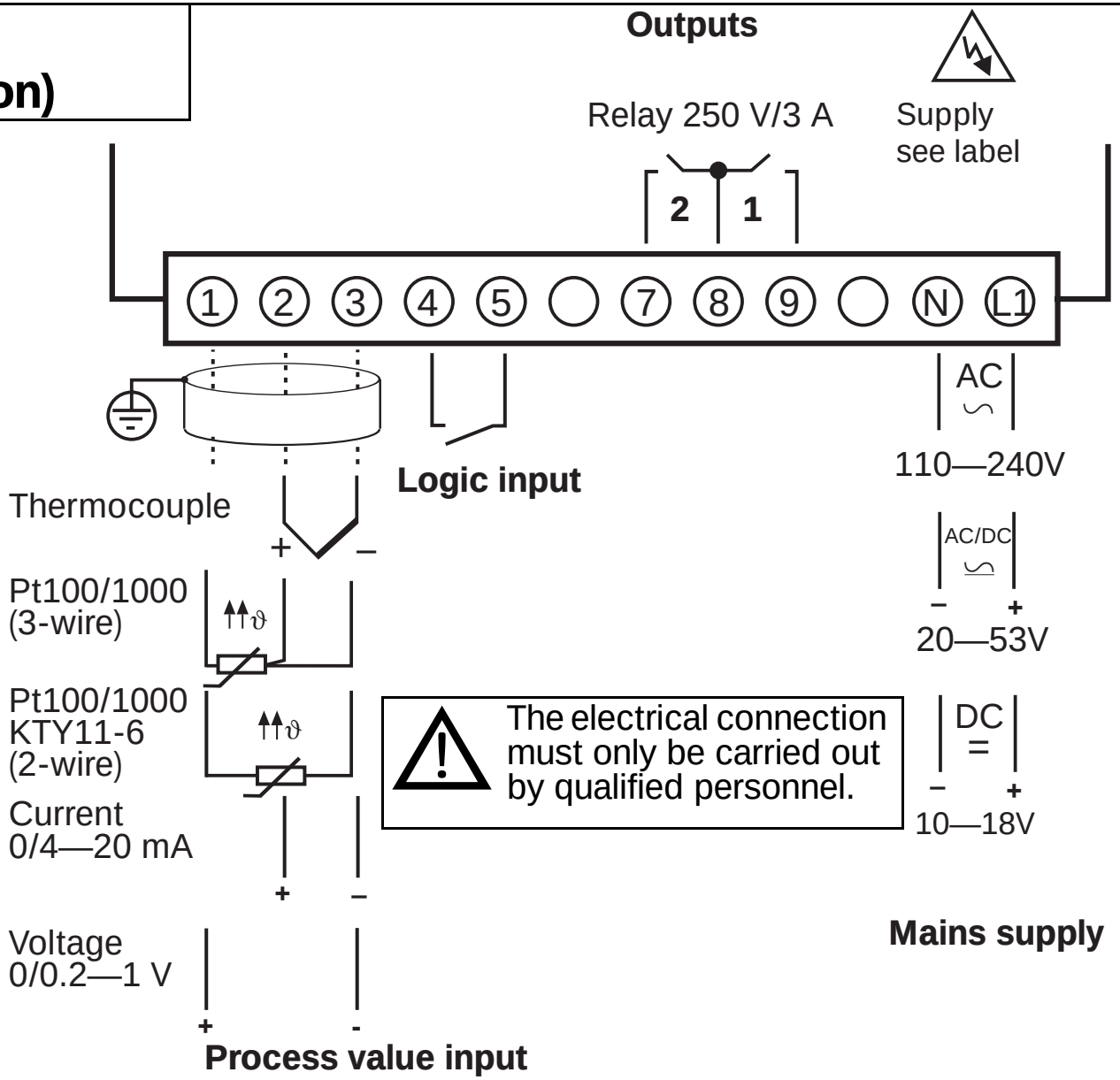
- The choice of cable, the installation, the fusing and the electrical connection must conform to the requirements of VDE 0100 “Regulations on the Installation of Power Circuits with nominal voltages below 1000V”, or the appropriate local regulations.
- The electrical connection must only be carried out by qualified personnel.
- If contact with live parts is possible when working on the instrument, it must be isolated on both poles from the supply.
- A current limiting resistor interrupts the supply circuit in the event of a short-circuit. The load circuit must be fused for the maximum relay current in order to prevent welding of the output relay contacts in the event of an external short-circuit.
- Electromagnetic compatibility conforms to the standards and regulations listed under Technical Data.
- Run input, output and supply lines separately and not parallel to each other.

- Do not connect any additional loads to the supply terminals of the instrument.
- The instrument is not suitable for installation in hazardous areas.
- Apart from faulty installation, there is a possibility of interference or damage to controlled processes due to incorrect settings on the controller (setpoint, data of parameter and configuration levels, internal adjustments).
  Safety devices independent of the controller, such as overpressure valves or temperature limiters/monitors, should always be provided and should be capable of adjustment only by specialist personnel.
  Please refer to the appropriate safety regulations in this connection. Since auto-tuning (self-optimization) cannot be expected to handle all possible control loops, there is a theoretical possibility of unstable parameter settings. The resulting process value should therefore be monitored for its stability.
- All input and output lines that are not connected to the supply network must be laid out as shielded and twisted cables (do not run them in the vicinity of power cables or components). The shielding must be grounded to the earth potential on the instrument side.

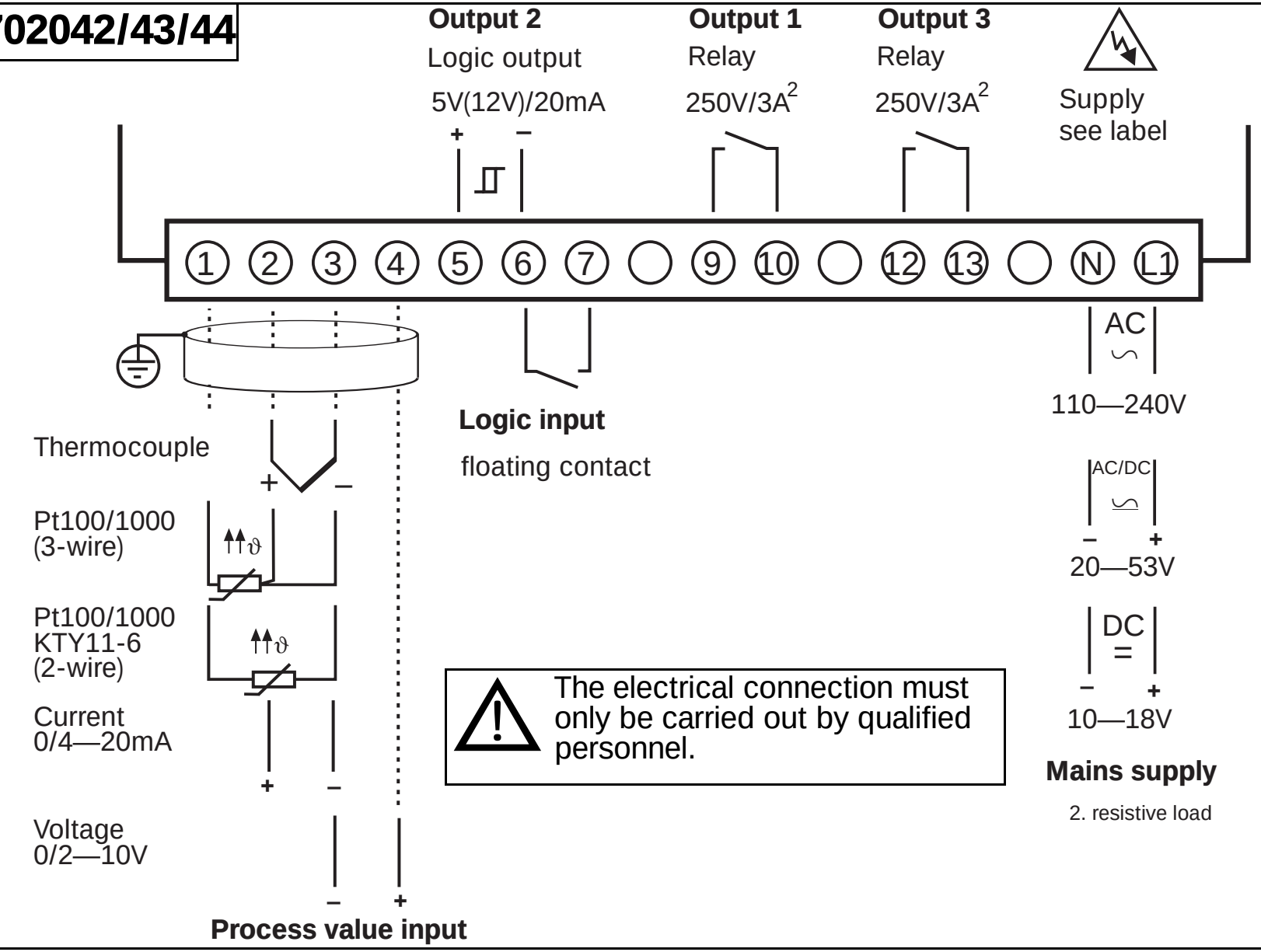
Type 702040/41



Type 702040/41 with 2 relay outputs (option)



