JUMO ILPF100 and JUMO ILPF200

3-channel profile controller

B 70.0105

Operating Manual

5.00/00337506

Contents

Contents

1.1 Foreword

Please read this Manual before starting up the instrument.
Keep this Manual in a place which is at any time accessible to all users.
Please assist us to improve this Manual.

Phone Germany (06 61) 60 03-7 26
abroad (int.+49) 661 60 03-0

Fax Germany (0061) 60 03-508
abroad (int.+49) 661 60 03-607

If any problems should arise during start-up you are asked not to carry out any manipulations on the unit which are not permitted. This endangers your rights under the warranty.
Please contact the nearest JUMO office or the main factory.

When returning chassis, modules or components the rules of EN 100 015 "Protection of electrostatic endangered components" have to be observed. Use only the appropriate **ESD** packaging material for transport.
Please note that we can not be held liable for any damage caused by ESD (electrostatic discharges).

Trademarks LON and Neuron are registered trademarks of the Echelon Corporation.
Microsoft and Windows are registered trademarks of the Microsoft Corporation.

1.2 Arrangement of the documentation

B 70.0105 This Manual is supplied with the instrument. It is addressed to the OEM (original equipment manufacturer) and to the user with appropriate technical know-how. In addition to installation and electrical connection, it contains all the information on start-up, operation and setting instrument parameters.

1.3 Typographical conventions

Warning signs

The signs for **Danger** and **Warning** are used in this Manual under the following conditions:

Danger
This symbol is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately.

Warning
This symbol is used when there may be **damage to equipment or data** if the instructions are disregarded or not followed accurately.

Note signs

Note
This symbol is used if your **special attention** is drawn to a remark.

Reference
This symbol refers to additional information in other handbooks, chapters or sections.

abc[1]

Footnote
Footnotes are notes which refer to certain points in the text.
Footnotes consist of 2 parts: the text marking and the footnote text.
The text markings are arranged as continuous raised numbers. The footnote text (in smaller typeface) is placed at the bottom of the page and starts with a number and a full stop.

✱

Action
This sign refers to the description of an action to be performed.
The individual steps are indicated by this asterisk, e.g.

✱ Switch off the supply

✱ Pull the connectors off the module

Presentation

Enter

Keys
Keys are shown in a frame in the instructions. Both symbols and texts are possible. Where a key has multiple functions, the text shown corresponds to the function which is currently active.

2.1 Standard accessories

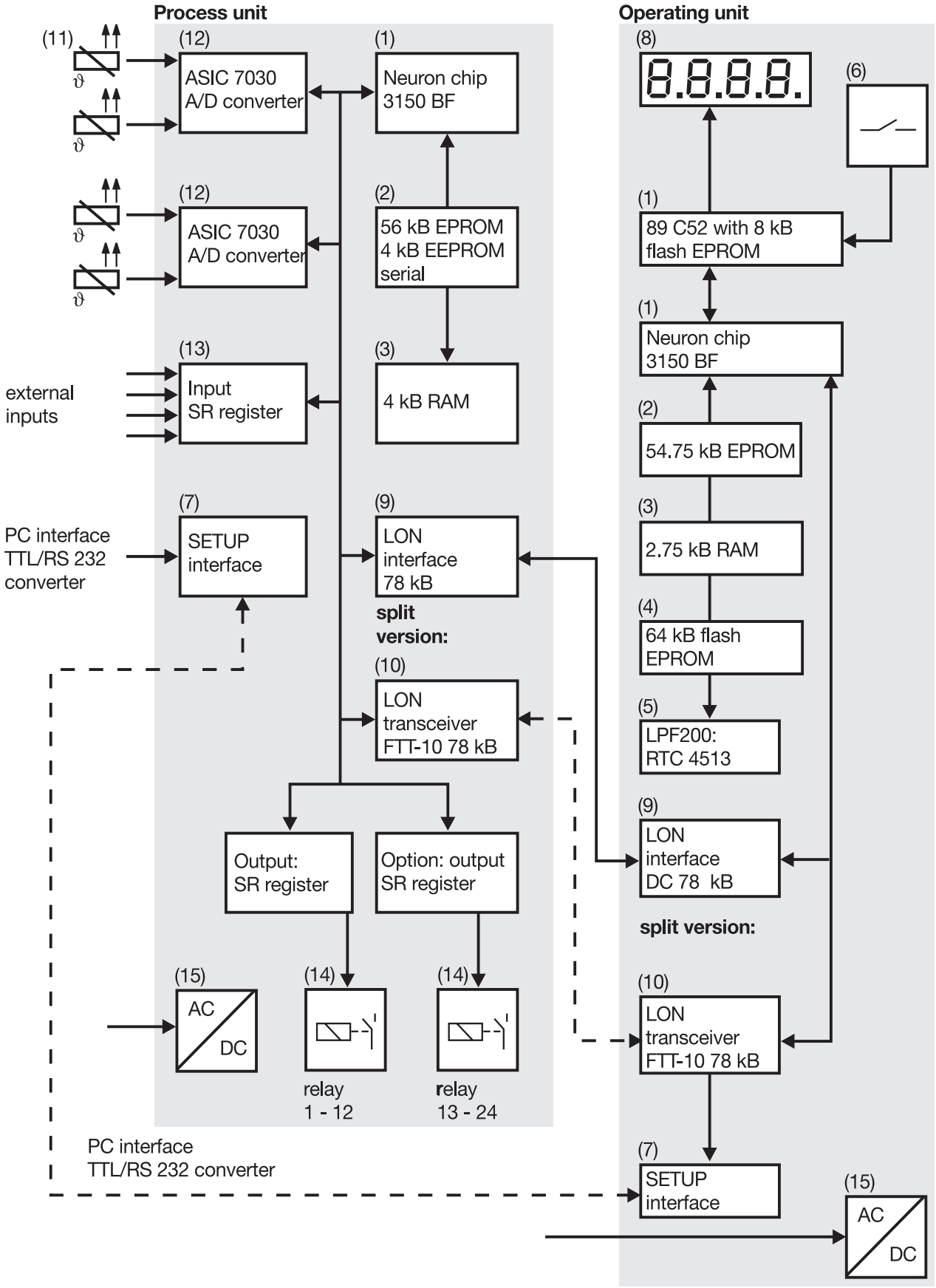
- 1 Operating Manual B 70.0105
- 1 rubber seal for flush panel mounting
- 4 mounting brackets
- Combicon push-on connector with screw terminals
  3-way, 8-way, 12-way for electrical connection

2.2 Accessories

- PC interface with TTL/RS 232 converter,
  Sales No. 70/00301315
- Project design software JUMO mTRON-iTOOL for configuration and
  in conjunction with mTRON modules
- Universal JUMO profile program editor EdiProg
- JUMO mTRON automation system
- Membrane key details to customer specification (colour, Company logo)

2.3 Function

The profile controller operates with three microcontrollers (1) which supervise the program sequence, control action, operation and display.
Included are EPROMS as read-only memory (2) and RAMs as read/write memory (3). The user programs are held in a non-volatile flash EPROM (4).
Version LPF-200 includes a real-time clock (5).
Inputs such as configuration, operation etc. are made using 24 keys on the LPF-100 (6), and more conveniently using 38 keys on LPF-200 (6), in part the inputs can also be made from a PC through the SETUP interface (7).
All the relevant values are shown on the LPF-100 on 17-place 7-segment displays and 25 LEDs (8), on the LPF-200 on 30-place 7-segment displays (8) in two colours together with 35 LEDs.
The data exchange between process unit and operating unit takes place in the case of the compact unit via the 78kbaud LON interface DC (9), and with separate units via the 78 kbaud LON transceiver FTT-10 (10).
The analogue values of the transducers (11) are processed and digitised in ASIC circuits (12).
Four external inputs (13) are available for remote operation and inhibition of instrument functions.
12 or 24 relay outputs (14) with contact protection circuit are provided.
On the compact unit the supply for the instrument is obtained from a switch-mode supply (15). In the split version the operating unit incorporates an additional power supply (15) which must be connected up separately.


Process unit
Operating unit
(11)
(12)
ASIC 7030
A/D converter
(1)
Neuron chip
3150 BF
(8)
8.8.8.8.
(6)
(12)
ASIC 7030
A/D converter
(2)
56 kB EPROM
4 kB EEPROM
serial
(1)
89 C52 with 8 kB
flash EPROM
(1)
Neuron chip
3150 BF
(13)
external
inputs
Input
SR register
(3)
4 kB RAM
(2)
54.75 kB EPROM
(3)
2.75 kB RAM
(4)
64 kB flash
EPROM
(5)
LPF200:
RTC 4513
PC interface
TTL/RS 232
converter
(7)
SETUP
interface
(9)
LON
interface
78 kB
split
version:
(10)
LON
transceiver
FTT-10 78 kB
(9)
LON
interface
DC 78 kB
split version:
Output:
SR register
Option: output
SR register
(15)
AC
DC
(14)
(14)
relay
1 - 12
relay
13 - 24
(10)
LON
transceiver
FTT-10 78 kB
PC interface
TTL/RS 232 converter
(7)
SETUP
interface
(15)
AC
DC

2.4 Type designation

	(1)		(2)		(3)		(4)		(5)		(6)		(7)
7001	. .	/	.	-	. . .	-	. . .	-	. . .	-	01	-	. . .

(1) Basic type	Code
LPF-100	05
LPF-200	06

(2) Basic type extension	Code
Compact unit	1
Compact unit with LON interface	2
External operating unit with LON interface	3

(3) Analogue inputs 1 — 4	Code
Pt 100 resistance thermometer in 3-wire cicuit	888
Configuration to customer specification[1]	999

(4) Logic inputs	Code
Input 1: profile program start Input 2: profile program stop Input 3: manual operation Input 4: next segment	888
Configuration to customer specification[1]	999

(5) Number of relays	Code
12 relays	012
24 relays[2]	024

(6) Supply	Code
93 — 263 V AC 48 — 63 Hz	01

(7) Controller type / limit comparators		Code
Relay	Application	888
1	single-setpoint controller 1	
2	single-setpoint controller 2	
3	single-setpoint controller 3 no limit comparators	
4 — 12 (24)	operating functions depending on (5) number of relays	
Configuration to customer specification[1]		999

1. Connect setup program and read out configuration from the instrument or check coding functions.
2. The relays 13 — 24 are available as option. If more than 24 relays are required, Types 7001..1/2 and 7001../3 can be combined with mTRON relay modules to provide up to 36 relays. Relay 12 is a combination alarm relay, if it is set as such ⇨ Section 6.1.8 “Combination alarm”

2.5 Installation notes

- The choice of cable, the installation and the electrical connection of the instrument must meet the requirements of VDE 0100 “Regulations on the Installation of Power Circuits with nominal voltages below 1000V” or the appropriate local regulations.
- Work on the instrument must only be carried out to the extent described and, like the electrical connection, only by properly qualified personnel.
- Isolate the unit on line and neutral from the supply if there may be contact with live parts during work.
- The external fuse of the supply should not be rated above 10 A (slow). The load circuit should be fused for the maximum relay current in order to prevent welding of the output relay contacts in case of an external short-circuit.
- Electromagnetic compatibility conforms to the Standards and Regulations specified under Technical Data. Setup interface and inputs are **not** isolated, ⇨ Data Sheet.
- The instrument is not suitable for installation in hazardous areas.
- Input, output and supply lines should be run separately and not parallel to each other.
- Sensor and interface lines should be screened and twisted together. Do not run them close to current-carrying components or cables. Temperature probes should have the screen grounded at one end at the instrument terminal TE; the LON interface should be grounded at both ends (at each unit).
- If there is no technical earth in the installation, connect terminal TE on the instrument to the potential earth (PE).
- Do not loop the earth connections, i.e. do not run them from one instrument to another; run them singly, e.g. to earth terminals on the rail (short leads!)
- Do not connect any further loads (relays) to the supply terminals of the instrument.
- Apart from unsatisfactory installation, incorrect settings on the instrument (setpoint, data at configuration level) may interfere with the proper operation of the controlled process or result in damage. Provision should therefore always be made for safety devices independent of the instrument, e.g. overpressure valves or temperature limiters/monitors. Setting up must be restricted to properly qualified personnel. Please observe the appropriate safety regulations in this connection. Adaptation (self-optimisation) cannot be expected to handle all possible control loops so that there is theoretically a possibility of setting unstable parameters. The final process value should therefore be checked for its stability.
- Setup interface and inputs are **not** isolated.
- If any inputs are carrying a voltage, the corresponding connectors have to be pulled off before the setup operation.

3 Installation

3.1 Location and climatic conditions

The process unit is located directly on the operating unit or is mounted separately. The location should be such that the ambient conditions do not exceed the technical data in the Data Sheet.

3.2 Fitting into the panel cut-out (Fig. A)

* Insert the operating unit from the front into the panel cut-out
* Tighten the retainers evenly.

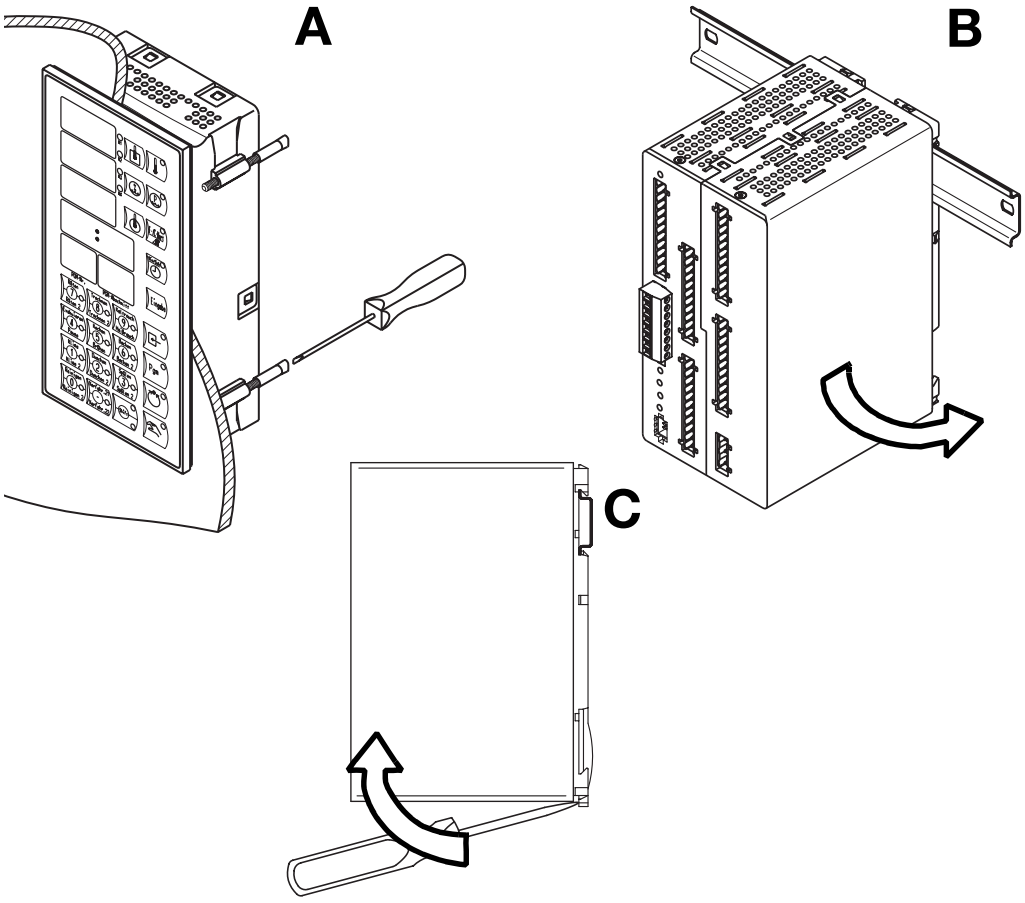
3.3 Mounting the process unit (Fig. B)

The separate process unit is usually mounted inside a control cabinet where it is clipped onto a standard rail.

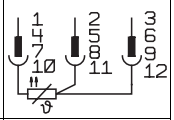
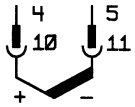
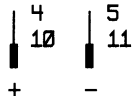
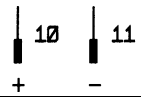
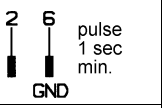
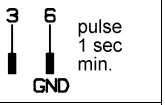
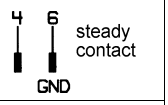
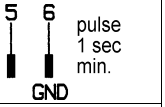
* Hang the process unit from above onto the rail
* Swing it down until it clicks home

3.4 Releasing the process unit (Fig. C)

* Insert a screwdriver into the slot of the locking mechanism, raise it slightly and at the same time swing the process unit upwards.