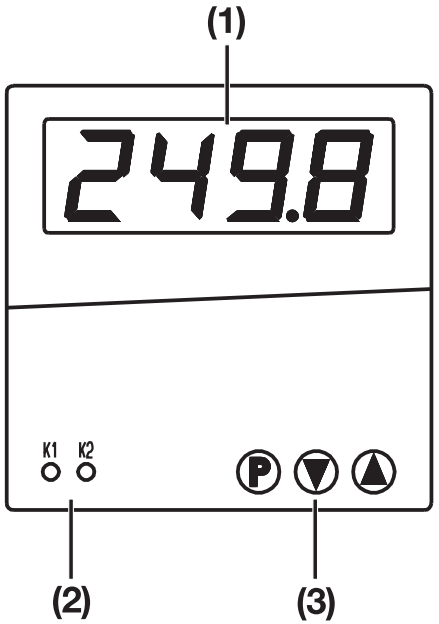
Type 702042/43/44



The electrical connection must only be carried out by qualified personnel.

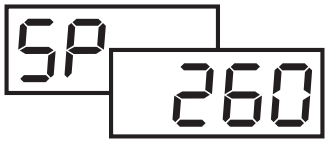
4 Operation

4.1 Displays and keys



Example: Type 702041

(1) Display

7-segment display	4 places, green Display alternates when setpoints, parameters and codes are entered and indicated. 
Character height	Type 702040/41/42: 10 mm Type 702043/44: 20 mm
Display range	-1999 to +9999 digit
Decimal places	none, one, two
Unit	°C/ °F (process value display)

(2) Status indicators

LED	two LEDs for the outputs 1 and 2, yellow

(3) Keys

P, ▲, ▼	for operating and programming the instrument. Dynamic modification of settings and parameters. * Increase value with ▲ * Decrease value with ▼ Automatic value acceptance after 2 seconds.

4.2 Principle of operation

Normal display
The display shows the process value.

Operating level
The setpoint SP is input here. On active setpoint switching via the logic input, SP 1 or SP 2 appears in the display. When the ramp function is active, the ramp setpoint SPr is displayed. With activated timer function, the timer value t1 or the timer start value t1 0 is shown.
The setpoint is altered dynamically using the ▲ and ▼ keys. The setting will be accepted automatically after approx. 2 sec.

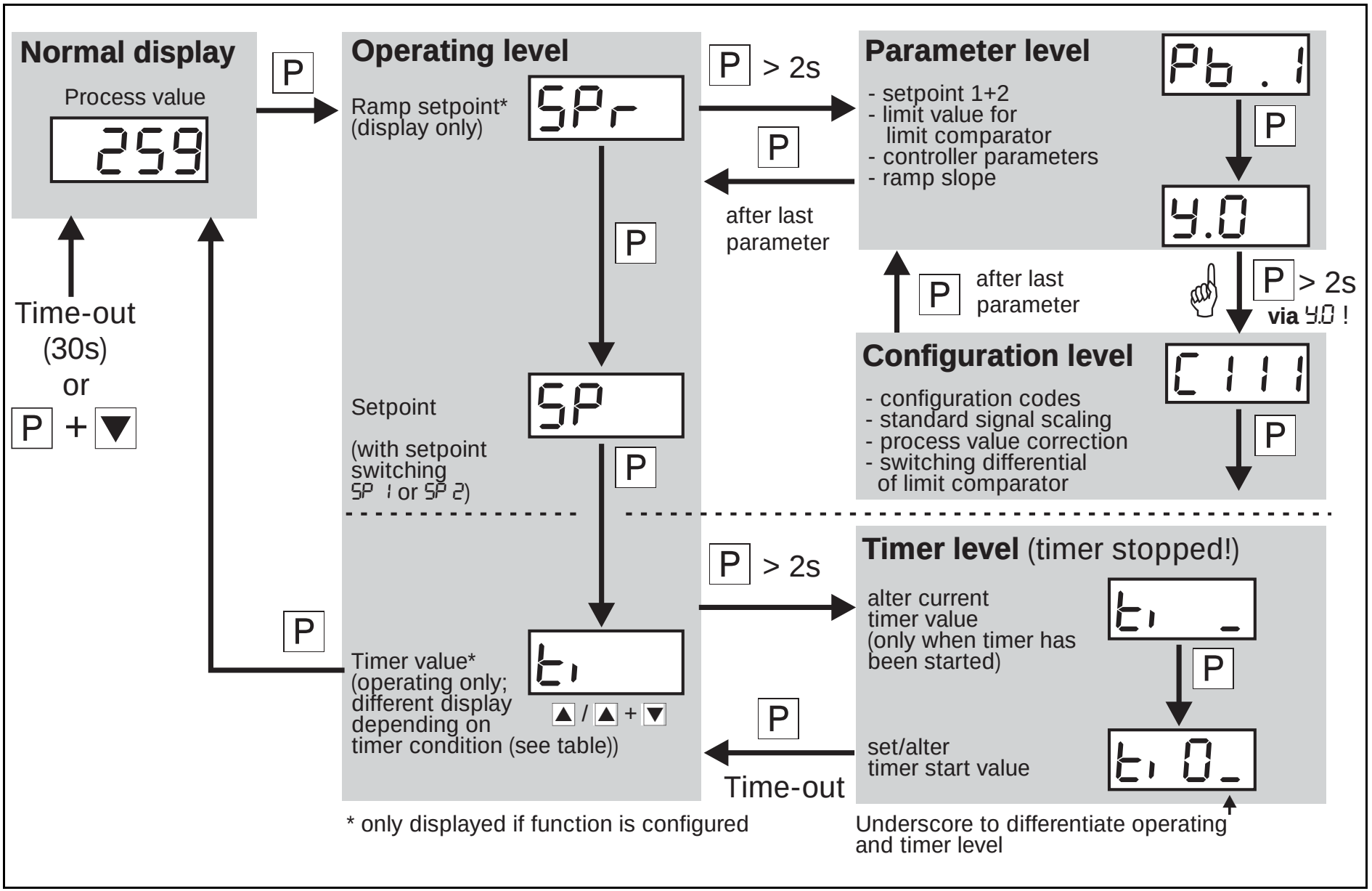
Parameter level
The setpoints, the limit value of the limit comparator, the controller parameters and the ramp slope are programmed here.

Configuration level
The basic functions of the controller are set here.

In order to make the settings, it is necessary to change to the configuration level via the parameter Y.0 (parameter level).

Timer level
The current timer value (only when the timer has been started) and the timer start value are altered here. The parameters at this level are marked with an underscore in the display.

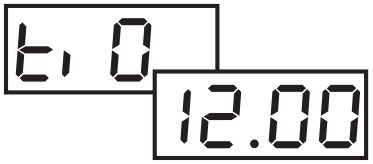
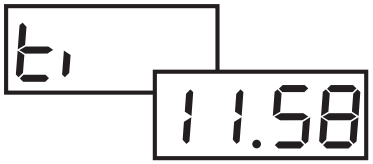
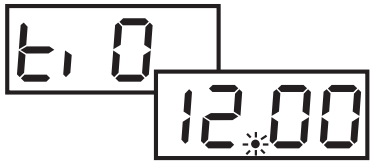
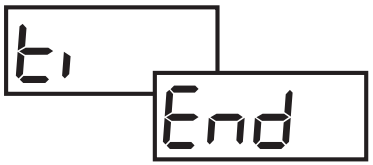
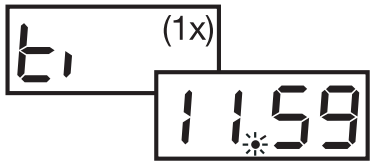
Time-out
If no operation occurs, the controller returns automatically to normal display after approx. 30 sec (exception: with timer functions starting via power ON, the timer value is displayed). If the timer value is displayed at the operating level, time-out is not active.


Normal display
Process value
259
Time-out
(30s)
or
P + ▼
P
Operating level
Ramp setpoint*
(display only)
SPr
P > 2s
P
after last
parameter
P
Setpoint
(with setpoint
switching
SP 1 or SP 2)
SP
P
P
Timer value*
(operating only;
different display
depending on
timer condition (see table))
t1
▲ / ▲ + ▼
P > 2s
P
Time-out
Parameter level
- setpoint 1+2
- limit value for
limit comparator
- controller parameters
- ramp slope
Pb.1
P
y.0
P
after last
parameter
P > 2s
via y.0 !
Configuration level
- configuration codes
- standard signal scaling
- process value correction
- switching differential
of limit comparator
C111
P
Timer level (timer stopped!)
alter current
timer value
(only when timer has
been started)
t1 _
P
set/alter
timer start value
t1 0_
* only displayed if function is configured
Underscore to differentiate operating
and timer level

4.3 Operation of the timer function

The timer can be operated with the keys (start, stop, cancel, acknowledge) if the timer at operating level is indicated. Time-out is not active here. If the logic input is configured accordingly, then a key, such as the ▲ key, can be used. In this case, the timer can also be operated even if the timer value does not appear in the display.

Possible displayed parameters for timer function at operating level

Display	State/Action	Display	State/Action
	Timer not running * Start with ▲		Timer has stopped * Continue with ▲ * Cancel with ▲ + ▼
	Timer has been started but the tolerance limit has not yet been reached * Cancel with ▲ + ▼		Timer has run down * Acknowledge with any key (timer start value t1 0 is indicated) With time-delayed control (C120=3), acknowledge with ▲ + ▼
	Timer running; t1 is displayed * Stop with ▲ * Cancel with ▲ + ▼		
When the timer has been started, the decimal point in the display for the timer value will blink! ☼			

5 Functions

We recommend the following procedure:

- ✱ Familiarize yourself with the controller functions
- ✱ Enter the configuration codes and the parameter values in the tables provided for this purpose in Chapter 6. Write down the appropriate values (✎), or mark selection with a cross (**X**✎). The parameters and the configuration codes are listed in the order of their appearance. Parameters which are not relevant are masked out (see table below).
- ✱ Enter the configuration code and parameters on the instrument

Configuration	**Masking out the parameters for**	**Parameter**
Single-setpoint controller	Double-setpoint controller	Pb .2, CY 2, db, HYS.2
Double-setpoint controller	Limit comp. for Type 702040/41 Logic input for Type 702040/41[1]	C 114, HYSt, AL C 117
Limit comparator no function	Limit comparator	HYSt, AL
Limit comparator activated	Logic input for Type 702040/41[1]	C 117
Resistance thermometer, thermocouple	Standard signal scaling	SCL, SCH
Ramp function off	Ramp function	rASd, SPr
Setpoint switching not activated	Setpoints at the parameter level	SP 1, SP 2
Timer function: no function	Timer function	t1 , C 121, C 122, C 123
Type 702040/41	Output 3	C 118

1. not for Type 702040/41 with 2 relay outputs (option)

5.1 Process value input

Symbol	Notes
C111	**Transducer/probe (process value input)** ⇨ **page 31**
C112	**Unit of process value (°C/°F)/decimal places of display** ⇨ **page 31**
SCL SCH	**Start/end value of value range** for standard signals ⇨ **page 35** Example: 0—20 mA→20—200°C: SCL = 20 / SCH = 200
OFFS	**Process value correction** ⇨ **page 35** Using the process value correction, a measured value can be corrected by a programmable amount upwards or downwards (offset). Lead compensation can be implemented in software for 2-wire circuit through process value correction. Examples: **Measured value** — **Offset** — **Displayed value** 294.7 — + 0.3 — 295.0 295.3 — - 0.3 — 295.0
dF	**Filter time constant** (damping) to adapt the digital input filter (0sec = filter off) ⇨ **page 36** if dF high: - high damping of interference signals - slow reaction of the process value display to changes in the process value - low cut-off frequency (2nd order low-pass filter)

5.2 Logic input

		
Key inhibit	Operation is possible from keys.	**No** operation from keys.
Level inhibit	Access to the parameter and configuration levels is possible. Starting self-optimization is possible.	**No** access to the parameter and configuration levels. Starting self-optimization is **not** possible.
Ramp stop	Ramp running	Ramp stopped
Setpoint switching	Setpoint SP 1 is active	Setpoint SP 2 is active
	The appropriate symbols SP 1 and SP 2 are displayed at the operating level.	
Timer control	Acknowledge start/stop/continue/timer run-down (edge-triggered)	

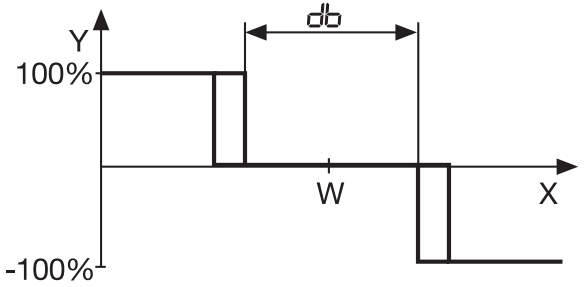
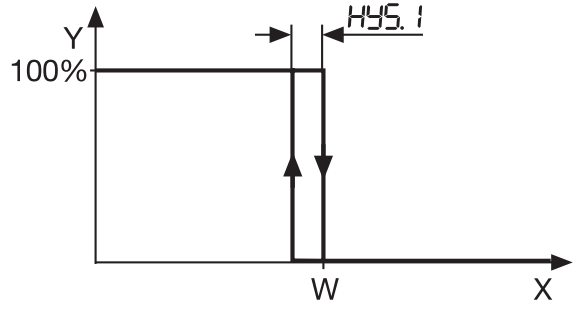
Symbol	Notes
C117	**Function of the logic input** ⇨**page 33** On Type 702040/41, the parameter C117 is masked out if output 2 has been programmed as controller output (C113) or the limit comparator has been configured (C114) (double assignment; not on Type 702040/41 with 2 relay outputs (option)).

5.3 Controller

Controller structure

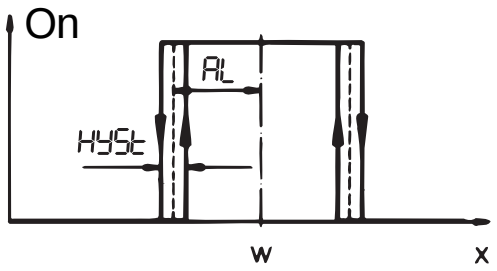
The controller structure is defined via the parameters Pb, dt and rt.
Example: Setting for PI controller → Pb . 1=120, dt=0sec, rt=350sec

Symbol	Notes
C 1 13	**Controller type and assignment of the controller outputs to the physical outputs 1+2** ⇨ **page 32**
C 1 16	**Outputs in fault condition** ⇨ **page 33** The switching states of the outputs are defined here in the event of over/underrange, probe break/short circuit or display overflow. ⇨ Chapter 7
C 1 18	**Assignment of the outputs** ⇨ **page 33** Only for Type 702042/43/44; overwrites the assignment of C 1 13 (controller type as C 1 13)
Pb . 1 Pb .2	**Proportional band 1** (controller output 1) ⇨ **page 36** **Proportional band 2** (controller output 2) Influences the P action of the controller. If Pb=0, the controller structure is not effective.
dt	**Derivative time** ⇨ **page 36** Influences the D action of the controller. If dt=0, the controller has no D action.
rt	**Reset time** ⇨ **page 36** Influences the I action of the controller. If rt=0, the controller has no I action.
Cy 1 Cy 2	**Cycle time 1** (controller output 1) ⇨ **page 36** **Cycle time 2** (controller output 2) The cycle time has to be selected so that the energy supply to the process is virtually continuous, while not subjecting the switching elements to excessive wear.