4.1 Connection chart

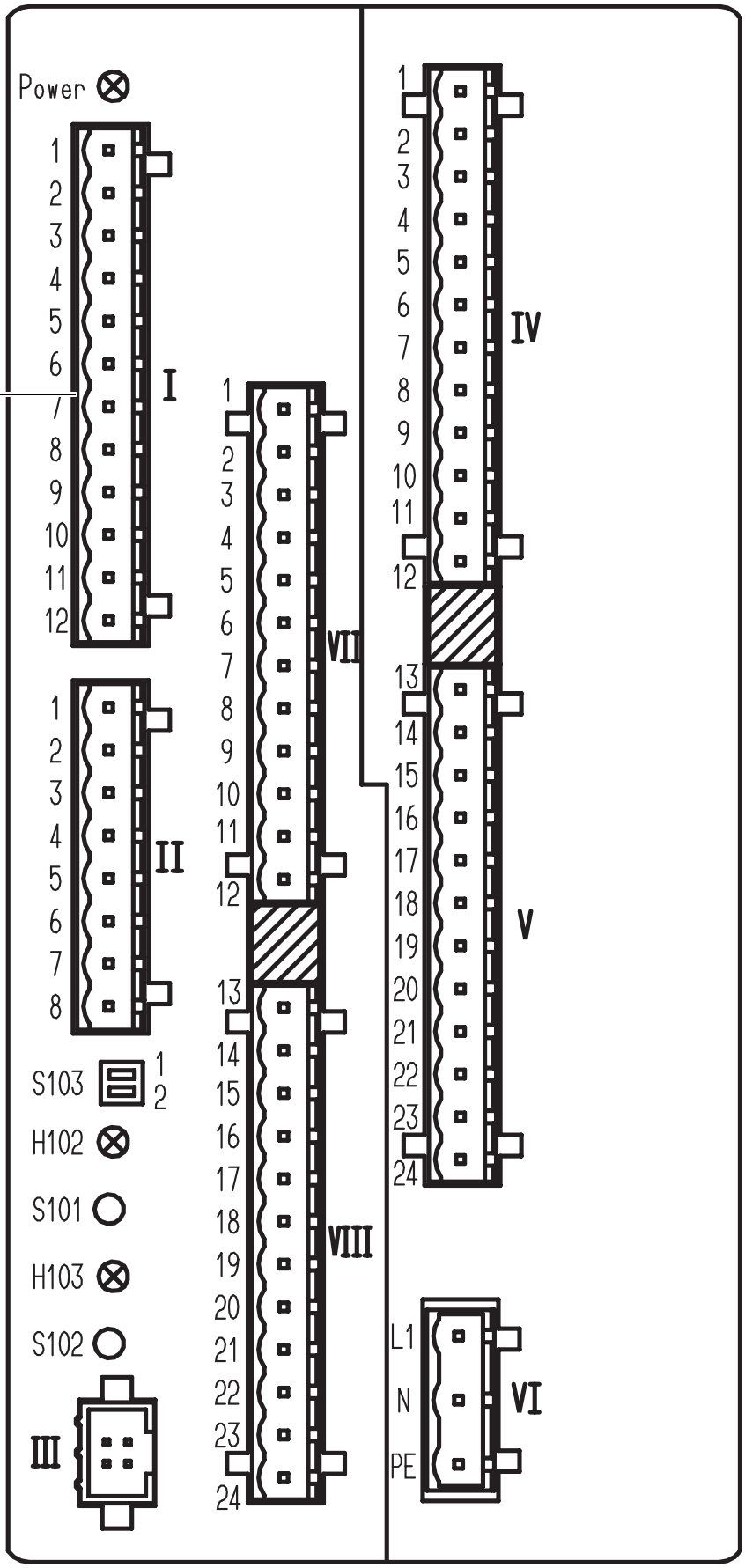
Connection for	**Terminals field I**					
		Signal inputs				
		chamber temperature	relative humidity	core temperature	extra temperature	
						
Resistance thermometer in 3-wire circuit		I 1 I 2 I 3	I 4 I 5 I 6	I 7 I 8 I 9	I 10 I 11 I 12	
Thermocouple			I 4 I 5		I 10 I 11	
Standard signal 0 — 1 V 0 — 10 V 0(4) — 20 mA			I 4 I 5		I 10 I 11	
0 — 20 mA AC (heater current)					I 10 I 11	
Connection for	**Terminals field II**					
Technical earth	II 1	To discharge interference potentials, connect the shield to the PE connection of the supply.				
Logic input 1	II 2 II 6	floating contact GND		ext. start[1]		
Logic input 2	II 3 II 6	floating contact GND		ext. stop[1]		
Logic input 3	II 4 II 6	floating contact GND		ext. manual[1]		
Logic input 4	II 5 II 6	floating contact GND		step on to next segment[1]		
Additional functions of the logic inputs		- programming inhibit[1] - key inhibit[1] - programming inhibit for operating functions at process steps[1] - all logic outputs off[1] - coding function inhibit[1]				steady contact
LON interface	II 7 II 8	twisted pair cable	only on Type 7501../2,..and 7501../3,..			
Connection for	**Terminals field III**					
Setup plug		PC interface with TTL/RS 232 converter Sales No. 70/00301315 (Type 7501../1 and 2 only)				

1. Functions can be altered and re-assigned through the coding functions 90 — 98

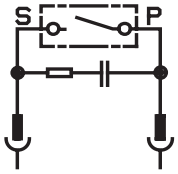
4 Electrical connection

Process unit

Please plug in the orange connector here (gold-plated contacts)

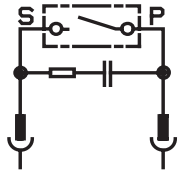


<table>
<tr><td>Connection for</td><td colspan="3">Terminals field IV</td><td></td></tr>
<tr><td rowspan="14">Relay outputs
Contact life:
10^6 operations at rated load
Rating:
230V 3A (resistive load)

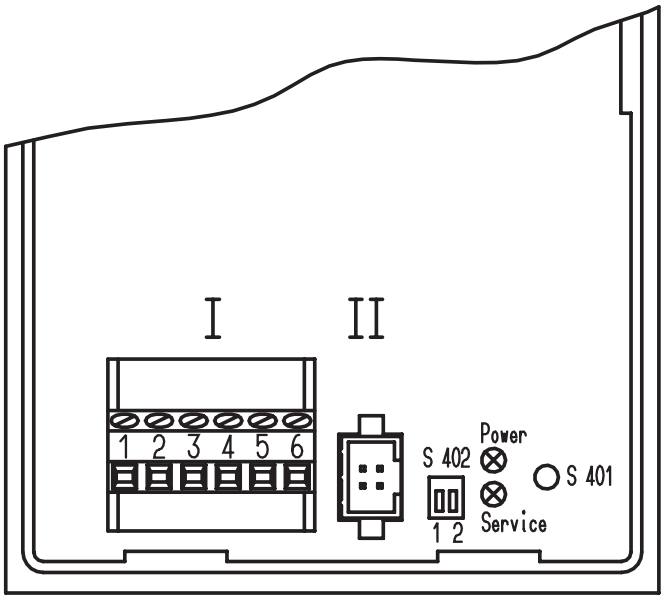
Connectors must only be plugged in and unplugged when not carrying current!</td><td>relay 1</td><td>IV 1
IV 2</td><td>(P) common
(S) n.o. (make)</td><td rowspan="14"> 

RC protection circuit (metal film resistor 56R 0.5W, metal-plastic capacitor 22nF 1000V)</td></tr>
<tr><td>relay 2</td><td>IV 3
IV 4</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 3</td><td>IV 5
IV 6</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 4</td><td>IV 7
IV 8</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 5</td><td>IV 9
IV 10</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 6</td><td>IV 11
IV 12</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td colspan="3">Terminals field V</td></tr>
<tr><td>relay 7</td><td>IV 13
IV 14</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 8</td><td>V 15
V 16</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 9</td><td>V 17
V 18</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 10</td><td>V 19
V 20</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 11</td><td>V 21
V 22</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>relay 12</td><td>V 23
V 24</td><td>(P) common
(S) n.o. (make)</td></tr>
<tr><td>Connection for</td><td colspan="3">Terminals field VI</td></tr>
<tr><td rowspan="3">Supply
93 — 263 V AC 48 — 63 Hz</td><td>L1</td><td colspan="2">line</td></tr>
<tr><td>N</td><td colspan="2">neutral</td></tr>
<tr><td>PE</td><td colspan="2">TE (technical earth)</td></tr>
</table>

4 Electrical connection

Connection for	Terminals field VII			
Relay outputs Contact life: 10^6 operations at rated load Rating: 230V 3A (resistive load) Connectors must only be plugged in and unplugged when not carrying current!	relay 13	VII 1 VII 2	(P) common (S) n.o. (make)	 RC protection circuit (metal film resistor 56R 0.5W, metal-plastic capacitor 22nF 1000V)
	relay 14	VII 3 VII 4	(P) common (S) n.o. (make)	
	relay 15	VII 5 6	(P) common (S) n.o. (make)	
	relay 16	VII 7 VII 8	(P) common (S) n.o. (make)	
	relay 17	VII 9 VII 10	(P) common (S) n.o. (make)	
	relay 18	VII 11 VII 12	(P) common (S) n.o. (make)	
	Terminals field VIII			
	relay 19	VIII 13 VIII 14	(P) common (S) n.o. (make)	
	relay 20	VIII 15 VIII 16	(P) common (S) n.o. (make)	
	relay 21	VIII 17 VIII 18	(P) common (S) n.o. (make)	
	relay 22	VIII 19 VIII 20	(P) common (S) n.o. (make)	
	relay 23	VIII 21 VIII 22	(P) common (S) n.o. (make)	
	relay 24	VIII 23 VIII 24	(P) common (S) n.o. (make)	

Operating unit



Connection for	**Terminals field I**		
Supply 93 — 263 V AC 48 — 63 Hz	1 2 3 4	line neutral PE not used	
LON interface	5 6	twisted pair cable	only on version with transceiver
Connection for	**Terminals field II**		
Setup plug		PC interface with RS 232 converter Sales No. 70/00301315	

4.2 Arrangement of the relay outputs

Controller 1 chamber	Controller 2 humidity	Controller 3	Relays for limit comparators						12 relays[1]	24 relays[2]
									for operating functions	
Single-setpoint controller relay 1	Single-setpoint controller relay 2	No controller	no limit comparator						3 — 12	13 — 24
			3						4 — 12	13 — 24
			3	4					5 — 12	13 — 24
			3	4	5				6 — 12	13 — 24
			3	4	5	6			7 — 12	13 — 24
			3	4	5	6	7		8 — 12	13 — 24
			3	4	5	6	7	8	9 — 12	13 — 24
Single-setpoint controller relay 1	Single-setpoint controller relay 2	Single-setpoint controller relay 3	no limit comparator						4 — 12	13 — 24
			4						5 — 12	13 — 24
			4	5					6 — 12	13 — 24
			4	5	6				7 — 12	13 — 24
			4	5	6	7			8 — 12	13 — 24
			4	5	6	7	8		9 — 12	13 — 24
			4	5	6	7	8	9	10 — 12	13 — 24
Double-setpoint controller relay 1, 2	Single-setpoint controller relay 3	No controller	no limit comparator						4 — 12	13 — 24
	or		4						5 — 12	13 — 24
Single-setpoint controller relay 1	Double-setpoint controller relay 2, 3		4	5					6 — 12	13 — 24
			4	5	6				7 — 12	13 — 24
			4	5	6	7			8 — 12	13 — 24
			4	5	6	7	8		9 — 12	13 — 24
			4	5	6	7	8	9	10 — 12	13 — 24
Single-setpoint controller relay 1	Single-setpoint controller relay 2	Double-setpoint controller relay 3, 4	no limit comparator						5 — 12	13 — 24
	or		5						6 — 12	13 — 24
Double-setpoint controller relay 1,2	Single-setpoint controller relay 3	Single-setpoint controller relay 4	5	6					7 — 12	13 — 24
	or		5	6	7				8 — 12	13 — 24
Single-setpoint controller relay 1	Double-setpoint controller relay 2, 3	Single-setpoint controller relay 4	5	6	7	8			9 — 12	13 — 24
			5	6	7	8	9		10 — 12	13 — 24
			5	6	7	8	9	10	11 — 12	13 — 24

1. Relay 12 is always the combination alarm relay, if set as such ⇨ Section 6.1.8 “Combination alarm”; “Err” appears in the lower display on the operating unit.
2. The unit is able to operate up to 36 operating functions. If more than 24 relays are required, Types 70.01../2 and 70.01../3 can be extended using mTRON relay modules to Data Sheet 70.4015.

■ factory setting

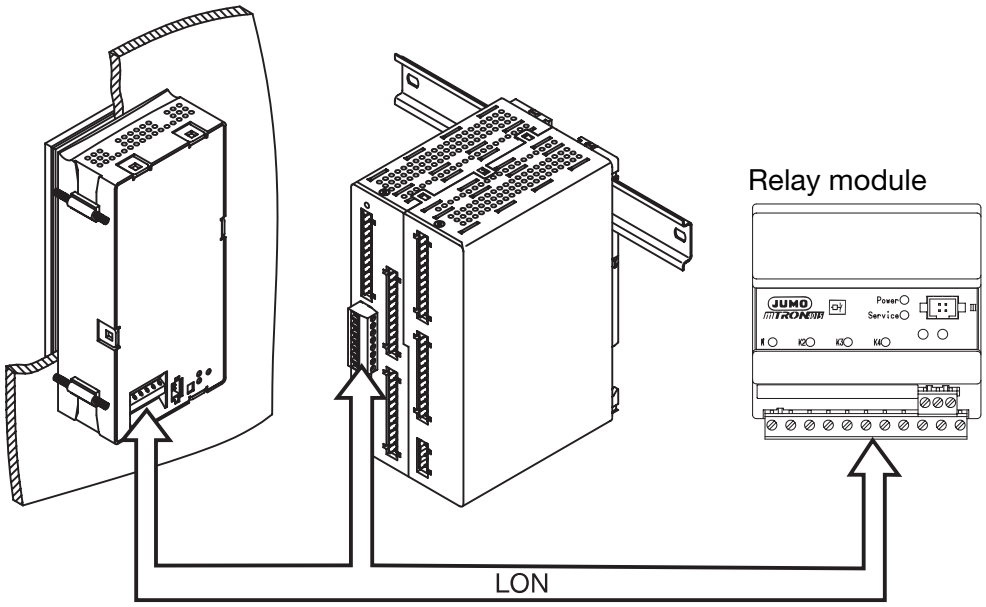
Controller 1 chamber	Controller 2 humidity	Controller 3	Relays for limit comparators						12 relays[1]	24 relays[2]
									for operating functions	
Double-setpoint controller relay 1,2	Double-setpoint controller relay 3, 4	No controller	no limit comparator						5—12	13—24
			5						6—12	13—24
			5	6					7—12	13—24
			5	6	7				8—12	13—24
			5	6	7	8			9—12	13—24
			5	6	7	8	9		10—12	13—24
			5	6	7	8	9	10	11—12	13—24
Single-setpoint controller relay 1	Double-setpoint controller relay 2, 3	Double-setpoint controller relay 4, 5	no limit comparator						6—12	13—24
	or		6						7—12	13—24
Double-setpoint controller relay 1, 2	Single-setpoint controller relay 3	Double-setpoint controller relay 4, 5	6	7					8—12	13—24
	or		6	7	8				9—12	13—24
Double-setpoint controller relay 1, 2	Double-setpoint controller relay 3, 4	Single-setpoint controller relay 5	6	7	8	9			10—12	13—24
			6	7	8	9	10		11—12	13—24
			6	7	8	9	10	11	12—12	13—24
Double-setpoint controller relay 1,2	Double-setpoint controller relay 3, 4	Double-setpoint controller relay 5,6	no limit comparator						7—12	13—24
			7						8—12	13—24
			7	8					9—12	13—24
			7	8	9				10—12	13—24
			7	8	9	10			11—12	13—24
			7	8	9	10	11		12	13—24
			7	8	9	10	11	12	-	13—24

1. Relay 12 is always the combination alarm relay
2. The unit is able to operate up to 36 operating functions. If more than 24 relays are required, Types 70.01../2 and 70.01../3 can be extended using mTRON relay modules to Data Sheet 70.4015.

4 Electrical connection

4.3 Connection of Series mTRON instruments

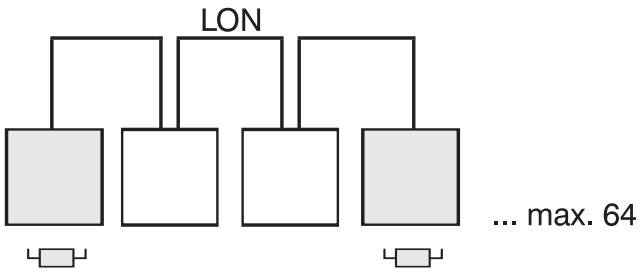
The profile controller can be looped into a network with modules of the JUMO mTRON automation system. When there is a separate operating unit, there are two “nodes” which have to be wired up as described below.
The connections are on the back of the unit. A screened twisted pair is used as transmission line in the JUMO mTRON automation system; it has to meet the following specification:
Characteristic impedance 100 — 120Ω, capacitance approx. 60pF/m.
The connection can be made as line, ring or star structure (free topology).