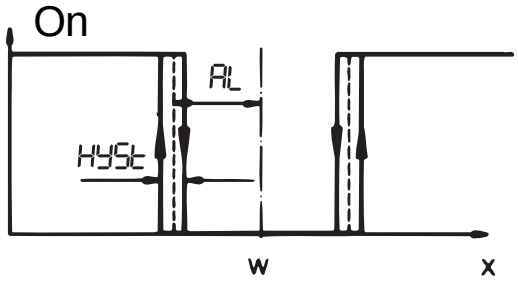
Symbol	Notes
db	**Contact spacing** ⇨ **page 36** for double-setpoint controller 
HYS.1 HYS.2	**Differential 1** (controller output 1) ⇨ **page 36** **Differential 2** (controller output 2) for controllers with Pb.1=0 or Pb.2=0 
y.0	**Working point (basic load)** ⇨ **page 36** Output if process value=setpoint
y.1 y.2	**Output limiting** ⇨ **page 36** y.1 - maximum output y.2 - minimum output ☞ For controllers without controller structure (Pb.1=0 or Pb.2=0), it is necessary that y.1=100% and y.2=-100%.

5.4 Limit comparator (alarm contact)

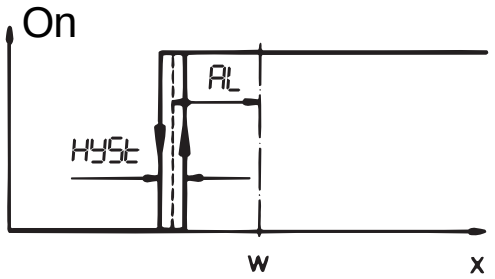
lk1



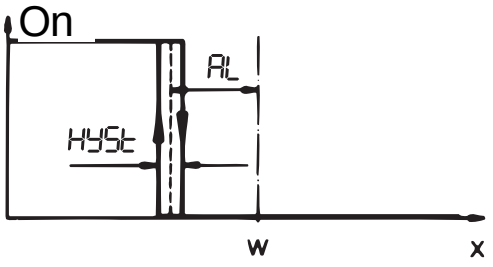
lk2



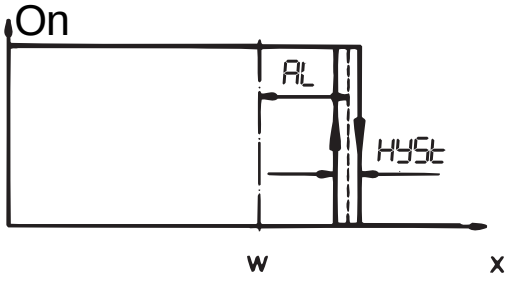
lk3



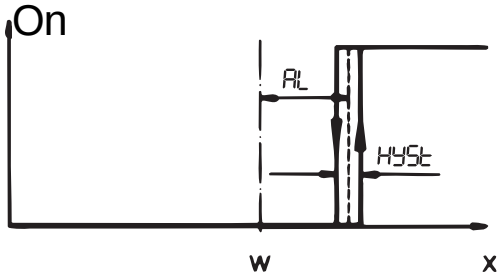
lk4



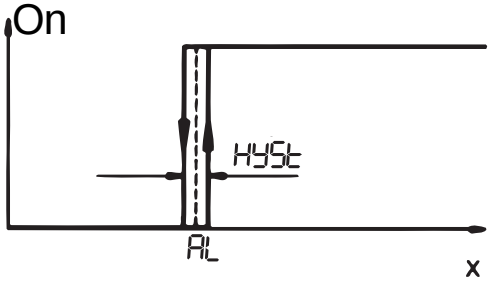
lk5



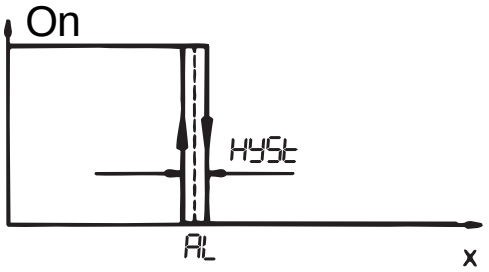
lk6



lk7



lk8

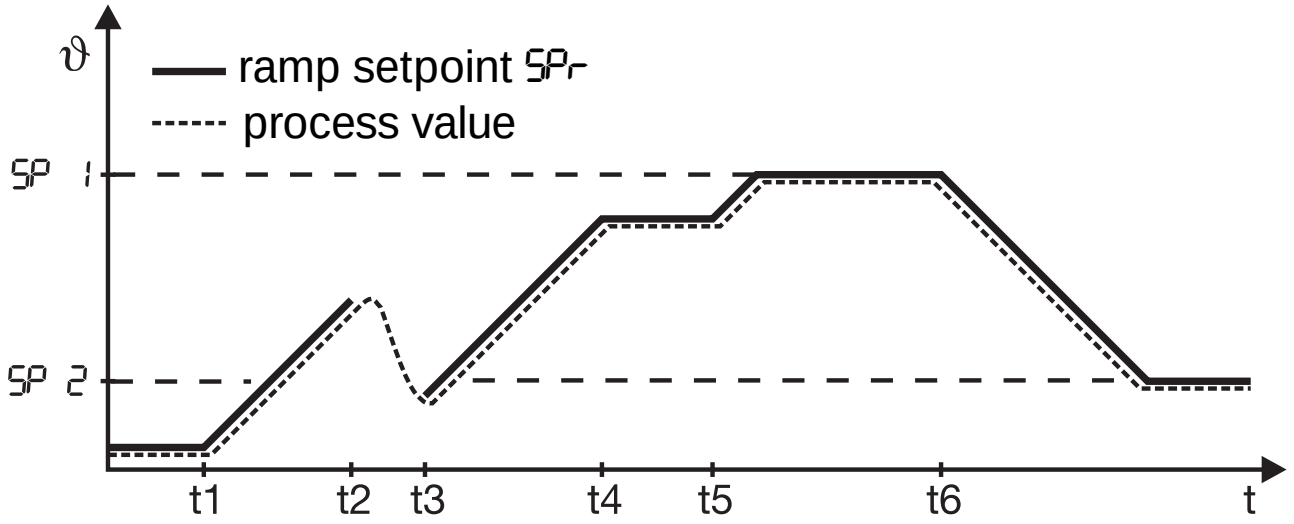


lk1—lk6: Monitoring referred to the setpoint.
lk7 / lk8: Monitoring referred to a fixed value AL.

w = setpoint, x = process value

Symbol	Notes
C 1 14	**Limit comparator function** (lk1— lk8) ⇨ **page 32**
HYSt	**Differential of limit comparator** ⇨ **page 35**
AL	**Limit value of limit comparator** ⇨ **page 36**

5.5 Ramp function



t1 power ON (SP 1 active)
t2— t3 power failure or overrange/underrange
t4—t5 ramp stop
t6 setpoint switching to SP 2

Symbol	Note
C15	**Ramp function** (on/off, time unit) ⇨**page 32**
C17	**Ramp stop** via logic input (floating contact) ⇨**page 33**
rASd	**Ramp slope** in °C/h or °C/min ⇨**page 36**

5.6 Self-optimization

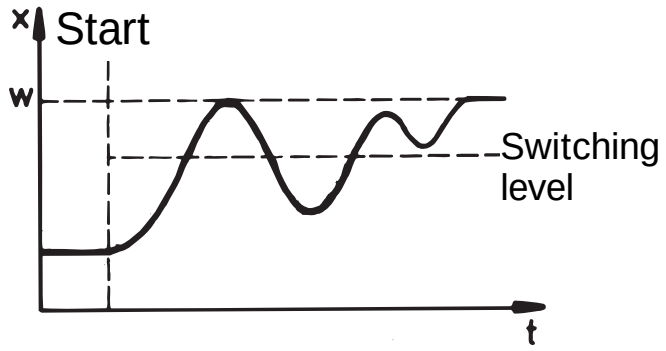
Self-optimization determines the optimum controller parameters for PID or PI controllers.