Line structure

The physical bus ends are provided at both ends with a termination resistance of 100 Ohm which is activated by a switch on the module.
At a data rate of 78 Kbaud this results in a typical network of 2700m.

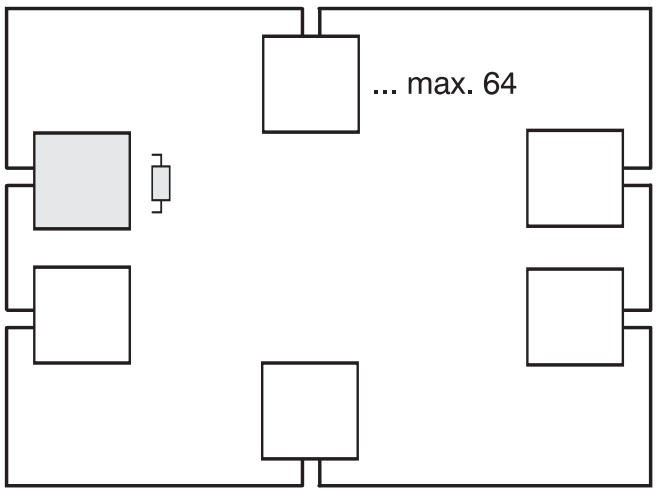
Conductor cross-section	Lead length
1.3 mm^2 (16 AWG)	2700 m
0.34 mm^2 (22 AWG)	1400 m



Ring structure

In this wiring arrangement the network remains functional even when there is a break. The termination resistance of any one module in the ring must be set to 50 Ohm. At a data rate of 78 Kbaud this results in a typical network size of 500 m.

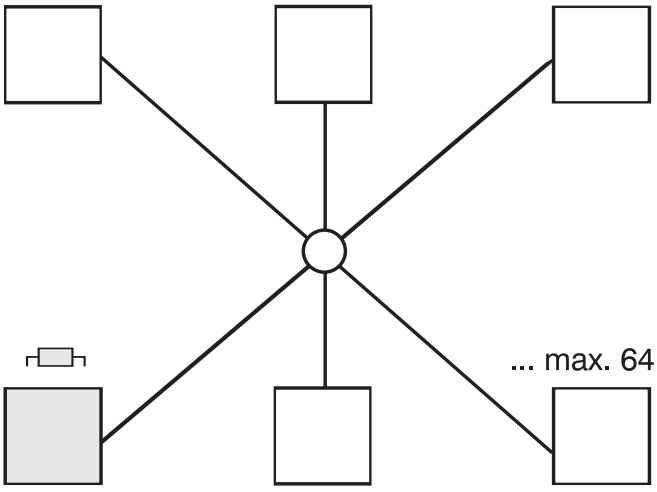
Conductor cross-section	Lead length
1.3 mm^2 (16 AWG)	500 m
0.34 mm^2 (22 AWG)	400 m



Star structure

In this wiring arrangement, too, the termination resistance of any one module must be set to 50 Ohm. At a data rate of 78Kbaud this results in typical network size of 500m.

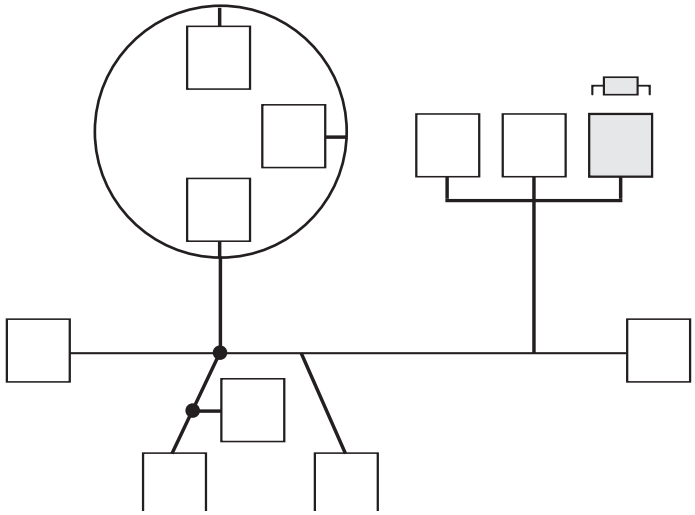
Conductor cross-section	Lead length
1.3 mm^2 (16 AWG)	500 m
0.34 mm^2 (22 AWG)	400 m



Mixed structure (free topology)

In this wiring arrangement, too, the termination resistance of any one module must be set to 50 Ohm. At a data rate of 78Kbaud this results in a typical network size of 500 m.

Conductor cross-section	Lead length
1.3 mm^2 (16 AWG)	500 m
0.34 mm^2 (22 AWG)	400 m



4.3.1 Suitable cables

for all network structures

Screened twisted pair cable: Bekon Co. D-14947 Felgentreu, Germany

Type: Bekonflex - Li2YCY

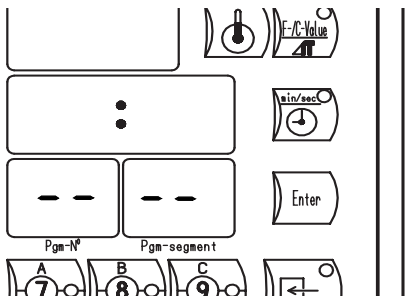
other connections

Only use copper, solid/stranded core
with diameter: 0.2 — 0.25 mm^2 AWG No. 24-12

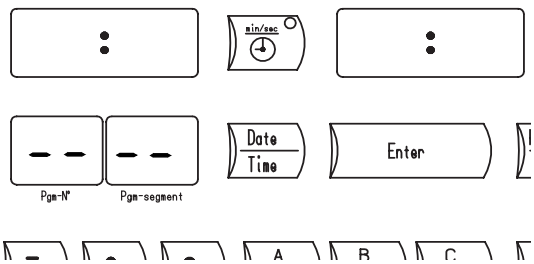
4.3.2 Indication of a faulty network connection

In the displays for profile program number (Pgm-No.) and segment number (Pgm-segment) two horizontal display segments light up when there is a cable break in the network. All other display windows remain dark.

LPF-100

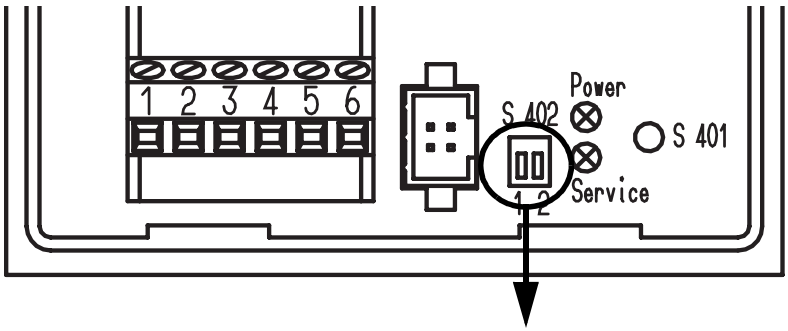


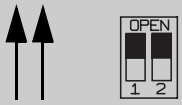
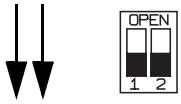
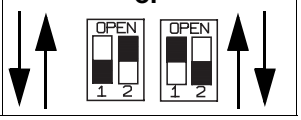
LPF-200



4.3.3 Termination resistance on the operating unit

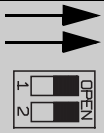
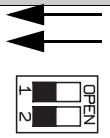
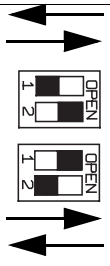
* Using a screwdriver move the switches to the position shown

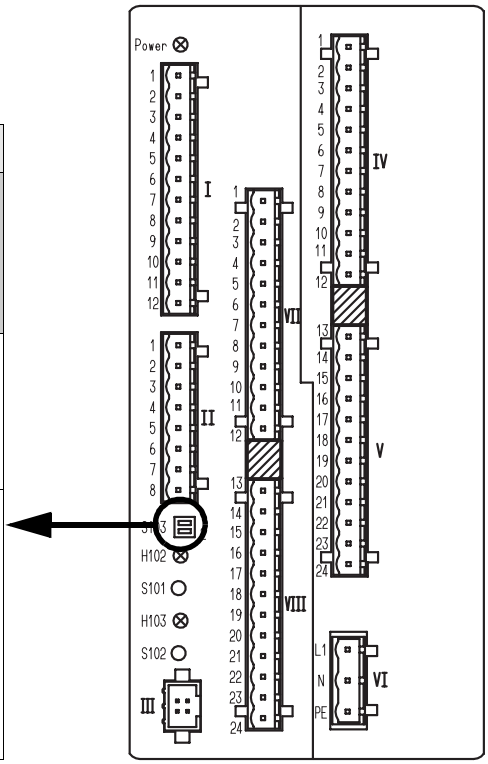


Termination resistance	Setting
open, no bus termination	
50 Ohm	
100 Ohm	or 

4.3.4 Termination resistance on the process unit

* Using a screw driver move the switches to the position shown

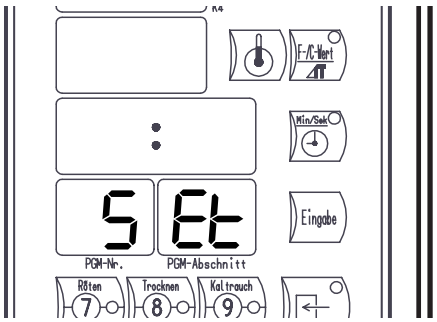
Termination resistance	Setting
open, no bus termination	
50 Ohm	
100 Ohm	



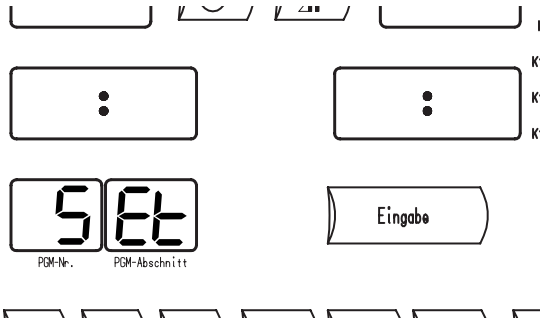
4 Electrical connection

4.3.5 Display with setup-connector plugged in

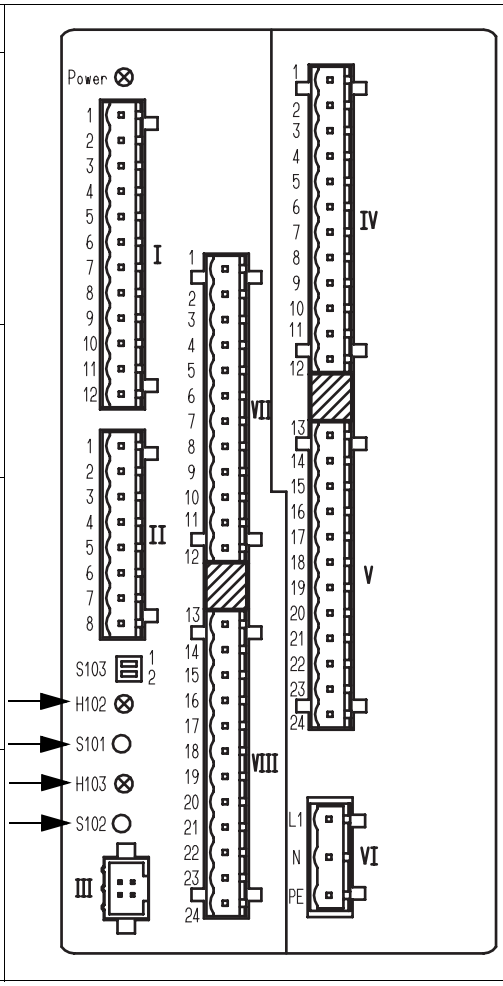
LPF-100



LPF-200



4.3.6 LEDs and keys on the compact unit

Power		- lights up when the supply is OK
LED H102		- is lit when the process module is faulty - flashes when a handshake command has been transmitted from the JUMO mTRON-iTOOL project design software to the process module
Key S101		- transmits a service pin message from the process module (LED H102 is on when the key is pressed)
LED H103		- is lit when the operating module is faulty - flashes when a handshake command has been transmitted from the JUMO mTRON-iTOOL project design software to the operating module
Key S102		- transmits a service pin message from the operating module (LED H103 is on when the key is pressed)

Handshake command

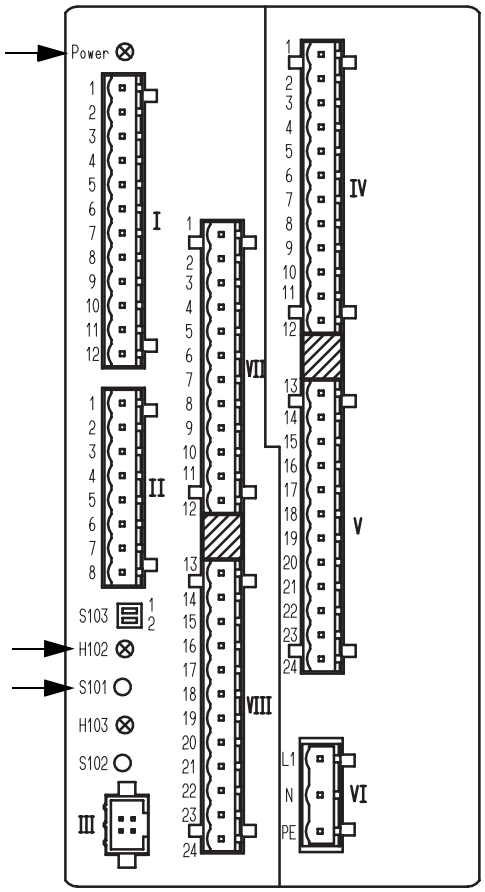
A handshake is a signal transmitted by the JUMO mTRON-iTOOL project design software so that a certain unit in the network is made visible.

Service pin message

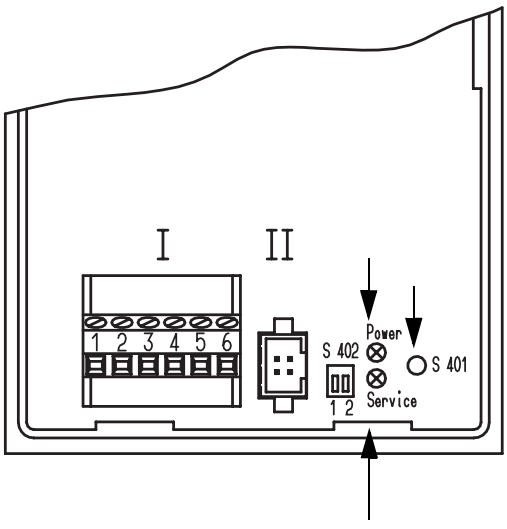
This identification message signals the presence of a unit in the network and in JUMO mTRON-iTOOL. The initially passive unit can now be linked to other modules through network variables (data exchange).

4.3.7 LEDs and keys on the split version

Process unit

Power		- lights up when the supply is OK
LED H102		- is lit when the process unit is faulty - flashes when a handshake command has been transmitted from the JUMO mTRON-iTOOL project design software
Key S101		- transmits a service pin message (LED H102 is on when the key is pressed)
LED H103	no function	
Key S102		

Operating unit

Power		- lights up when the supply is OK
Service		- is lit when the operating unit is faulty - flashes when a handshake command has been transmitted from the JUMO mTRON-iTOOL project design software
Key S401		- transmits a service pin message (LED Service is on when the key is pressed)

5 Features

5.1 Profile programs

Up to 99 profile programs (1—99) with up to 99 segments can be programmed for chamber temperature and humidity, a freely assigned extra temperature and various cooking processes.

5.1.1 Setpoints and segment times

Each segment carries a **process step** (e.g. “B”) with the setpoints for the temperatures, the cooking process and the segment time. In addition it is possible to input operating functions separately for each segment. The limit comparators are active throughout the entire profile program.

5.1.2 Operating functions

Activated operating functions can be used to control fans, flaps and valves. An operating function can have only one status during a segment, and/or one pulsing action if this is configured.

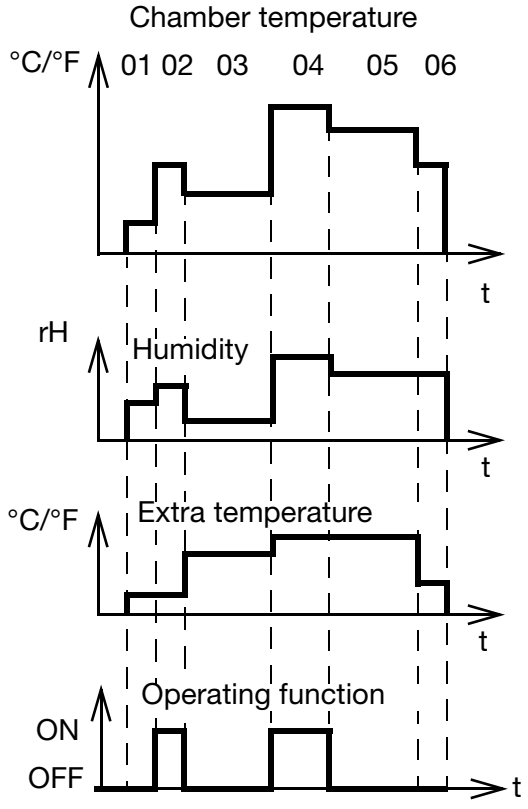
⇨ Section 6.1.3 “Switching action of the operating functions”

The number of operating functions and their assignment depends on the instrument version.

⇨ Section 2.4 “Type designation”

☞ Operating functions may be inhibited!

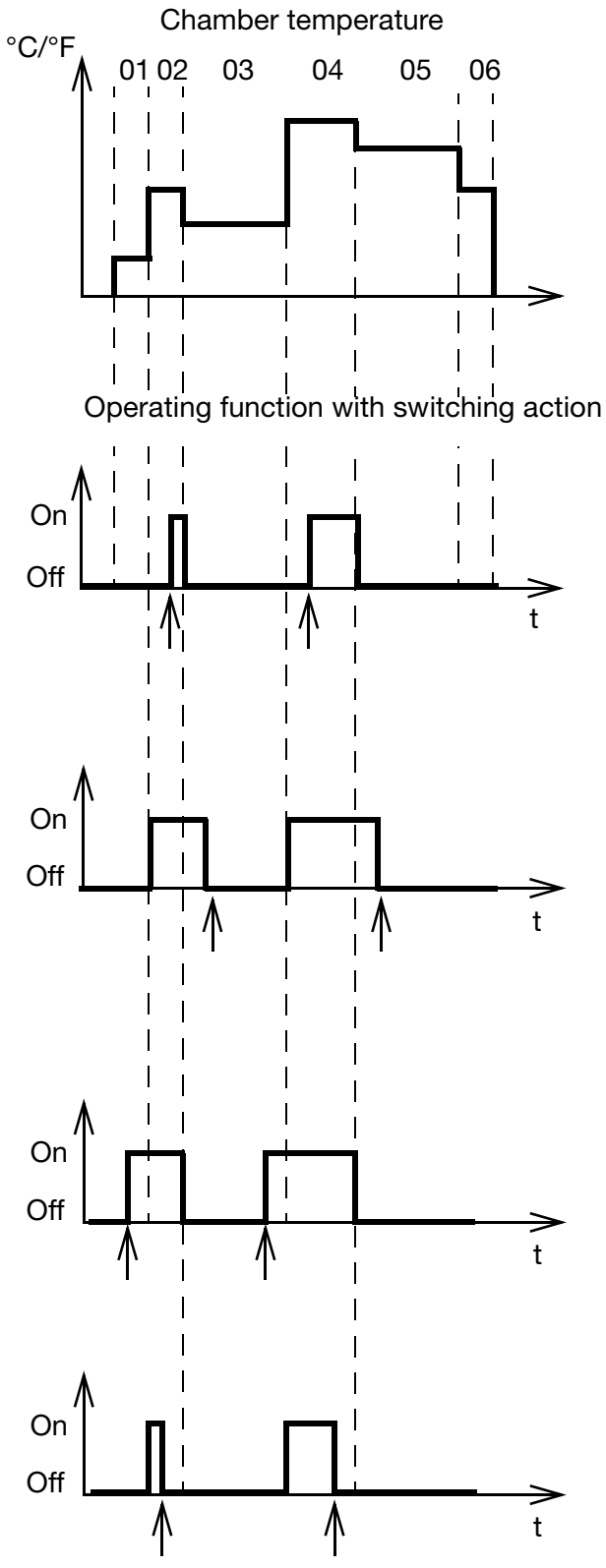
Programming example



Modifying the switching action

The switching action of the operating functions can be modified through coding functions. Each operating function can be switched on and off either in advance or with delay.

⇨ Section 6.1.3 “Switching action of the operating functions”

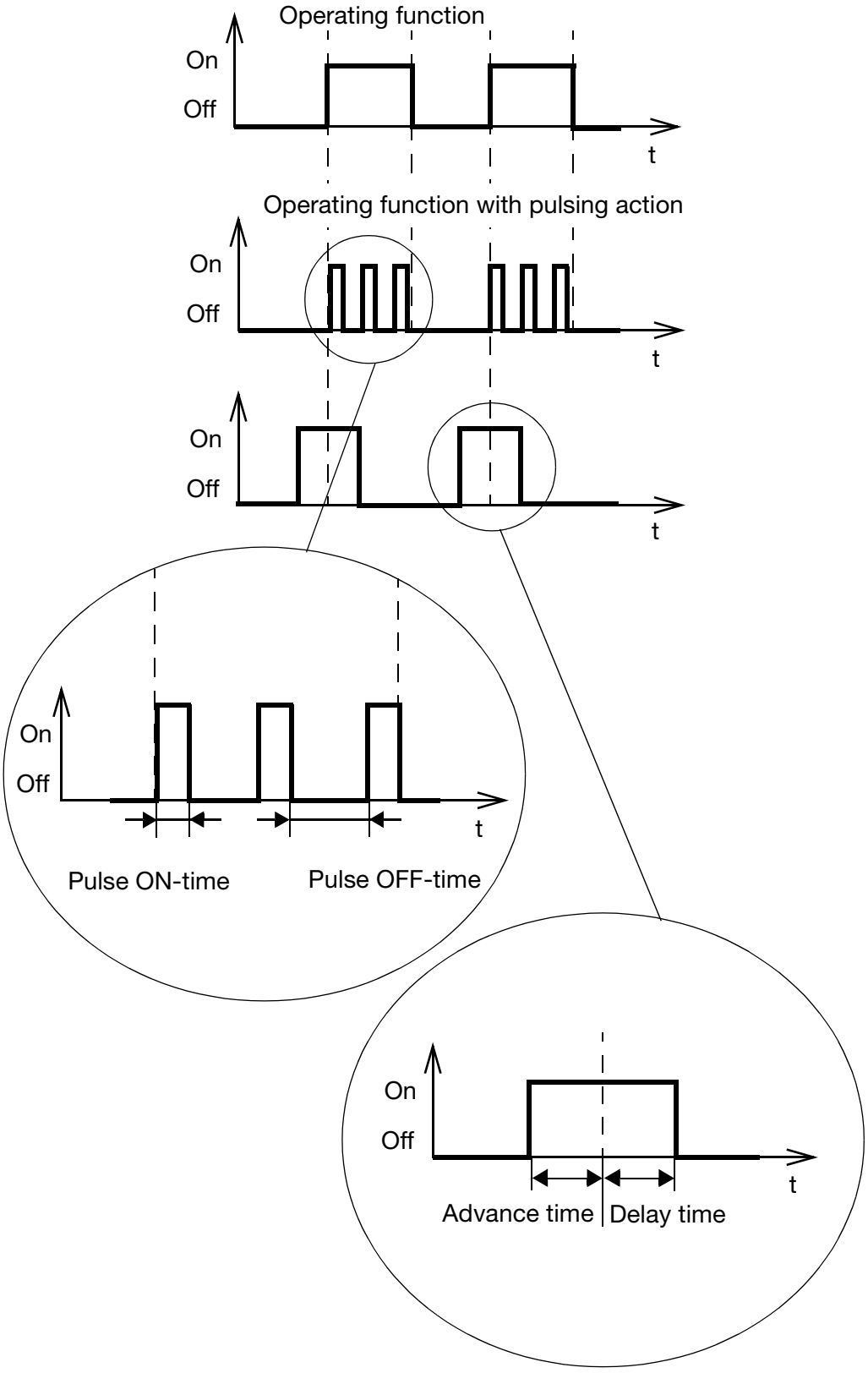


Pulsing action

Pulsing action causes the operating function to be activated for the duration of the set time and is selected with the coding functions (Cd 23, Cd 24).

⇨ Section 6.1.3 “Switching action of the operating functions”

Ignition for smoke generator



5.1.3 Step-on conditions

Stepping on to the next segment during the profile run depends on several conditions which are laid down when the profile program is input. These step-on conditions can be combined with each other. The start of the next segment is initiated by the first step-on condition to fulfill the step-on requirements.

The profile steps on when...

- the set segment time has elapsed;
- the set core temperature has been reached;
- the set F-value or C-value has been reached;
- if F-value or C-value setpoint has been programmed together with the core temperature setpoint, when both setpoints have been reached;
- if an external input has been configured so that it initiates stepping on to the next segment; ⇨ Section 6.1.11 “Logic inputs”
- when the key [⊡] on the operating unit is pressed.

☞ De-activating the step-on conditions:
Input (- - -) for setpoint or core with the [Shift] key,
input (0 0 0) for segment time, F or C .

5.1.4 Process steps

The equipment manufacturer normally pre-defines up to 99 process steps in the profile controller. During input of the profile program, each profile segment must have a process step assigned to it consisting of chamber temperature, humidity, core temperature, delta value, final F-value, final C-value, segment time and operating functions. The more important processes are marked as letters on the number keypad (e.g. “B”). Additional processes up to No. 99 can be input through the number keys.
The process steps contain setpoints and operating functions.
A process step must be selected for each profile segment and also for manual operation.

Input of the process steps:

⇨ Section 6.2 “Input of process steps”

⇨ Section 7.3.3 “Process step”

☞ Operating functions may be inhibited!

5.1.5 Delta cooking

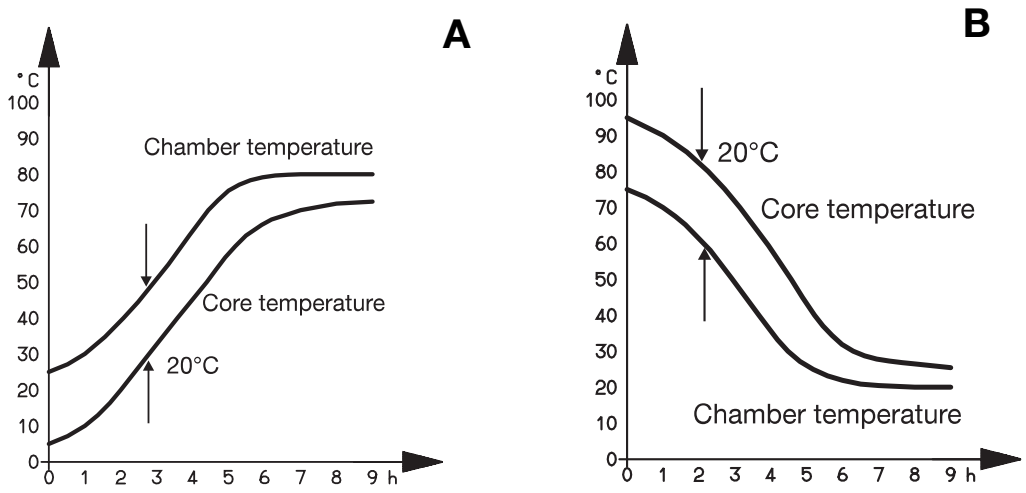
Delta cooking is possible both during heating and during cooling. The temperature difference (delta value) can be selected.

Heating

Fig. A:
Here the chamber temperature setpoint is raised by 20 °C parallel to the actual core temperature until the desired chamber temperature is reached. The core temperature then rises up to the set core temperature setpoint and the controller then switches to the next profile segment.

Cooling

Fig. B:
If the chamber temperature setpoint is below the core temperature setpoint, cooling takes place in a similar manner.



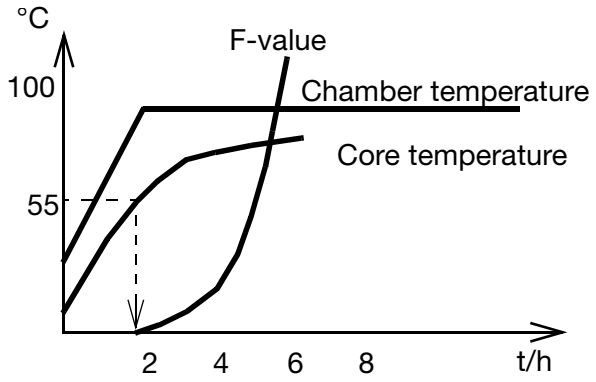
5.1.6 F-value cooking

The calculation of the F-value (bactericidal factor) is based on the time during which a temperature acts on the product and is derived from a table for

$F^{10°C}_{70°C}$ cooking.

The subscript value 70°C is the reference temperature. At a core temperature of 70°C and an action time of 1 min the product reaches an F-value of 1.
The superscript value 10°C (= time-temperature relationship of bactericidal action) means that every temperature increase by 10°C increases the F-value 10fold.

The F-value is calculated at a core temperature between 55°C and 95°C. During input of the profile program, final F-values of 0—9999 can be input as setpoint. The display must first be switched over to “F”.



☞ The F-value is also calculated in the background during standard cooking.
In automatic operation the current F-value can be called up by pressing the F-Value key.

After the end of the profile the final F-value reached can be called up by pressing the F-Value key.

Calculation of the F-value starts as soon as the core temperature has exceeded 55°C.

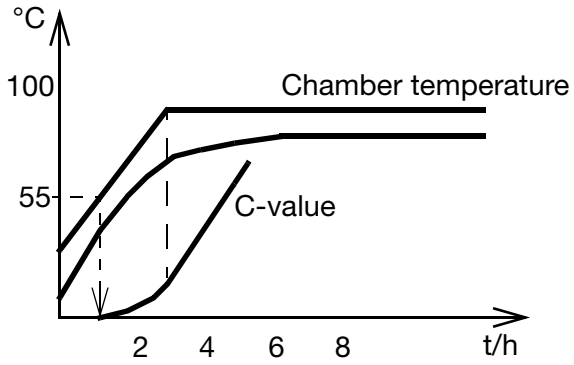
5.1.7 C-value cooking

The calculation of the C-value (reduction in cooking damage) is based on the time during which a temperature acts on the product and is derived from a

table for C $^{38°C}_{100°C}$ cooking.

The subscript value 100°C is the reference temperature. At a chamber temperature of 100°C and an action time of 1 min a C-value of 1 is reached.
The superscript value 38°C is the z-value (= time-temperature relationship of the bactericidal factor) and means that every temperature increase of 38°C increases the C-value 10fold.

The C-value is calculated for a product ambient temperature (= chamber temperature) between 55°C and 100°C. During input of the profile program, final C-values of 0—9999 can be input as setpoint. The display must first be switched over to “C”.



☞ The C-value is also calculated in the background during standard cooking.
In automatic operation the current C-value can be called up by pressing the C-Value key.

After the end of the profile the final C-value reached can be called up by pressing the C-Value key.

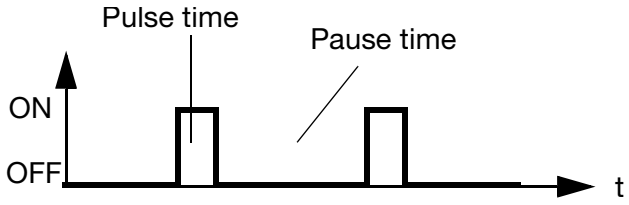
Calculation of the C-value starts as soon as the chamber temperature has exceeded 55°C.

5.1.8 Humidifying by pulse-pause control

The relative humidity in the chamber can be controlled automatically, or alternatively can be set through an adjustable pulse-pause ratio.

The selection is made by switching over with the key [%] or [P] when the profile program is being input. Switch-over is also possible while the process is running. The pause time in seconds is input directly on switching over, separately for each segment. The pulse time is input as a fixed value through the coding function (Cd 03).

⇨ Section 6.1.1. “General instrument data”



5.1.9 Extra temperature

The transducer for additional tasks, such as monitoring or controlling a smoke generator or for controlling an afterburner, can be connected to input 4.

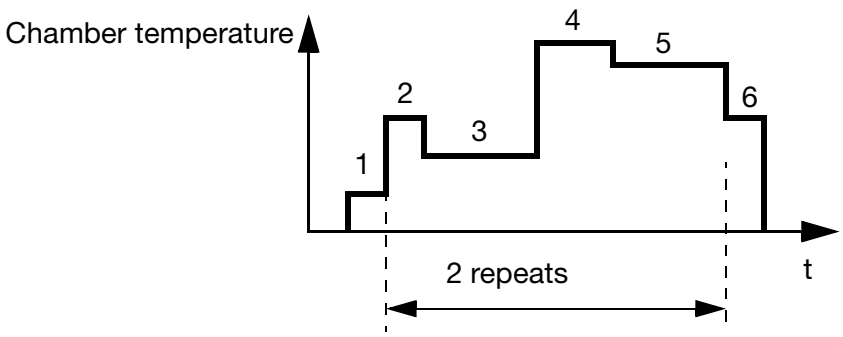
Pressing the key [🌡] switches the display of actual values and setpoints from chamber temperature to the extra temperature.