The following controller parameters are defined: rt, dt, Pb .1, Pb .2, CY 1, CY 2, dF

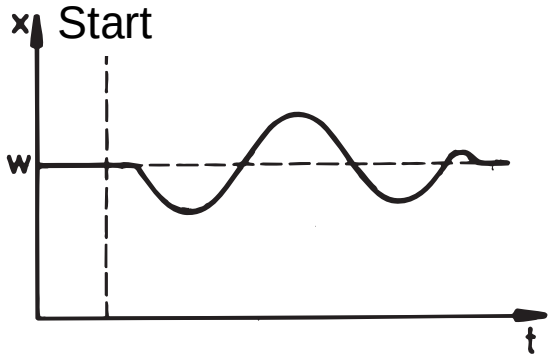
The controller selects procedure **a** or **b**, depending on the size of the control deviation:

a) Self-optimization in the approach phase

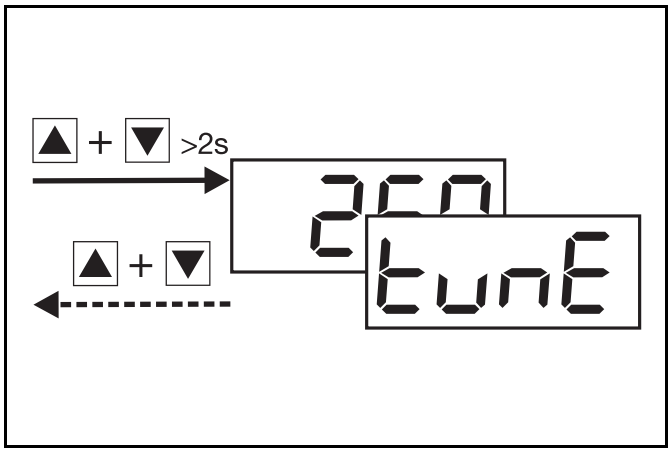
x = process value
w = setpoint



b) Self-optimization at set-point



Starting self-optimization



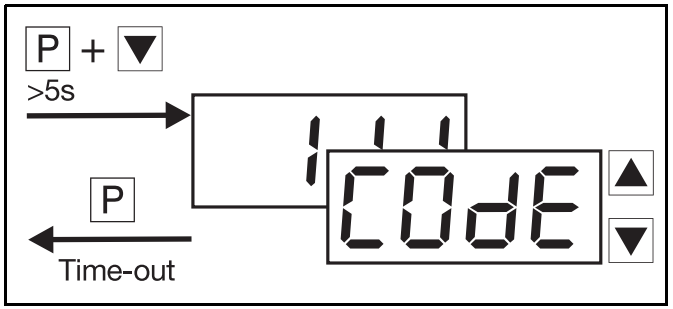
Starting self-optimization is not possible with active level inhibit and ramp function.

Self-optimization is automatically terminated, or can be cancelled.

5.7 Level inhibit via code

As an alternative to the logic input, the level inhibit can be set via a code (logic input has priority).

* Set the code using P + ▼ (at least 5 sec) in normal display



Level inhibit via the logic input will lock the parameter and configuration levels (corresponds to code 011).

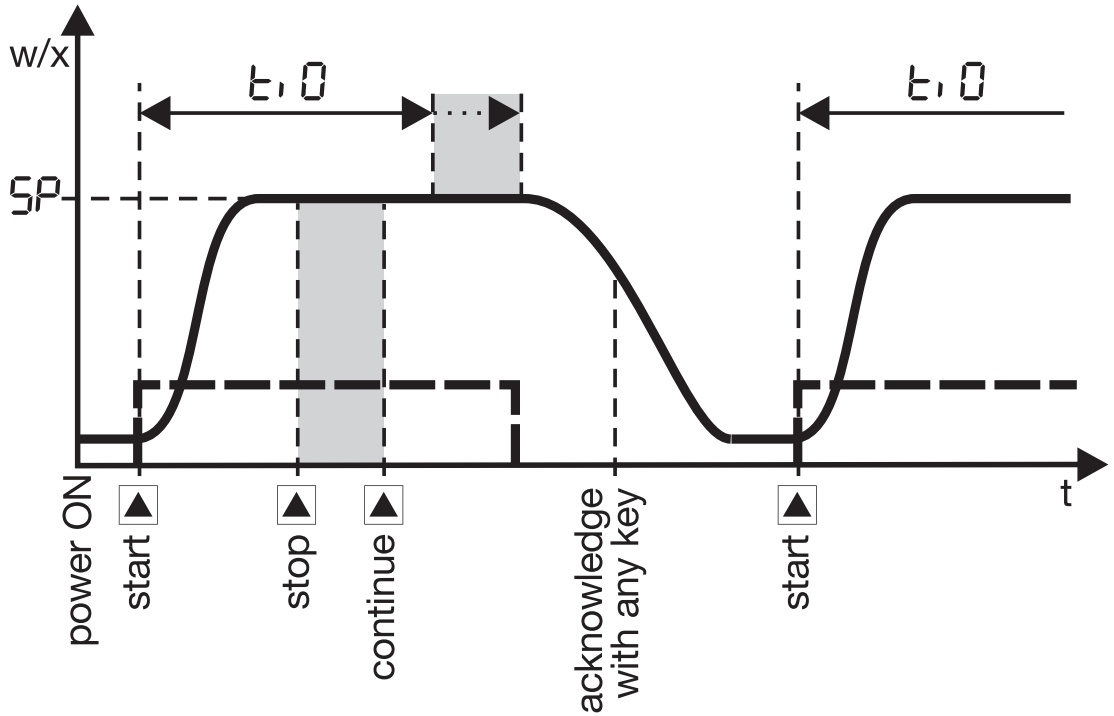
Code	Operating level	Parameter level	Configuration level	Timer level
000	enabled	enabled	enabled	enabled
001	enabled	enabled	inhibited	enabled
011	enabled	inhibited	inhibited	enabled
111	inhibited[1]	inhibited	inhibited	inhibited[2]

1. The values at the operating level can only be indicated but not modified.
2. Timer operation (start/stop/continue/cancel) will continue to be possible.

5.8 Timer function (extra code)

Using the timer function, the control action can be influenced by means of the adjustable time t1 0. After the timer has been started by power ON, by pressing the key, or via the logic input, the timer start value t1 0 is counted down to 0, either instantly or after the process value has gone above or below a programmable tolerance limit. When the timer has run down, several events are triggered, such as control switch-off (output 0%) and setpoint switching. Furthermore, it is possible to implement timer signalling via an output.

Example:



w - setpoint
x - process value
SP - programmed setpoint
t1 0 - timer start value
----- - timer signalling (here: C122=1)
▲ - increment key

Notes on the timer function in conjunction with the ramp function

- Generally, the setpoints can also be approached using the ramp function.
- Stopping the timer does not influence the ramp function.
- If control is active after the timer has run down, the current setpoint is approached with the ramp. Cancellation of the timer is followed by a setpoint step without ramp.
- For timer functions with a tolerance limit, only the setpoint (=ramp end value) is monitored.

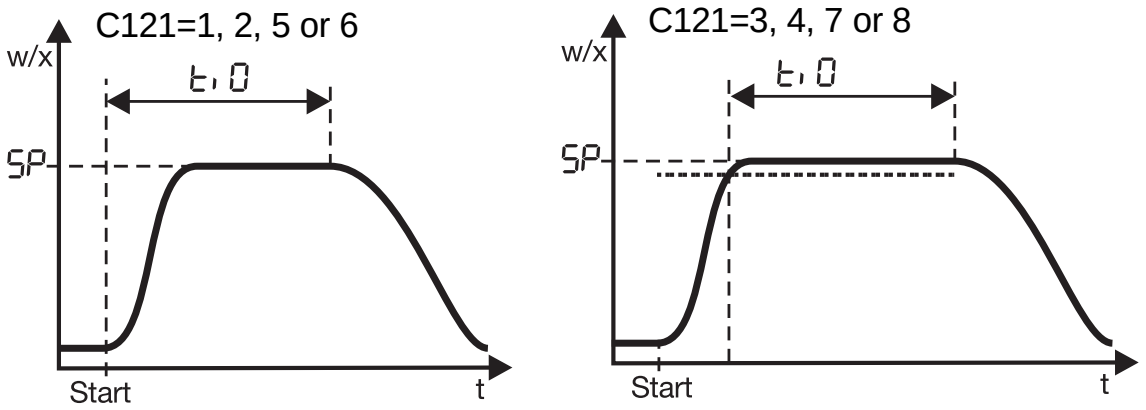
Note on setpoint switching via the logic input

- Setpoint switching via the logic input is generally possible. An exception here is the timer function “Time-dependent setpoint switching”. In this case, configured setpoint switching via the logic input will not be active.

Note on the display status in the event of a power failure

- The state of the display before the power failure will be restored, except for events that are related to the timer (start, cancel, continue, stop). Then the timer value will be shown in the display.