Configuration and programming are the same as for the chamber temperature; alternatively a fixed value can be set through the coding function (Cd 45 and Cd 46).

⇨ Section 6.1.6. “Controller configuration”

5.1.10 Repeat cycles

Repeat cycles for certain segments can be input during the input of the profile program. If the segments 2 to 5 have to be repeated twice in the profile, the start segment for the repeat (segment 2) is input under segment 5, together with the number of repeats (2x).
As a result the profile runs a total of 3 times through segments 2 to 5.



☞ Repeat cycles are activated ex-factory. They can, however, be inactivated through the coding function Cd 28.

⇨ Section 6.1.3 “Switching action of the operating functions”

5.2 Action on supply interruption

There are several possibilities for the action after interruption of the supply during automatic operation; they can be set at the configuration level.

⇨ Section 6.1.1. “General instrument data”

Continue The instrument automatically continues the profile program at the point where it was interrupted.

Profile abort The instrument aborts automatic operation and returns to the basic status.

Stop After the supply has been restored the profile program stops at the point where it was interrupted. The LED in key ⟲ is flashing.

* Abort automatic operation with ⟲, or
* continue automatic operation with Enter

Continue at xx% The value of the difference xx can be adjusted at the configuration level.
If, following a supply failure, the difference of the chamber temperature before and after the supply failure is less than or equal to the value xx%, the profile program continues automatically.

If the difference is larger, the instrument acts for “stop”, i.e. there is a manual decision on profile program abort or continuation.

* Abort automatic operation with ⟲, or
* continue automatic operation with Enter

5.3 Real-time clock (LPF-200)

The profile controller LPF-200 incorporates a real-time clock. In the basic status it indicates the clock time (hours:minutes). It can be used to start the profile program at a certain point of time (day, moth, year, clock time). If the controller is disconnected from the supply, the clock continues to operate, typically for 8 days.

6.1 Coding functions

The coding functions are used to adapt the controller to the particular application. They cover controller-specific actions and parameter settings.
Related functions are grouped together.
On the selected functions all settings have to be entered with Enter .
The next function is reached with Shift + Enter .

To reach the function level

* Press key Shift + Min/Sec (time display is flashing; “Func”is displayed)
* Input password “9510” on number keys
* Enter with Enter

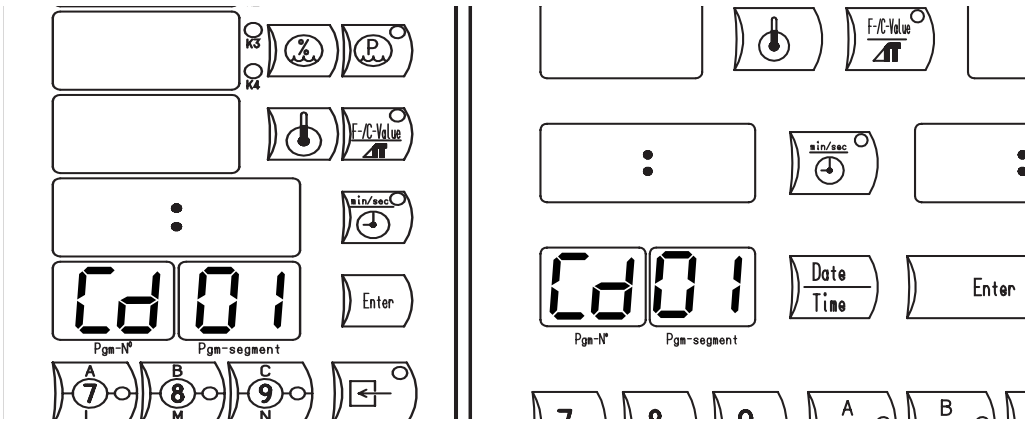
To leave the function level press the keys Shift + Min/Sec at any time. All changes entered with Enter are stored automatically.

This level can be inhibited through the coding function (Cd 97).

“01” is flashing on the display and requests input of a code number.

* Input the Cd number through the number keys
  (for explanation see the next pages)
* Enter with Enter

LPF-100 **LPF-200**



6 Configuration

6.1.1 General instrument data

Code	Setting	Explanation	factory-set
Cd 01		**Re-start action**	
	0	continue	
	2	profile abort	
	3	stop	
	4	continue at xx% The value for xx can be adjusted with Cd 02.	X
Cd 02		**Difference for re-start at xx%** Value range: 0 — 100 %	10 %
Cd 03		**Pulse time for humidity control** Value range: 0 — 255 sec	5 sec
Cd 04		**Time for signal at profile end** Value range: 0 — 255 sec	90 sec
Cd 05		**Deleting all profiles** * Input 001 and enter with Enter	
Cd 06		**Deleting one profile** * Input profile program number 1—99 and enter with Enter **Deleting all process steps** * Input 100 and enter with Enter	
Cd 07		**Testing display and keys** All segments are tested * Input 001 * Enter with Enter * Abort with Shift + Enter	

Code	Setting	Explanation
Cd 08		**Starting self-optimisation**  The controller must be in manual operation with setpoints appropriate to practical conditions. For each controller the display shows 0 0 0 (top display is flashing). One of the controllers has to be selected for self-optimisation. ✱ Select controller ✱ Input 001 for the required controller ✱ Enter with Enter Self-optimisation starts immediately after entering. If a controller is configured with a special function, such as psychrometric humidity, ratio or difference, self-optimisation of this controller must not run at the same time as that of other controllers. Recommendation: optimise first the chamber temperature, let it stabilise at a reasonable value, and then optimise the humidity controller. The profile program number display shows “t”. **Aborting self-optimisation** ✱ Press
Cd 09		**Resetting to the factory setting** ✱ Input 015 and enter with Enter  The configuration data are reset to the factory setting!

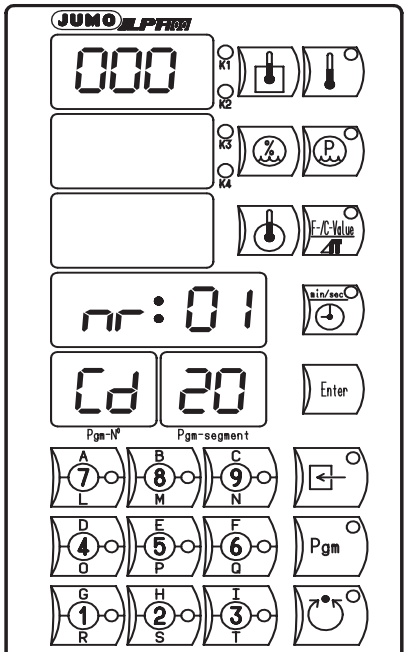
6.1.2 Measurement inputs

Code	Setting	Explanation	factory-set
Cd 10	Sensor type		
	00	no sensor	X (input 4)
	01	thermocouple (please note type designation)	
	05	Pt100, 3-wire circuit	X (inputs 1—3)
	17	standard signal 0—10 V (please note type designation)	
	19	standard signal 0—20 mA (please note type designation)	
	20	standard signal 4—20 mA (please note type designation)	
	21	standard signal 0—1 V (please note type designation) ⇨ Section 2.4 “Type designation”	
Cd 11	**Linearisation**		
	0	linear (–99 +999)	X (input 4)
	1	Pt100 (–99 +850°C)	X (inputs 1—3)
	2	Fe-Con L (–99 +900°C)	
	3	NiCr-Ni K (–99 +999°C)	
	8	Cu-Con T (–99 +400°C)	
	9	Fe-Con J (–99 +999°C)	
Cd 12	**Start of range**		
		✱ input chamber temperature	0
		✱ input humidity	0
		✱ input core temperature	0
		✱ input extra temperature	0
		☞ The decimal places are taken from the setpoint ranges (Cd 32).	
Cd 13	**End of range**		
		✱ input chamber temperature	200
		✱ input humidity	100
		✱ input core temperature	200
		✱ input extra temperature	850
		☞ The decimal places are taken from the setpoint ranges (Cd 32).	

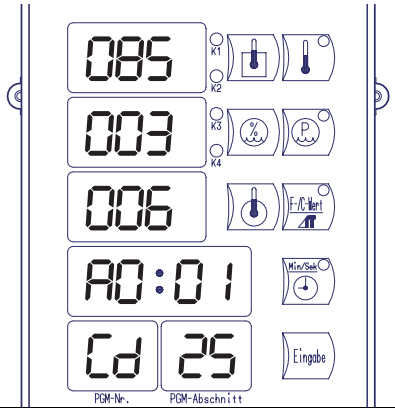
Code	Setting	Explanation	factory-set
Cd 14	**Unit**		
	00	none	
	01	°C	X
	02	°F	
Cd 15	**Offset**		
		Input of an offset adjusts the measurements upwards or downwards by the value entered. Value range: –199 to +999 (1 ≡ 0.1 °C)	
Cd 16	**Filter time constant**		3sec
	01	display chamber temperature	3sec
	02	display humidity	3sec
	03	display core temperature	3sec
	04	display extra temperature	3sec
	05	controller chamber temperature	3sec
	06	controller humidity	3sec
	07	controller extra temperature	3sec
		Value range: 0—40sec	
Cd 17	**Indication of terminal temperature**		
		The terminal temperature is indicated if a thermocouple is configured at an input. ✱ with Enter on to Cd 20 or abort with Shift + Min/Sec .	

6 Configuration

6.1.3 Switching action of the operating functions

Code	Operating function No.	Setting	Explanation	factory-set
Cd 20		**Switching action**		
	01— 24		The assignment of the relays depends on the configuration. 	
		000	no function	X
		001	delayed switch-on	
		002	delayed switch-off	
		003	advanced switch-on	
		004	advanced switch-off	
		006	Ignition for smoke generator ☞ Function is only possible if stepping is switched exclusively via segment start time	
Cd 21		**Times for switch-on delay or advance**		000 sec
	01— 24	Value range: 0—999 sec	The assignment of the relays depends on the configuration.	
Cd 22		**Times for switch-off delay or advance**		000 sec
	01— 24	Value range 0—999 sec	The assignment of the relays depends on the configuration	

6.1.4 Pulse times

Code	Operating function No.	Setting	Explanation	factory-set
Cd 23		**Pulse time ON**		000 sec
	01 — 24	Value range: 0 — 999 sec	The assignment of the relays depends on the configuration	
Cd 24		**Pulse time OFF**		000 sec
	01 — 24	Value range: 0 — 999 sec	The assignment of the relays depends on the configuration.	
Cd 25		**Display software version: operating unit**		
		Software version Node address		
Cd 26		**Display software version: process unit**		
Cd 27		**Activate batch no. or user no. (8 positions)**		0
		0	no entry possible	
		1	Enter batch no.	
		2	Enter user no.	
		3	enter batch no. and user no.	
Cd 28		**De-activate repeat cycles**		0
		0	Repeat cycles active	
		1	Repeat cycles inactive	
Cd 29		**Display of process steps/relay state (LPF 100)**		0
		0	Process steps ⇨ Section 7.3.3 “Process step”	
		1	Relay state ⇨ Section 7.1 “Displays and controls of the LPF-100” and Section 7.2 “Displays and controls of the LPF-200”	

6.1.5 Control ranges (setpoint and process value limits)

Code	Number	Setting	Explanation	factory-set
Cd 30		**Setpoint range start**[1]		
	01	–199 to +999	chamber	000
	02	0—999	humidity (⇨ Section 6.1.10)	000
	03	–199 to +999	core	000
	04	–199 to +999	extra temperature	000
	05	1—99	delta cooking	001
	06	0—9999	F- value or C-value	000
Cd 31		**Setpoint range end**[1]		
	01	–199 to +999	chamber	200
	02	0—999	humidity (Section 6.1.10)	100
	03	–199 to +999	core	200
	04	–199 to +999	extra temperature	850
	05	1—99	delta cooking	99
	06	0—9999	F- value or C-value	9.999
Cd 32		**Decimal places for setpoints and process values**		
	01	0—2	chamber	0
	02	0—2	humidity	0
	03	0—2	core	0
	04	0—2	extra temperature	0
	05	0—2	delta cooking	0
	06	0—2	F- value or C-value	0
Cd 33		**Setpoint not programmed**		
		0	display “---”	X
		1	display “0”	
Cd 34		**Timebase program**		
		1	hh : min (fixed)	
		4	hh: min or min : sec (variable timebase)	X

1. If the setpoint ranges are changed, new conditions apply for the setpoints, process steps and profiles which were entered and which could result in overrange or underrange.

6.1.6 Controller configuration

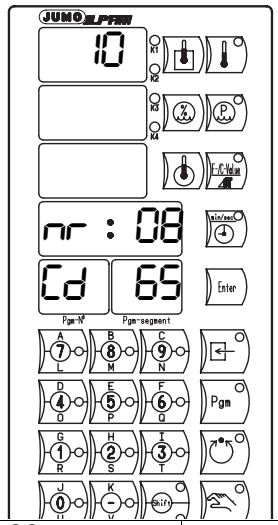
Code	Setting	Explanation	factory-set
Cd 40	**Controller type**		
	2	single-setpoint controller (Cd 55 must be 0)	X
	3	double-setpoint controller (Cd 55 must be set to –100)	
	4	modulating controller (Cd 55 must be set to –100)	
Cd 41	**Controller structure**		
	0	none	
	1	P	
	2	I	
	3	PD	
	4	PI	
	5	PID	X
Cd 42	**Characteristic**		
	0	rising characteristic (process value above setpoint)	
	1	falling characteristic (process value below setpoint)	X
Cd 43	**Controller output on overrange/underrange**		
	0	output 0%	X
	1	output 100%	
	2	last valid output	
	3	output (defined value; Cd 44)	
Cd 44	**Controller output (defined value)**		
	Value range: –100 to +100%		0%
Cd 45	**Setpoint for temperature controller**		
	0	no function (temperature controller inactive)	X
	1	chamber setpoint	
	2	humidity setpoint	
	3	core setpoint	
	4	setpoint extra temperature	
	5	fixed setpoint (Cd 46)	
Cd 46	**Fixed setpoint**		
	Value range: –199 to +999		0
Cd 47	**Heater current monitoring**		
	000	no	X
	001	yes ⇨ Section 6.1.9 “Limit comparators”	

6 Configuration

6.1.7 Controller parameters

Code	Setting	Explanation	Value range	factory-set
Cd 50	Xp 1	proportional band	0—999	4
Cd 51	Xp 2	proportional band	0—999	4
Cd 52	Tn	reset time	0—999sec	350
Cd 53	Tv	derivative time	0—999sec	80
Cd 54	Y0	working point	–100 to +100%	0
Cd 55	Ymin	output Y2	–100 to +100%	–100
Cd 56	Ymax	output Y1	0—100%	100
Cd 57	Xd 1	switching differential	0—999	1
Cd 58	Xd 2	switching differential	0—999	1
Cd 59	XSh	deadband	0—999	0
Cd 60	TT	stroke time	15—999sec	60
Cd 61	Cy 1	cycle time 1	1—999sec	20
Cd 62	Cy 2	cycle time 2	1—999sec	20

6.1.8 Combination alarm

Code		Setting	Explanation	factory- set
Cd 65	**Number**			
	1			1
	2			2
	3			3
	4			4
	5			5
	6			6
	7			0
	8			0
		00	no input value	
		01	overrange/underrange of process value chamber temperature	
		02	overrange/underrange of process value wet bulb temperature	
		03	overrange/underrange of process value core temperature	
		04	overrange/underrange of process value extra temperature	
		05	stop after supply failure	
		06	profile end signal (time Cd 04)	
		07	logic input 1	
		08	logic input 2	
		09	logic input 3	
		10	logic input 4	
Cd 66		**Extension of combination alarm signal**		
			Value range: 0—255sec Although there is no longer any combination alarm situation the relay remains activated for the set time.	90sec

Code		Setting	Explanation	factory- set
Cd 67		**Error display for logic inputs**		
Logic input 1	0	inactive		X
	1	Err 1		
Logic input 2	0	inactive		X
	1	Err2		
Logic input 3	0	inactive		X
	1	Err3		
Logic input 4	0	inactive		X
	1	Err4		
Logic input 5	0	inactive		X
	1	Err5		
Logic input 6	0	inactive		X
	1	Err6		
Logic input 7	0	inactive		X
	1	Err7		
Logic input 8	0	inactive		X
	1	Err8		

☞ A program that is running will be stopped every time the error display is activated. Please check whether other functions are to be initiated at the same time!

⇨ Section 6.1.11 “Logic inputs”

6.1.9 Limit comparators

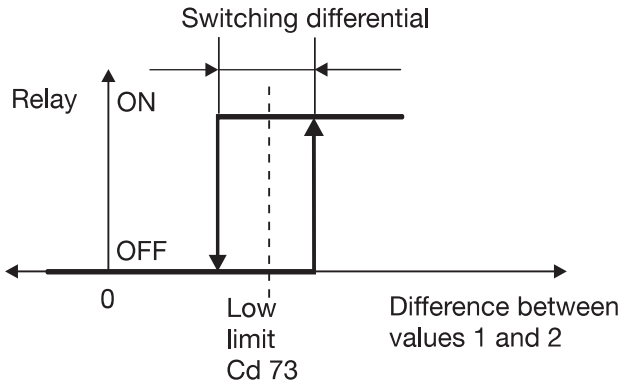
6 limit comparators can be used for comparison between all analogue process parameters inside the controller, and for monitoring against a set limit. Either a process value or a setpoint can be selected for the first value in the comparison; only a setpoint can be selected for the second value (Cd 70, 71). The particular function is selected only with Cd 72. Relays are automatically assigned as outputs to the selected limit comparators.

⇨ Section 4.2 “Arrangement of the relay outputs”

☞ The limit comparator is switched off if 000 is input for the first value in the comparison (Cd 70).

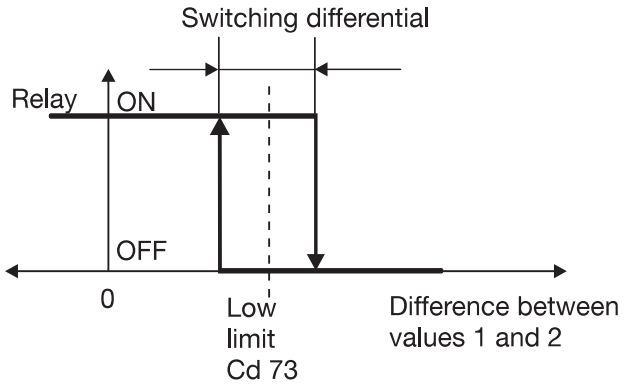
Comparator (2 analogue values)

The difference between 2 analogue values can be used e.g. to realise an advance or follow-on contact. The relay pulls in when the difference between the first and second value in the comparison exceeds the lower limit (Cd 73). Settings of the upper limit are not permitted at this function.



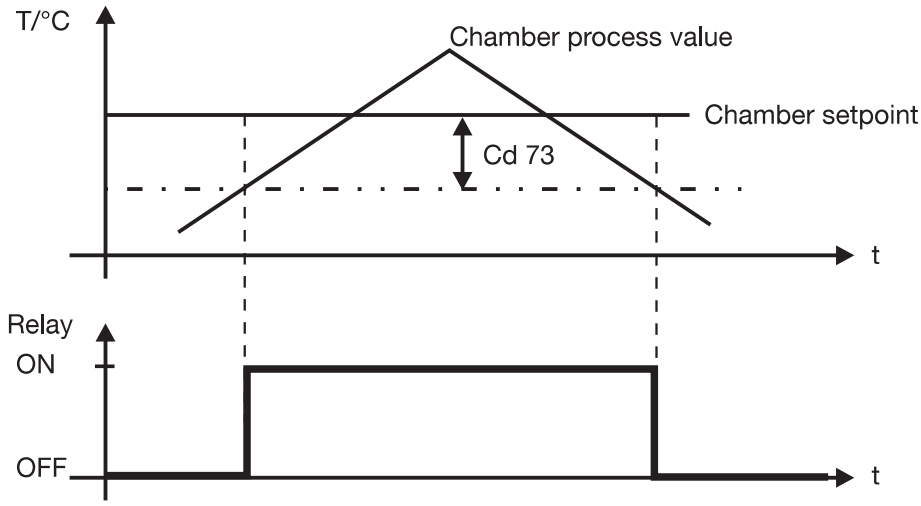
Reversed comparator

The switching action of the relay is reversed.



Advance contact

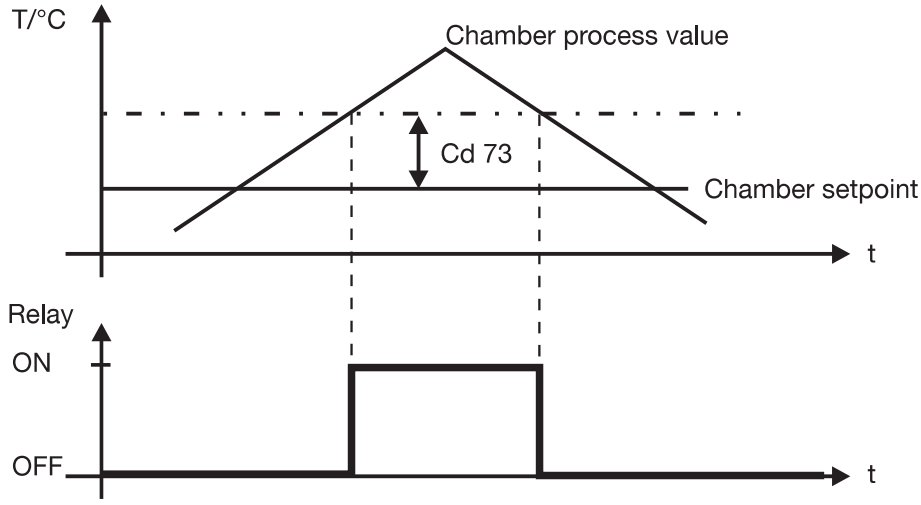
Example:
An **advance contact** should signal a process value 5 °C before the setpoint.



Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	001	chamber process value
Cd 71	value 2 in comparison	001	chamber setpoint
Cd 72	function	000	comparator
Cd 73	low limit	-05	(value input is negative)
Cd 75	switching differential	001	

Follow-on contact

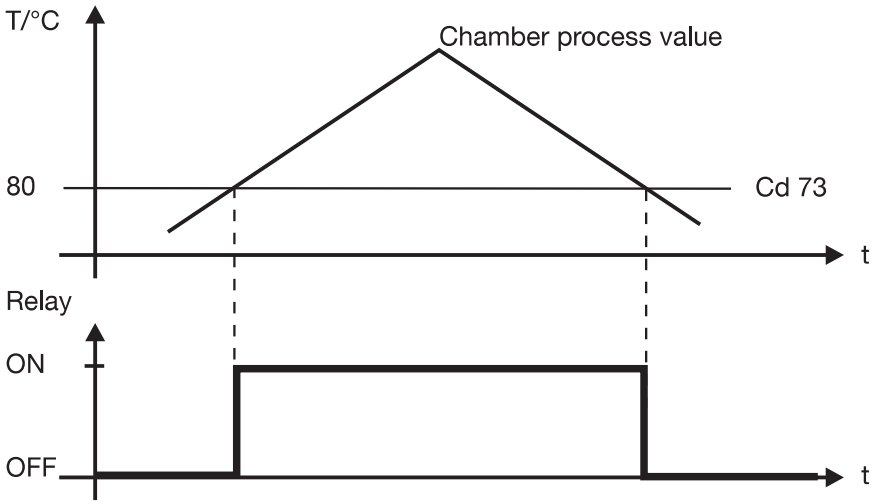
Example:
A **follow-on contact** should signal a process value 5 °C above the setpoint.



Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	001	chamber process value
Cd 71	value 2 in comparison	001	chamber setpoint
Cd 72	function	000	comparator
Cd 73	low limit	005	
Cd 75	switching differential	001	

Comparator (1 analogue value)

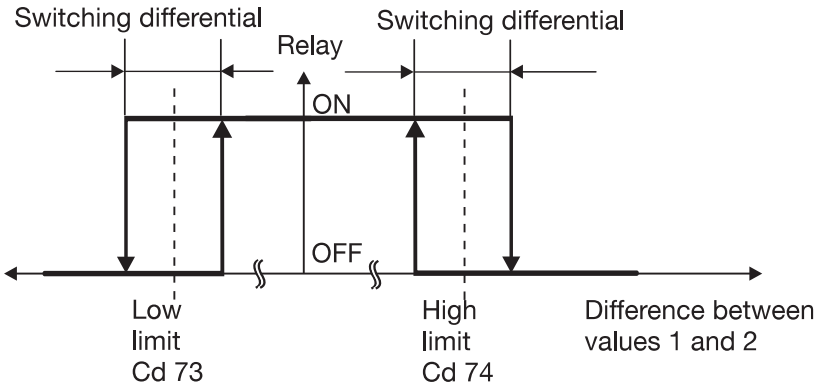
If in the example only the first value in the comparison is used, the switching level of the limit comparator is not relative to the setpoint as advance or follow-on contact; instead it is fixed and independent of the setpoint.
The limit comparator becomes active if the set limit of 80°C (Cd73) is exceeded.



Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	001	chamber process value
Cd 71	value 2 in comparison	000	no function
Cd 72	function	000	comparator
Cd 73	low limit	080	low limit
Cd 75	switching differential	001	switching differential

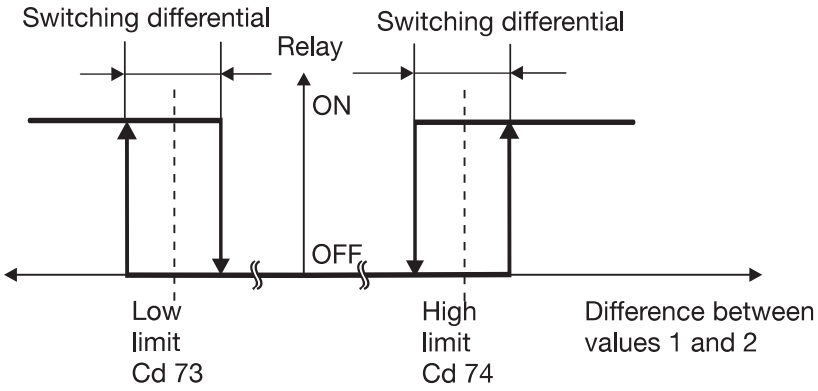
Window (2 analogue values)

With the difference between the compared values 1 and 2 it is possible to set a window to signal going above the high limit (Cd 74) and going below the low limit (Cd 73).

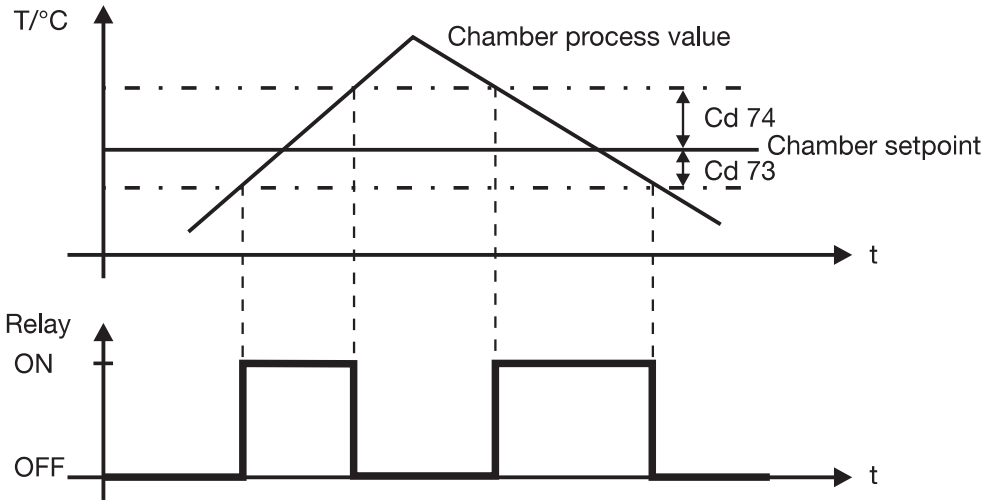


Reversed window

The switching action of the relay is reversed.



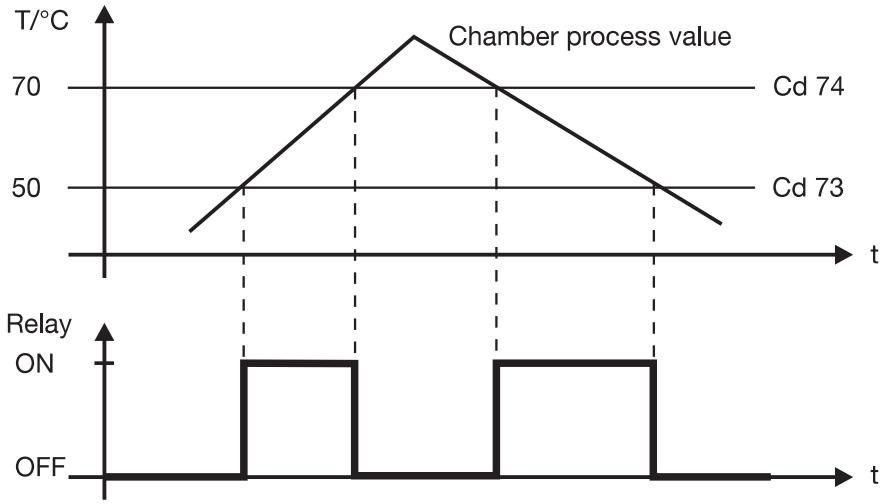
Example:
A limit comparator has to monitor the process value to be in a **window** from 5°C below to 10°C above the setpoint.
The relay has to switch on as soon as the process value is within the window.



Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	001	chamber process value
Cd 71	value 2 in comparison	001	chamber setpoint
Cd 72	function	001	window
Cd 73	low limit	005	
Cd 74	high limit	010	
Cd 75	switching differential	001	

Window (1 analogue value)

Example:
A fixed **window** is used to monitor the process value between 50°C and 70°C. The relay has to pull in when the process value is within the window, irrespective of the setpoint.



Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	001	chamber process value
Cd 71	value 2 in comparison	000	no function
Cd 72	function	001	window
Cd 73	low limit	050	
Cd 74	high limit	070	
Cd 75	switching differential	001	

Replacement value

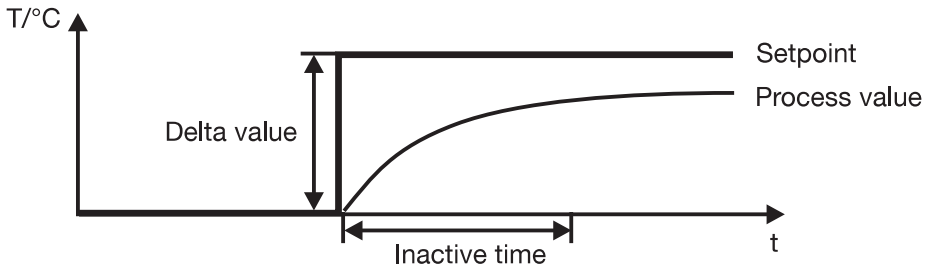
In case of overrange or underrange through a pobe break the limit comparator can no longer operate correctly.
The controller then uses a so-called replacement value (Cd 76) which defines the switching action of the limit comparator to ON or OFF.

Limit comparator inactive time

The inactive time (Cd 77) is a time interval during which the old status of a limit comparator is retained unchanged.
In case of a sudden change in setpoint the difference between setpoint and process value is very large initially so that a limit comparator would immediately respond. If this is undesirable, the limit comparator can be set inactive for a period of time until the process value approaches the setpoint (Cd 78).

Delta value for inactive time

This value sets the amount of the difference above which a setpoint step makes the limit comparator inactive.

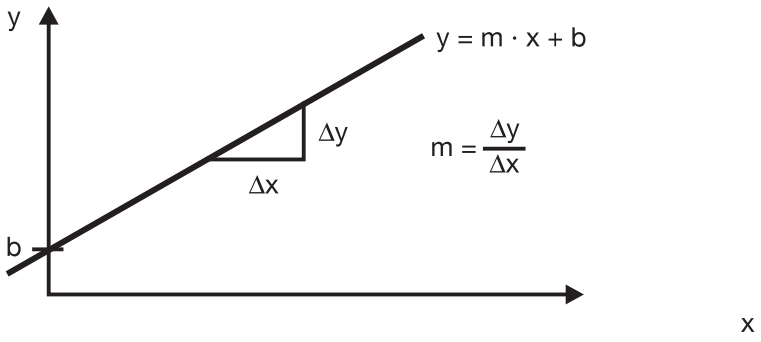


Modification parameters m and b for value 2 in the comparison

Before the second value becomes effective on the limit comparator it can be modified by the parameters m and b following the straight line equation below:
y= m • x + b

where:

y: new second value in comparison
m: slope (factory-set to 1)
x: old second value
b: a constant (factory-set to 0)



Activating the heater current monitoring

The heater current monitoring acts on the first limit comparator.

⇨ Section 4.2 “Arrangement of the relay outputs”

It is only active if the relay of the controller for the chamber temperature is activated.