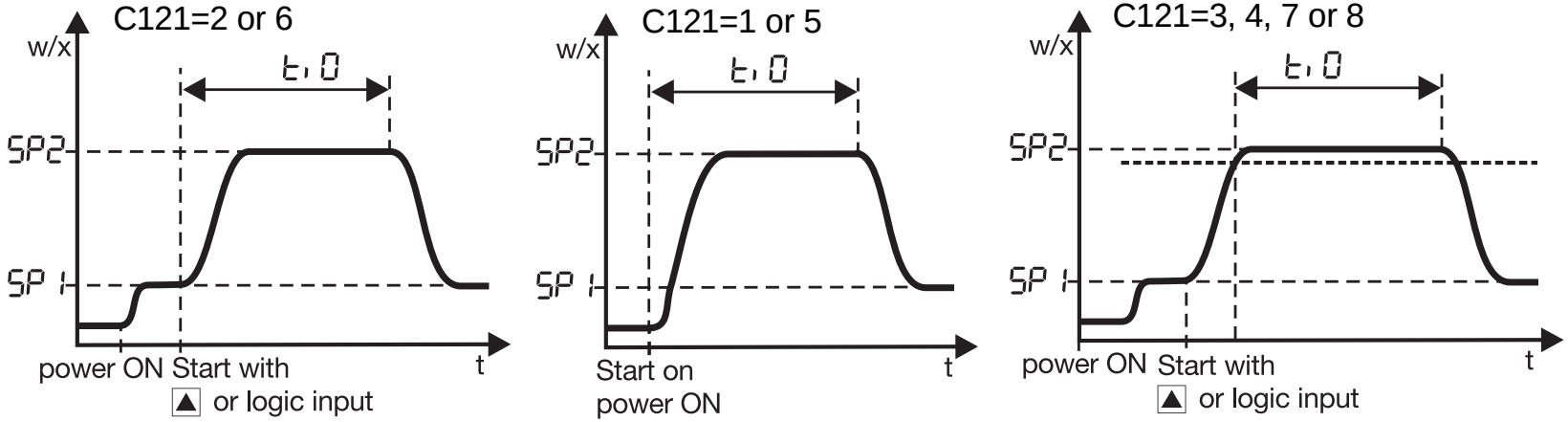
Symbol	Notes
C 120	**Timer function** ⇨ **page 34**
C120=1	**Time-limited control:** The control is switched off after the timer has run down (output 0%)

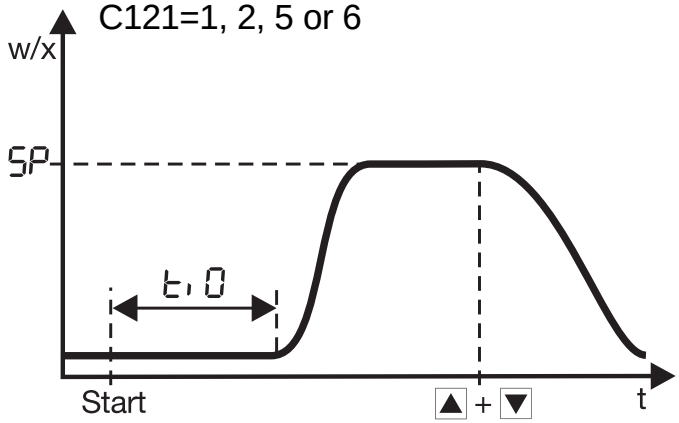
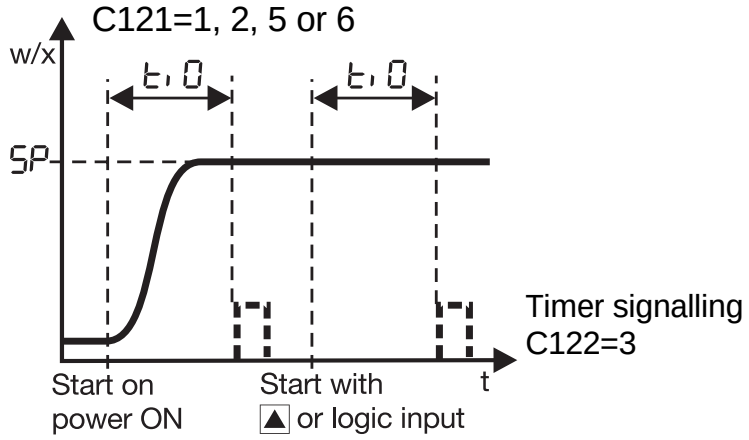
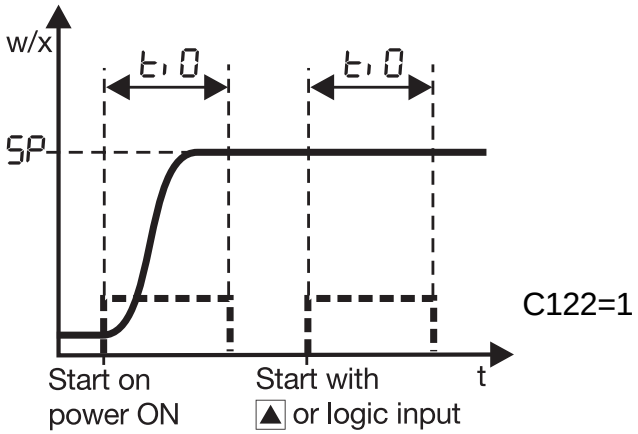


Diagrams with and without start above tolerance limit.

---- Tolerance limit

C120=2 **Time-dependent setpoint switching:** After the start of the timer function, the process is controlled to setpoint SP2. After the timer has run down, the controller automatically switches over to SP 1.



Symbol	Notes
C 120 C120=3	**Time-delayed control:** The control action starts after the timer has run down.  After the timer has run down (End), the ▲ + ▼ keys are used for acknowledgement. Set t.0 > 0s
C120=4	**Timer:** After the start of the timer function, t.0 is counted down to 0. The control action is independent of the timer. Here, too, the timer run-down can be signalled via an output.  

Symbol	Notes
C 121	**Start condition of the timer** ⇨**page 34** The timer start value t1 0 is counted down as selected in the following events: 1. Power ON or logic input/keys 2. Start via keys/logic input 3. Process value has reached tolerance limit (1°C or 5°C) (start via keys/logic input) The position of the tolerance limit depends on the controller type: - 1-setpoint controller (direct): tolerance limit above setpoint - 1-setpoint controller (reversed): tolerance limit below setpoint - 2-setpoint controller: tolerance limit below setpoint  If, during the control process, the process value goes above/below the tolerance limit, the timer will be stopped for the duration of the infringement. **Response to a power failure** ⇨**page 34** After a power failure, the condition before the power failure can be restored, or the timer function can be cancelled. If the timer had run down before the power failure, the timer start value will be loaded. The timer will start automatically when C121=1 or 5. The timer value is saved at one minute intervals, to cover the case of a power failure.
C 122	**Timer signalling** ⇨**page 35** From the start of the timer function until timer run-down, or after the run-down, a signal can be produced via an output.
C 123	**Time unit for the timer** ⇨**page 35**

Programming example

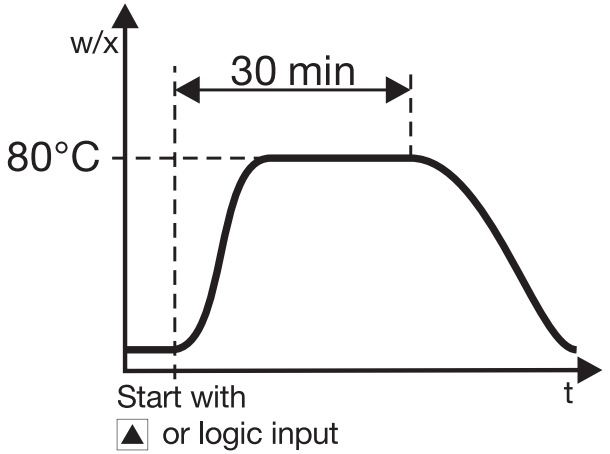
After the start via the logic input or from the keys, the process has to be controlled for 30 minutes to a setpoint of 80°C. The control action is to be cancelled in the event of a power failure.

Configuration:

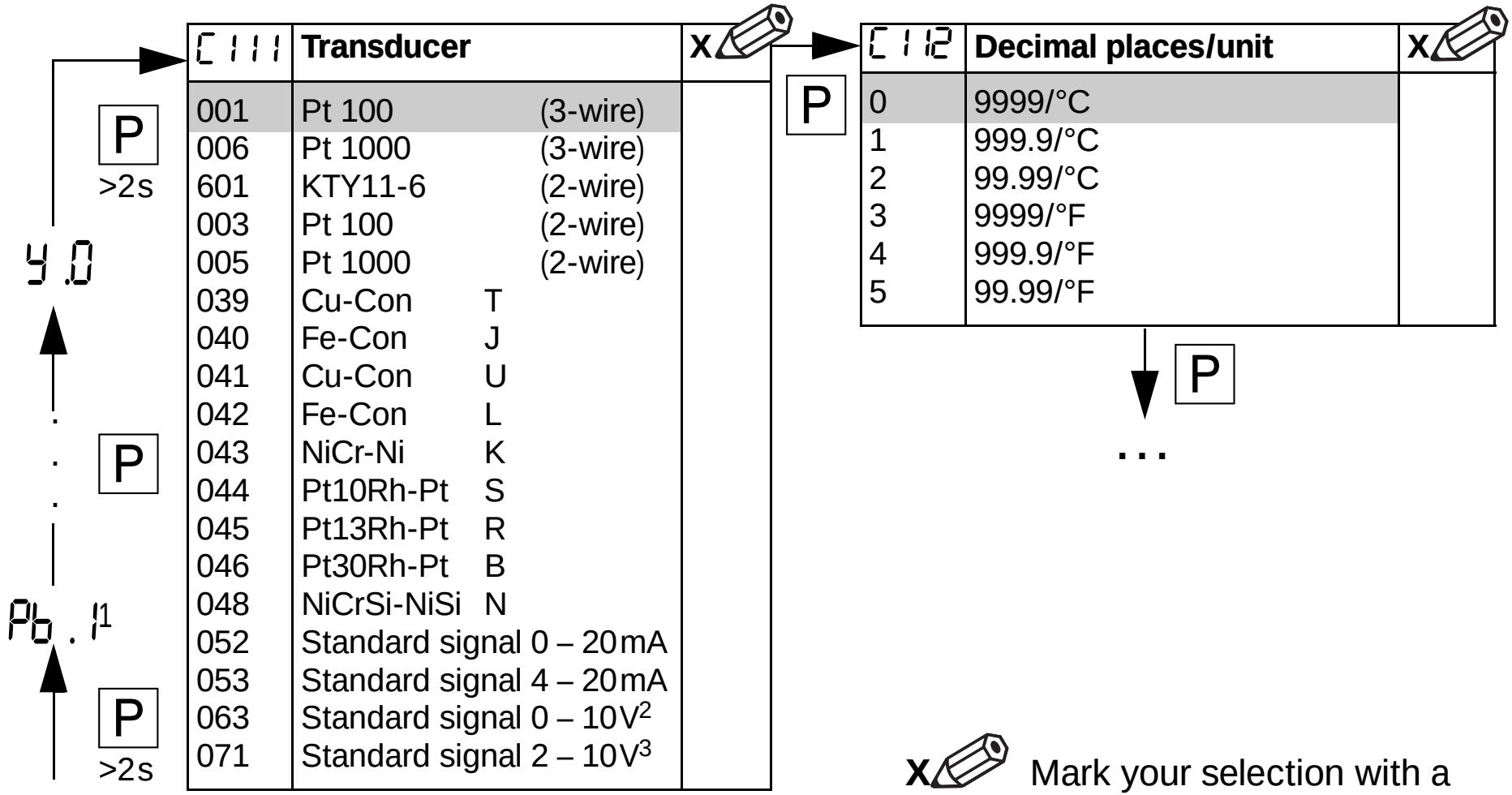
- C111— C116: Controller programming
- C117=5: Logic input = timer control
- C120=1: Timer function = time-limited control
- C121=6: Start condition for timer = via logic input/keys - cancellation on power failure
- C122=0: Timer signalling = no function
- C123=1: Time unit (timer) = mm.ss

Operation:

* Enter the setpoint SP (80°C)
* Press the [P] key until t.0 is indicated
* Change over to the timer level using [P] (at least 2sec)
* Enter the timer start value t.0_ (30.00)
* Return to the operating level (timer value) with [P]
* Start the control action via the logic input or with [▲]



6 Configuration and parameter tables



C111	Transducer		X
001	Pt 100	(3-wire)	
006	Pt 1000	(3-wire)	
601	KTY11-6	(2-wire)	
003	Pt 100	(2-wire)	
005	Pt 1000	(2-wire)	
039	Cu-Con	T	
040	Fe-Con	J	
041	Cu-Con	U	
042	Fe-Con	L	
043	NiCr-Ni	K	
044	Pt10Rh-Pt	S	
045	Pt13Rh-Pt	R	
046	Pt30Rh-Pt	B	
048	NiCrSi-NiSi	N	
052	Standard signal 0 – 20 mA		
053	Standard signal 4 – 20 mA		
063	Standard signal 0 – 10 V[2]		
071	Standard signal 2 – 10 V[3]		

P

C112	Decimal places/unit	X
0	9999/°C	
1	999.9/°C	
2	99.99/°C	
3	9999/°F	
4	999.9/°F	
5	99.99/°F	

P

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X Mark your selection with a cross.

Normal display/ Operating level

1. SP 1, AL or Pb.1 is shown here, depending on the configuration
2. 0 – 1 V for Type 702040/41 with 2 relay outputs (option)
3. 0.2 – 1 V for Type 702040/41 with 2 relay outputs (option)

C13	Controller type	Output 1 (relay)	Output 2+3 (logic+relay)	X
10	single setpoint (reversed)	controller	LK/timer signalling[1]	
11	single setpoint (direct)	controller	LK/timer signalling[1]	
30	double setpoint	controller output 1	controller output 2	
20	single setpoint (reversed)	LK/timer signalling[1]	controller	
21	single setpoint (direct)	LK/timer signalling[1]	controller	
33	double setpoint	controller output 2	controller output 1	

P

1. A programmed limit comparator (LK) has priority over the timer signalling.

Further settings for the outputs with Type 702042/43/44, see C118.

C14	Limit comparator (LK)	X
0	no function	
1	lk 1	
2	lk 2	
3	lk 3	
4	lk 4	
5	lk 5	
6	lk 6	
7	lk 7	
8	lk 8	

P

C15	Ramp function	X
0	ramp function off	
1	ramp function (°C/min)	
2	ramp function (°C/h)	

P

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reversed = heating (output is active when process value is below setpoint) = controller output 1
direct = cooling (output is active when process value is above setpoint) = controller output 2

C16	Outputs on fault		X
0	0%[1]	LK/timer signalling OFF	
1	100%[2]		
2	-100%[1]		
3	0%[1]	LK/timer signalling ON	
4	100%[2]		

1. Minimum output limiting Y2 is effective
2. Maximum output limiting Y1 is effective

P

C17	Logic input	X
0	no function	
1	key inhibit	
2	level inhibit	
3	ramp stop	
4	setpoint switching	
5	timer control	

P

C18		Output 1: Relay (K1)	Output 2: Logic (K2)	Output 3: Relay	X
0		Functions of outputs as defined under C13			
1	for 1-setpt. contrl.	controller output	limit comparator	timer signalling	
2		controller output	timer signalling	limit comparator	
3		limit comparator	controller output	timer signalling	
4		limit comparator	timer signalling	controller output	
5		timer signalling	controller output	limit comparator	
6		timer signalling	limit comparator	controller output	
7	for 2-setpt. contrl.	controller output 1	controller output 2	limit comparator/timer	
8		controller output 1	limit comparator/timer	controller output 2	
9		controller output 2	controller output 1	limit comparator/timer	
10		controller output 2	limit comparator/timer	controller output 1	
11		limit comparator/timer	controller output 1	controller output 2	
12		limit comparator/timer	controller output 2	controller output 1	

P

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C 120	Timer function	X
0	no function	
1	time-limited control	
2	time-dependent setpoint switching	
3	time-delayed control	
4	timer (control independent of timer)	

P

C 121	Start condition for timer	Action on power failure	X
1	after power ON, logic input/keys	Condition as before the power failure	
2	via logic input/keys		
3	via logic input/keys; timer counts 1°C from tolerance limit		
4	via logic input/keys; timer counts 5°C from tolerance limit		
5	after power ON, logic input/keys	Cancellation of timer function (StOP appears in the display)	
6	via logic input/keys		
7	via logic input/keys; timer counts 1°C from tolerance limit		
8	via logic input/keys; timer counts 5°C from tolerance limit		

P

The start conditions with tolerance limit (C121=3, 4, 7, 8) are not valid for C120=3 or 4.
If C120 is altered, the validity of C121 must be checked.