* Check if the controller has been supplied with the “heater current monitoring” option
* Configure the measurement input 4 to 0 — 20 mA
* Using Cd 47 set “Yes”

Code	Designation	Setting	Explanation
Cd 70	value 1 in comparison	4	temperature process value
Cd 71	value 2 in comparison	0	—
Cd 72	function	2	reversed comparator
Cd 73	low limit		

Code	Number	Setting	Explanation	factory-set
Cd 70	1 — 6	**Value 1 in comparison**		
		000	no function (limit comparator inactive)	X
		001	chamber process value	
		002	relative humidity process value	
		003	core temperature process value	
		004	temperature process value	
		005	chamber setpoint	
		006	relative humidity setpoint	
		007	core temperature setpoint	
		008	temperature setpoint	
Cd 71	1 — 6	**Value 2 in comparison**		
		000	no function	X
		001	chamber setpoint	
		002	relative humidity setpoint	
		003	core temperature setpoint	
		004	temperature setpoint	
Cd 72	1 — 6	**Function**		
		000	comparator	X
		001	window	
		002	reversed comparator	
		003	reversed window	
Cd 73	1 — 6	**Low limit**		
			Value range: –199 to +999	0
Cd 74	1 — 6	**High limit**		
			Value range: –199 to +999	0
Cd 75	1 — 6	**Switching differential (in 0.1 °C steps)**		
			Value range: 0—999 (1 ≙ 0.1 °C)	0
Cd 76	1 — 6	**Replacement value (action on out-of-range)**		
		0	OFF on overrange and underrange	0
		1	ON on overrange and underrange	
Cd 77	1 — 6	**Limit comparator inactive time**		
			Limit comparator out of action Value range: 0—999 sec	0 sec
Cd 78	1 — 6	**Delta value for inactive time**		
			Time of setpoint deviation after which Cd 77 becomes effective Value range: 0—999 sec	0 sec
Cd 79	1 — 6	**Modification parameter m for value 2 in comparison**		
			Value range: –199 to +999	1
Cd 80	1 — 6	**Modification parameter b for value 2 in comparison**		
			Value range: –199 to +999	0

6.1.10 Calculation algorithm for humidity input

Code	Setting	Explanation	factory-set
Cd 85	**Algorithm**		
	0	difference	
	1	humidity (psychrometric) The factory setting links the two measurement inputs 1 and 2 mathematically and uses it to calculate the relative humidity according to the psychrometric procedure. The second display then shows the relative humidity from 0 —100 %. If the relative humidity is outside these limits, no combination alarm is produced, and no time base is stopped. ⇨ Chapter 9 “What to do if.....”	X
	2	ratio	
	4	differentiation	

Code	Number	Setting	Explanation	factory-set
Cd 86		**Input values 1 and 2**		
	Input value 1			
		0	function inactive	
		1	chamber process value (dry bulb temperature)	X
		2	relative humidity PV (wet bulb temperature)	
		3	core temperature process value	
		4	temperature process value	
		5	chamber setpoint	
		6	relative humidity setpoint	
		7	core temperature setpoint	
		8	extra temperature setpoint	
	Input value 2			
		0	function inactive	
		1	chamber process value (dry bulb temperature)	
		2	relative humidity PV (wet bulb temperature)	X
		3	core temperature process value	
		4	temperature process value	
		5	chamber setpoint	
		6	relative humidity setpoint	
		7	core temperature setpoint	
		8	extra temperature setpoint	
Cd 87		**Low limit**		–10
			Value range: –199 to +999	
Cd 88		**High limit**		110
			Value range: –199 to +999	

6.1.11 Logic inputs

Code	Setting	Explanation	factory-set
Cd 90	**External profile start**		
	0	no function	
	1	logic input 1	X
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	
Cd 91	**External profile stop**		
	0	no function	
	1	logic input 1	
	2	logic input 2	X
	3	logic input 3	
	4	logic input 4	
Cd 92	**External manual (time base held during auto operation)**		
	0	no function	
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	X
	4	logic input 4	
Cd 93	**External next segment**		
	0	no function	
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	X
Cd 94	**All logic outputs off**		
	0	no function	X
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	
Cd 95	**Keys inhibit**		
	0	no inhibit	X
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	

Code	Setting	Explanation	factory-set
	4	logic input 4	
	5	 This function is active after entering with Enter and can not be cancelled from the keys.	
Cd 96	**Profile program inhibit**		
	0	no inhibit	X
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	
	5	✱ Enter with Enter , the function is then active	
Cd 97	**Coding function inhibit**		
	0	no inhibit	X
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	
	5	 This function is active after entering with Enter and can not be cancelled from the keys.	
Cd 98	**Programming inhibit of the operating functions**		
	0	no inhibit	X
	1	logic input 1	
	2	logic input 2	
	3	logic input 3	
	4	logic input 4	
	5	✱ Enter with Enter , the function is then active	

6.2 Input of process steps

The equipment manufacturer who knows the exact system states, usually sets up the process steps so that the user during programming only needs to select a process.

Any changes in process steps after input of the profile program are not entered in the profile program.

Reaching the function level

* Press keys Shift + Min/Sec (time display is flashing; func is displayed)
* Input password “2345” on the number keys
* Enter with Enter

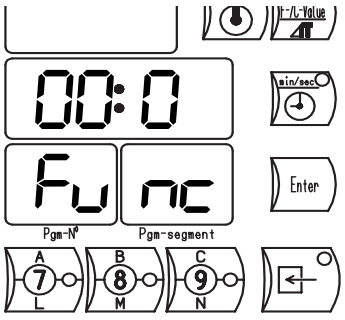
The user can leave the function level at any time using the keys Shift + Min/Sec or Pgm.
Any alterations which have been entered are then stored automatically.

The LED in key Pgm is lit.

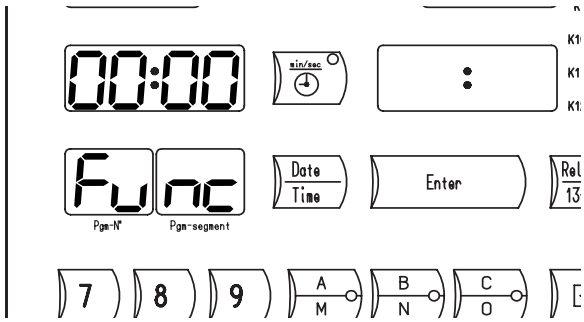
The LEDs of the process steps are flashing.

If the upper LED in the Shift key is lit, the upper process steps can be selected.
For the lower function steps press key Shift again so that the lower LED lights up.

LPF-100



LPF-200



6.2.1 Selection of process step designation (LPF-100)

Selection covers either the 22 process steps A — V marked on the number keys, or the steps 23 — 99.

Process steps upper half-key

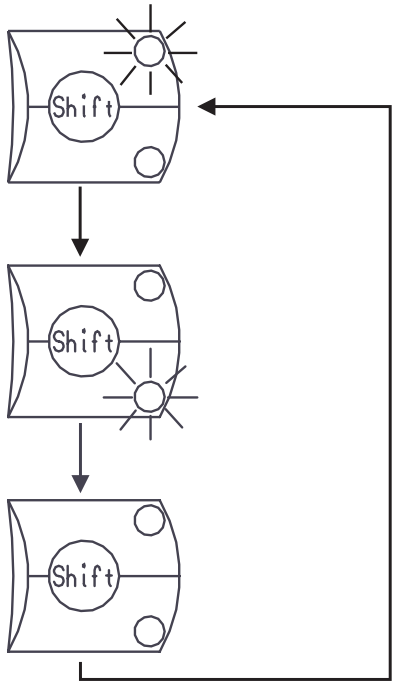
* Press Shift so that the upper LED lights up
* Press key for the required process step, e.g. “B”

Process steps lower half-key

* Press Shift so that the lower LED lights up
* Press key for the required process step, e.g. “M”

Process steps 23 — 99

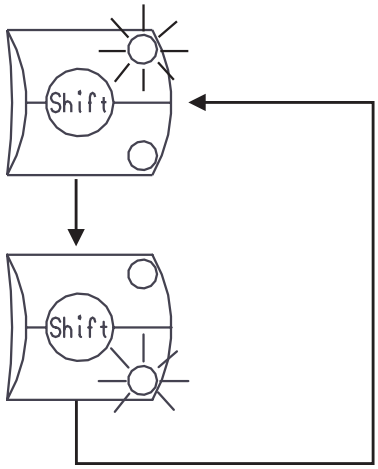
* Press Shift so that no LED is lit
* Input the number of the process step on the number keys
* Enter with Enter



6.2.2 Selection of process step designation (LPF-200)

Selection covers either the 24 process steps A—X marked on the letter keys, or the steps 25—99.

Process steps upper half-key
✱ Press Shift so that the upper LED lights up ✱ Press key for the required process step, e.g. “B”
Process steps lower half-key
✱ Press Shift so that the lower LED lights up ✱ Press key for the required process step, e.g. “N”
Process steps 25 — 99
✱ Input the number of the process step on the number keys ✱ Enter with Enter



6.2.3 Input of setpoints

✱ Input the chamber temperature setpoint on the number keys

✱ Enter with Enter (display chamber humidity / pause time is flashing)

✱ Input chamber humidity setpoint or pause time

☞ If relative humidity is to be controlled by pulse-pause control the key P has to be pressed (LED is lit).
Using the Shift key, the value “not programmed” (- - -) or (0) is set.

⇨ Section 6.1.5 “Control ranges (setpoint and process value limits)”

✱ Enter with Enter (lower display is flashing)

✱ Input core temperature setpoint

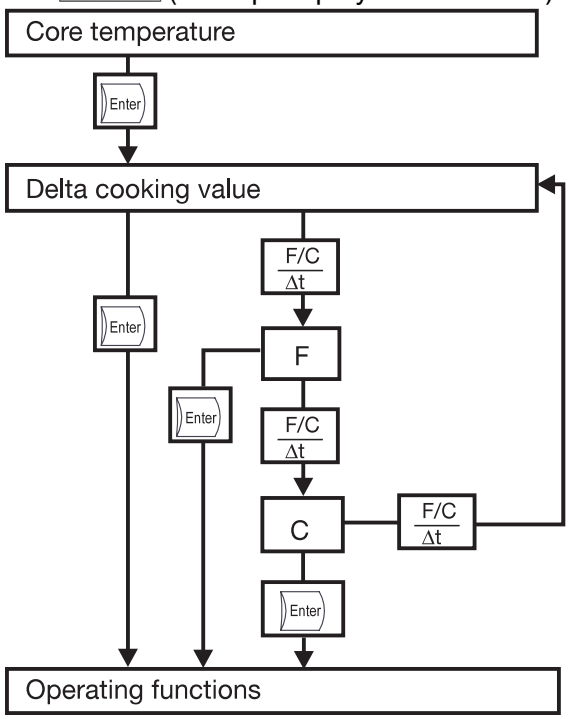
✱ Enter with Enter

✱ Input setpoint for delta cooking (small letter d on display)

✱ Enter with Enter

☞ F-value or C-value is selected with the keys F-Value / C-Value .

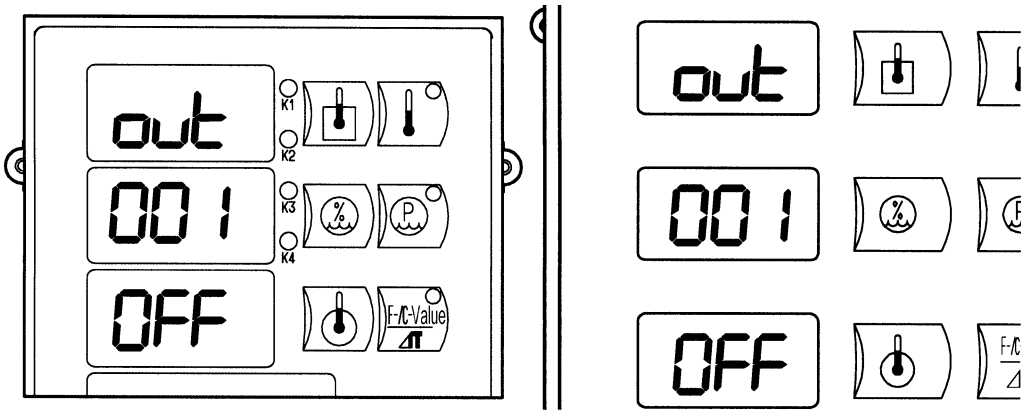
* Input the required value
* Acknowledge with Enter (the top display shows “out”)



6.2.4 Setting of operating functions

* Select operating contacts (on number keys; 36 max.)
* Enter with Enter
* Select contact status (ON/OFF) with Shift
* Enter with Enter
* Set new operating contacts or terminate programming of the operating contacts with setpoint keys. With Shift + Enter forward to the next process step

LPF-100 **LPF-200**



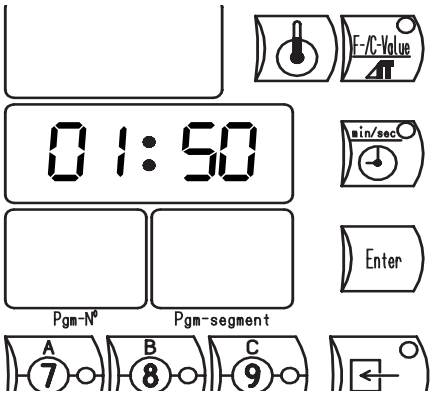
6.2.5 Input of segment time

* Input segment time on the number keys
* Enter with Enter
* Program the next process step

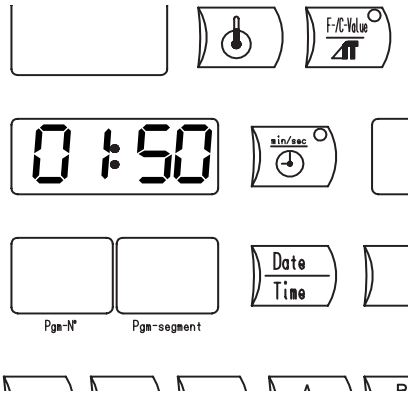
Here again an extra setpoint can be programmed at any point.

⇨ Section 7.3.8 “Input extra setpoint”

LPF-100

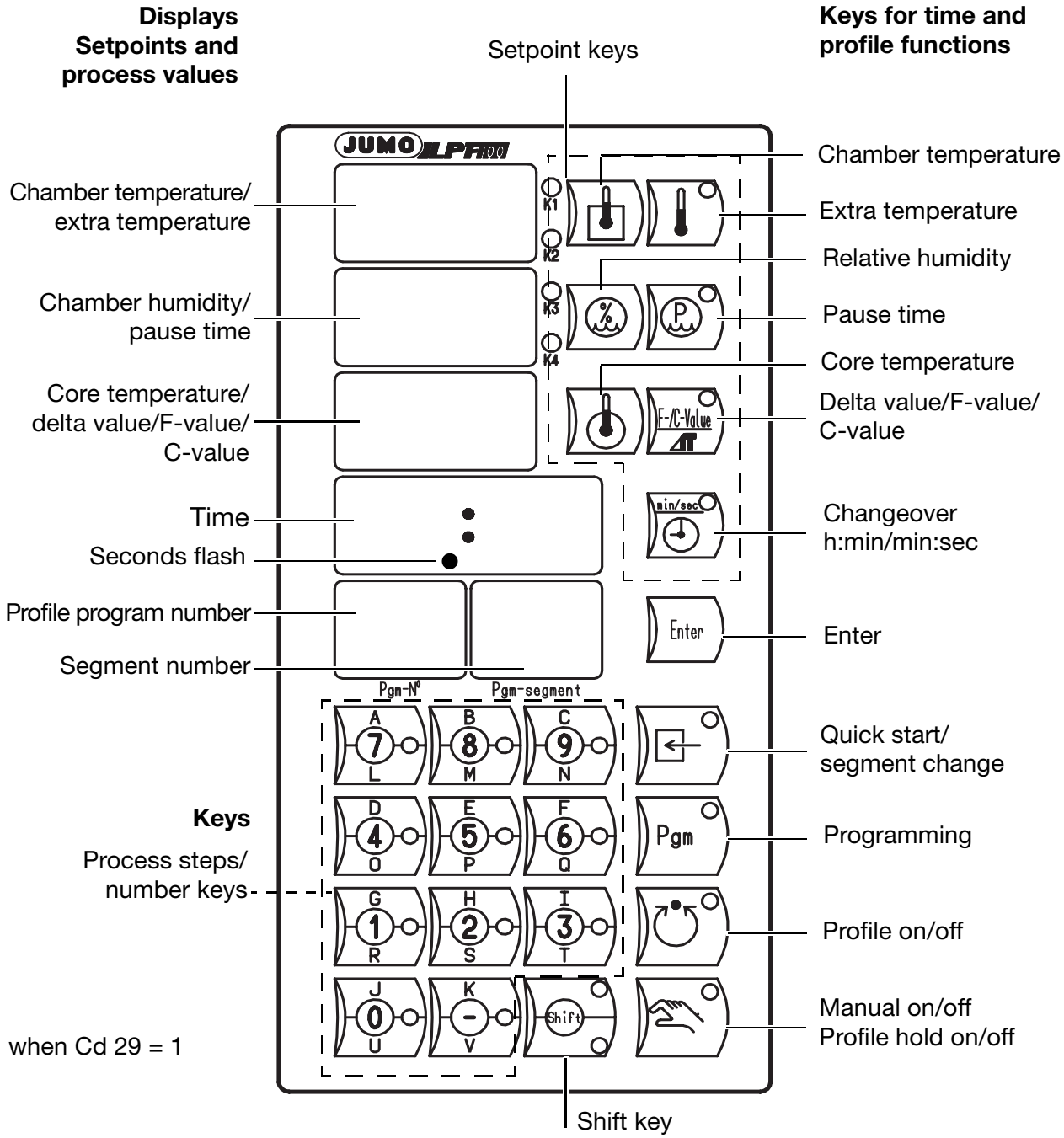


LPF-200

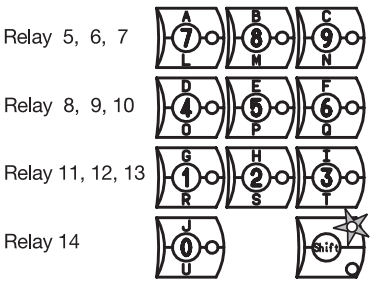


7 Operation

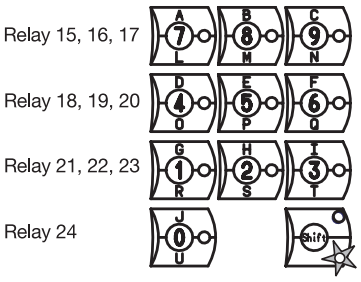
7.1 Displays and controls of the LPF-100