C 122	Timer signalling	X
0	no function	
1	timer start until run-down	
2	after run-down for 10sec	
3	after run-down for 1min.	
4	after run-down until acknowledgement	

P

C 123	Unit of time (timer)	X
1	mm.ss (max. 99.59)	
2	hh.mm (max. 99.59)	
3	hhh.h (max. 999.9)	

s = seconds; m = minutes;
h = hours

One output has to be configured correspondingly(C113/C118).

P

Parameter	Explanation	Value range	factory-set	Your setting
SCL	start value of the standard signal	-1999 to +9999 digit	0	
SCH	end value of the standard signal	-1999 to +9999 digit	100	
SPL	lower setpoint limiting	-1999 to +9999 digit	-200	
SPH	upper setpoint limiting	-1999 to +9999 digit	850	
OFFS	process value correction	-1999 to 9999 digit[1]	0	
HYSt	switching differential of the limit comparator	0 — 9999 digit[1]	1	

P

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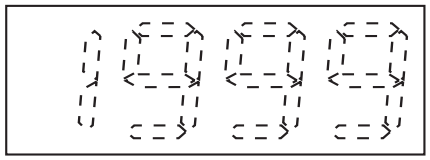
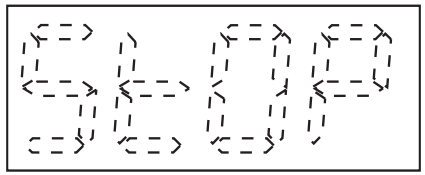
1. For displays with one or two decimal places, the value range and the factory setting change accordingly.
   Example: 1 decimal place → value range: -199.9 to +999.9

Parameter	Explanation	Value range	factory-set	Your setting
SP 1	setpoint 1	SPL — SPH	0	
SP 2	setpoint 2	SPL — SPH	0	
AL	limit value of limit comparator	-1999 to +9999 digit	0	
Pb.1	proportional band 1	0 — 9999 digit[1]	0	
Pb.2	proportional band 2	0 — 9999 digit[1]	0	
dt	derivative time	0 — 9999 sec	80 sec	
rt	reset time	0 — 9999 sec	350 sec	
CY 1	cycle time 1	1.0 — 999.9 sec	20.0 sec	
CY 2	cycle time 2	1.0 — 999.9 sec	20.0 sec	
db	contact spacing	0 — 1000 digit[1]	0	
HYS.1	differential 1	0 — 9999 digit[1]	1	
HYS.2	differential 2	0 — 9999 digit[1]	1	
y.0	working point	-100 to 100 %	0 %	
y.1	maximum output	0 — 100 %	100 %	
y.2	minimum output	-100 to +100 %	-100 %	
dF	filter time constant	0.0 — 100.0 sec	0.6 sec	
rASd	ramp slope	0 — 999 °C/h (°C/min)[1]	0	

1. For displays with one or two decimal places, the value range and the factory setting change accordingly.

7 Alarm messages

Display	Description	Cause/response
	The displays for the process value or timer value flashes “1999”. Display current timer value by repeatedly pressing the P key.	Over/underrange of process value. Controller and limit comparators referred to the process value input behave in accordance with the configuration of the outputs. The timer is stopped.
	The display for the timer value alternates between showing “StOP” and the time. ✱ Acknowledge by using any key, (the timer start value t1 0 is loaded)	The timer function has been cancelled due to a supply failure. The timer value that was present at the time of the supply failure will be indicated.

The following events come under the heading over/underrange:
- Probe break/short-circuit
- Measurement is outside the control range of the probe that is connected
- Display overflow

Measurement circuit monitoring (• = recognized)

Transducer		**Overrange/ underrange**	**Probe/ lead short-circuit**	**Probe/lead break**
Thermocouple		•	-	•
Resistance thermometer		•	•	•
Voltage	2 – 10V/0.2 – 1V	•	•	•
	0 – 10V/0 – 1V	•	-	-
Current	4 – 20mA	•	•	•
	0 – 20mA	•	-	-

8 Technical data

Input for thermocouple

Designation			Range
Fe-Con	L		-200 to + 900°C
Fe-Con	J	EN 60584	-200 to +1200°C
Cu-Con	U		-200 to + 600°C
Cu-Con	T	EN 60584	-200 to + 400°C
NiCr-Ni	K	EN 60584	-200 to +1372°C
NiCrSi-NiSi	N	EN 60584	-200 to +1300°C
Pt10Rh-Pt	S	EN 60584	0 — 1768°C
Pt13Rh-Pt	R	EN 60584	0 — 1768°C
Pt30Rh-Pt6Rh	B	EN 60584	0 — 1820°C[1]
Measurement accuracy: ≤0.4% / 100ppm/°C Cold junction: Pt100 internal			

1. Accuracy is assured within the range 300 — 1820°C

Input for standard signals

Designation	Range
Voltage	0 — 10V, R_E > 100kΩ[2] 2 — 10V, R_E > 100kΩ[3] R_E - input resistance
Current	4 — 20mA, voltage drop ≤ 1,5V 0 — 20mA, voltage drop ≤ 1,5V
Measurement accuracy: ≤0.1% / 100ppm/°C	

2. 0—1V, R_E>10MΩ for Type 702040/41 with 2 relays
3. 0.2—1V, R_E>10MΩ for Type 702040/41 with 2 relays

Input for resistance thermometer

Designation	Range
Pt100 EN 60751	-200 to +850°C
Pt1000 EN 60751	-200 to +850°C
KTY11-6	-50 to +150°C
Measurement accuracy: Pt100/1000: ≤0.1% / 50ppm/°C KTY11-6: ≤1.0% / 50ppm/°C Sensor lead resistance: 20Ω max. per lead Meas. current: 250µA	

Outputs

Relay:
n.o.(make) contact; 3A at 250V AC resistive load;
150,000 operations at rated load
Logic 0/5V:
Current limiting: 20mA; R_{load} ≥250Ω
Logic 0/12V:
Current limiting: 20mA; R_{load} ≥600Ω

Supply

110 — 240V AC -15/+10% 48 — 63Hz, or
20 — 53V AC/DC 48 — 63Hz, or
10 — 18V DC

Controller

Controller type	1-setpt. controller with limit comparator, 2-setpt. controller
Controller structure	P/PD/PI/PID
A/D converter	resolution >15 bit
Sampling time	210 msec (250 msec with timer function)

Accuracy of timer: 0.7 % / 10 ppm/°C

Test voltages (type test)
to EN 61 010, Part 1, March 1994,
overvoltage category II, pollution degree 2,
for Type 702040/41
overvoltage category III, pollution degree 2,
for Type 702042/43/44

Power consumption: 5 VA max.

Electrical connection
at the rear via plug-in screw terminals,
conductor cross-section ≤ 2.5 mm^2 (1.3 mm^2 with Type 702040/41) solid wire or
1.5 mm^2 (1.0 mm^2 for Type 702040/41) stranded wire with ferrules

Electromagnetic compatibility
EN 61 326
Immunity to interference: Class B
Interference emission: industrial requirements

Data backup: EEPROM

Housing type
plastic housing for panel mounting
to DIN 43700

Cleaning the front panel
use warm or hot water (add mildly acidic, neutral or mildly alkaline detergents, if necessary). Do not use any abrasive cleaning agents or high-pressure cleaners. Limited resistance to organic solvents (e. g. spirits, benzol, etc.).

Housing mounting
in panel to DIN 43 834

Ambient and storage temperature
0 to 55 °C / -40 to +70 °C

Climatic conditions
≤ 75 % rel. humidity, no condensation

Operating position: any

Weight (approx.)
75 g (702040)
95 g (702041)
145 g (702042)
160 g (702043)
200 g (702044)

Protection
IP66 (front) to EN 60529
IP20 (rear)

Safety regulation: to EN 61010

TEMATEC Löbach GmbH

Street adress:
Löhestraße 37
53773 Hennef, Germany
Delivery address:

Postal address:
53759 Hennef, Germany
Phone: +49 2242 8703-0
Fax: +49 2242 8703-20
e-mail: team@tematec.de
Internet: www. tematec.de