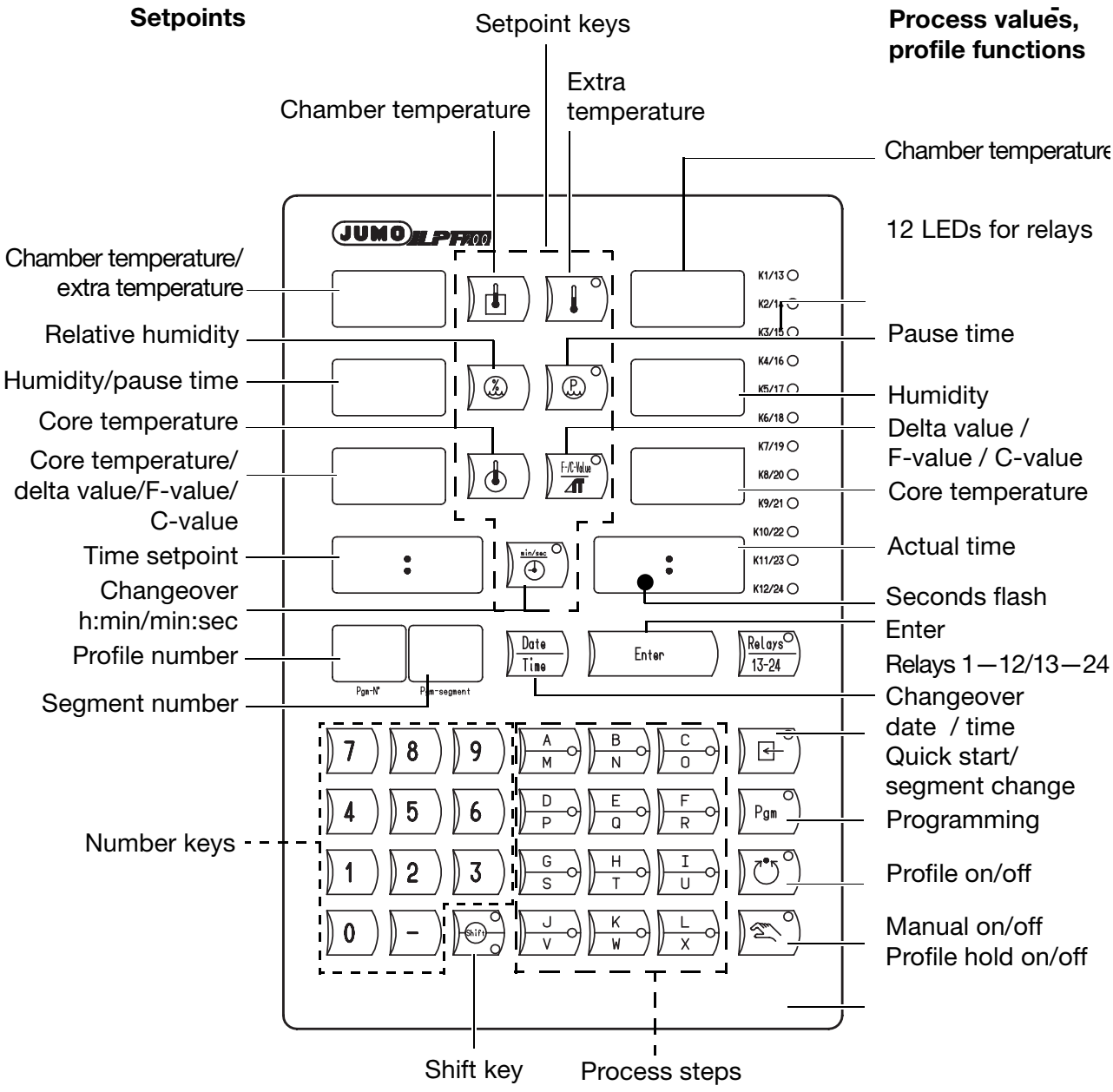
Display of active Relays in the keys
(only if upper LED in the Shift key lights)



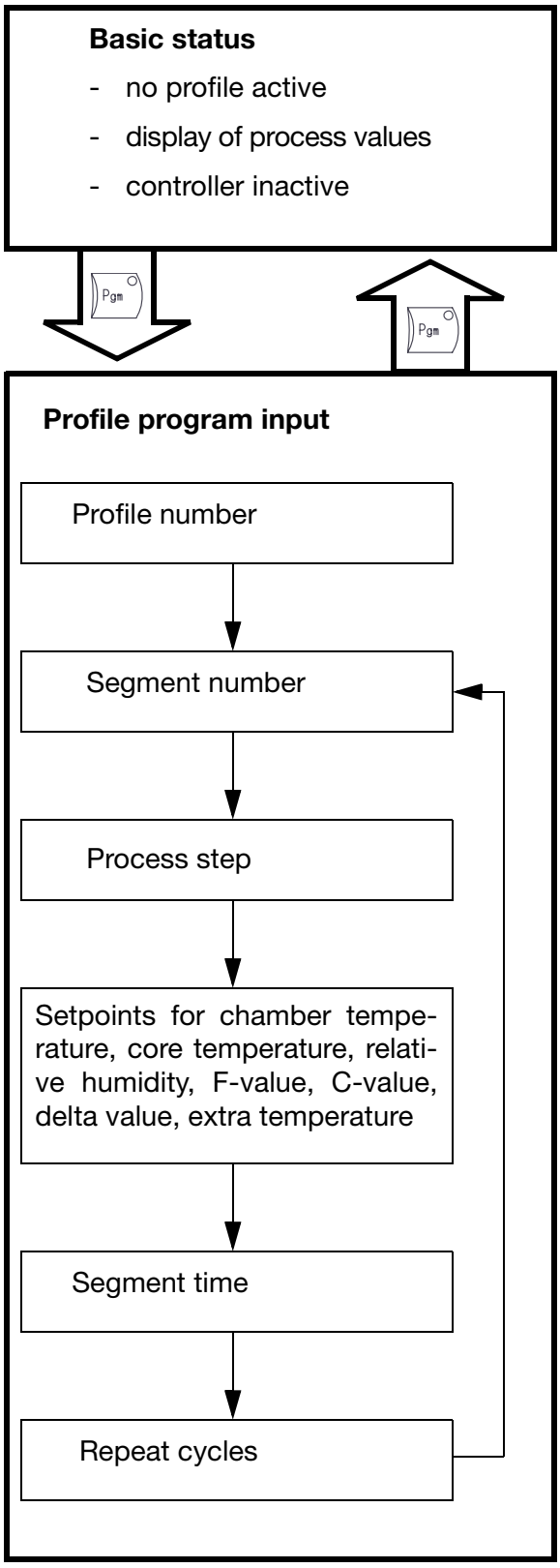
Display of active Relays in the keys
(only if lower LED in the Shift key lights)



7.2 Displays and controls of the LPF-200



7.3 Input of the profile program



7.3.1 Profile number

* Press key Pgm
* Input profile number (1—99) (display is flashing)
* Enter with Enter

If there is already a profile program the word “yes” appears above the flashing profile number display, otherwise a “no”.

7.3.2 Segment number

* Input segment number (1—99) (display is flashing)
* Enter with Enter

7.3.3 Process step

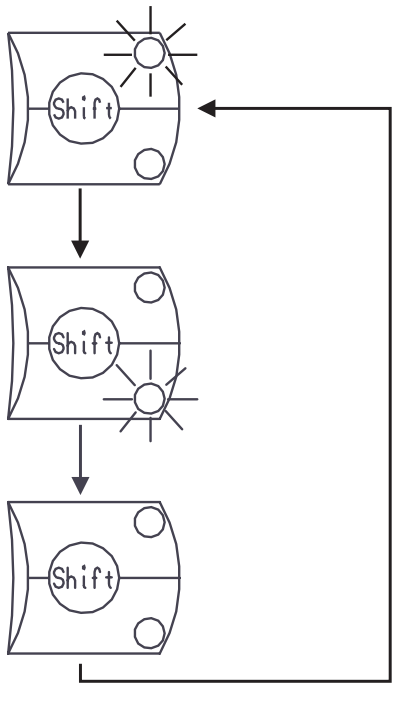
Each profile segment carries a process step as default. Setpoints, operating functions and segment time are programmed by the equipment manufacturer and identified by a letter, e.g. “B”.
Equipment-related parameters are permanently assigned to these letters, such as operating functions. Setpoints can be altered if required.

⇨ Section 6.2. “Input of process steps”

The LEDs in the keys for the process steps are flashing and request an input.

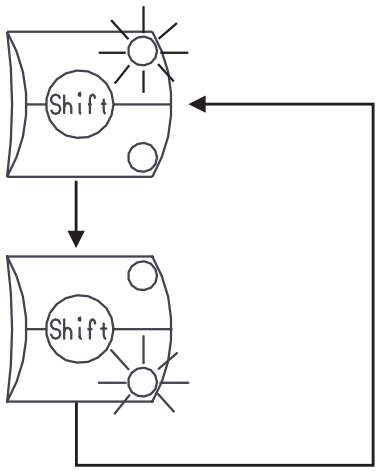
Selecting process steps LPF-100

Process steps upper half-key
* Press Shift so that the upper LED lights up * Press key for the required process step, e.g. “B”
Process steps lower half-key
* Press Shift so that the lower LED lights up * Press key for the required process step, e.g. “M”
Process steps 23 — 99
* Press Shift so that no LED is lit * Input the number of process step on the number keys * Enter with Enter



Selecting process steps LPF-200

Process steps upper half-key
* Press Shift so that the upper LED lights up * Press key for the required process step, e.g. “B”
Process steps lower half-key
* Press Shift so that the lower LED lights up * Press key for the required process step, e.g. “N”
Process steps 25 — 99
* Enter the number of the process step on the number keys * Enter with Enter



A process step can be changed in the program in several ways:

Keeping the process step

* Confirm with Enter
(values in the program remain unchanged)

☞ The setpoints for the process steps in the program and in the process step storage may be different!

Accepting the same process step again

* Enter the key or number of the same process step
(values from the process step storage will be accepted)

New process step

* Enter key or number of a new process step

☞ ⇨ Process steps changes made after program entry will not be incorporated in the program!

7.3.4 Setpoints

* Input the chamber temperature setpoint (upper display is flashing)
* Enter with [Enter]
* Input chamber humidity setpoint (centre display is flashing)

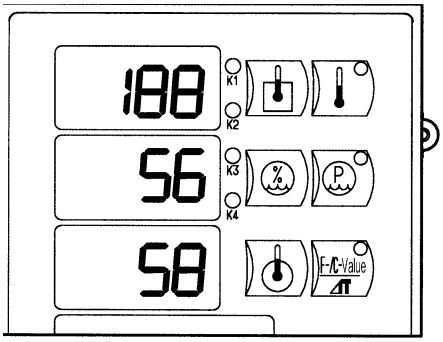
Relative humidity can be switched from control [%] to pulse-pause ration [P].
The LED in key [P] flashes on pulse-pause ratio.

The [Shift] key enters the value (- - -) for “not programmed”or „0“.

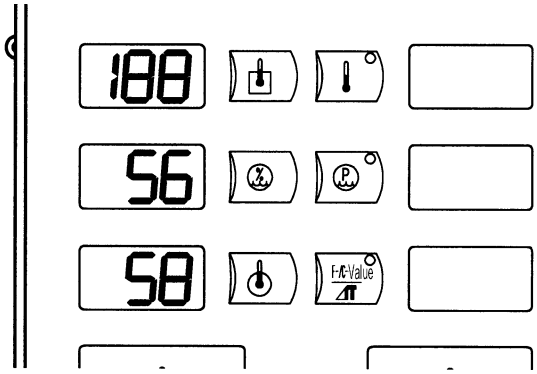
⇨ Chapter 6

* Enter with [Enter]
* Input setpoint for core temperature, delta value, F-value or C-value (lower display is flashing)
* Enter with [Enter]

LPF-100



LPF-200



7.3.5 Set operating functions

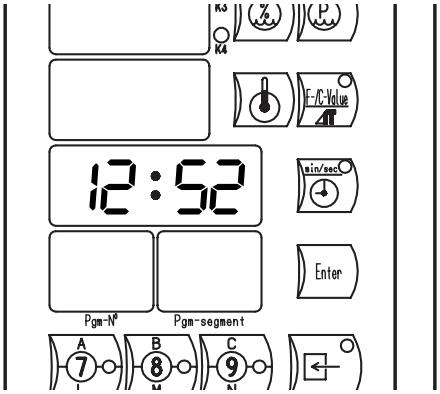
The operating functions may be inhibited; if this is the case they can not be set or altered.

⇨ Section 6.2. “Input of process steps”

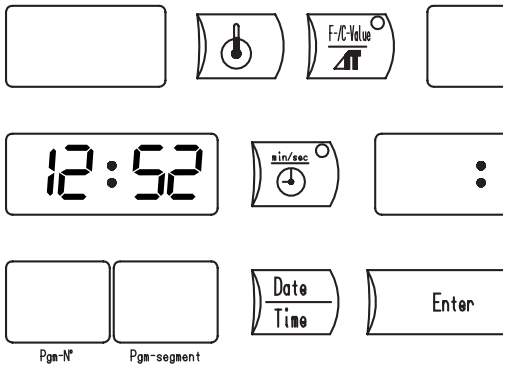
7.3.6 Segment time

* Input the segment time (display is flashing)
* Enter with Enter

LPF-100



LPF-200

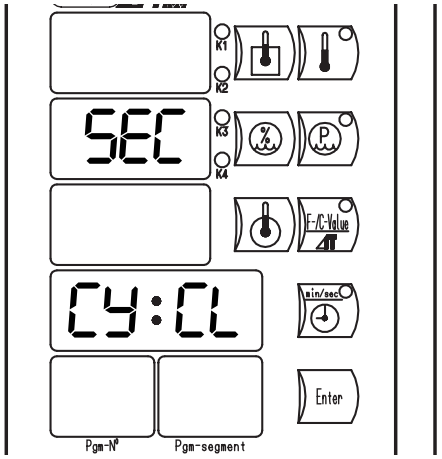


7.3.7 Repeat cycles

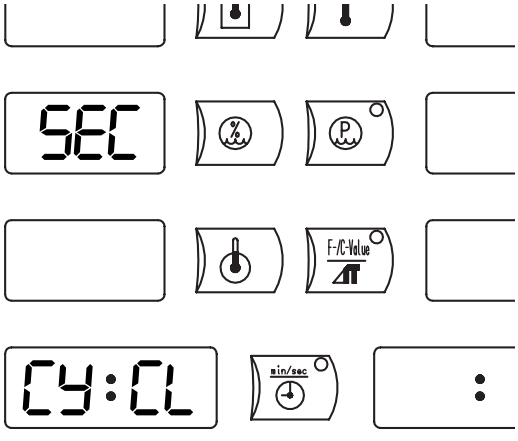
The repeat cycles can be de-activated by Cd 28. The entry will then be ignored.

* Input the segment number where the repeat starts
* Enter with Enter
* Input the number of repeats
* Enter with Enter
* The profile segment is fully programmed and is stored automatically
* Input next segment or teminate the profile with Pgm

LPF-100



LPF-200



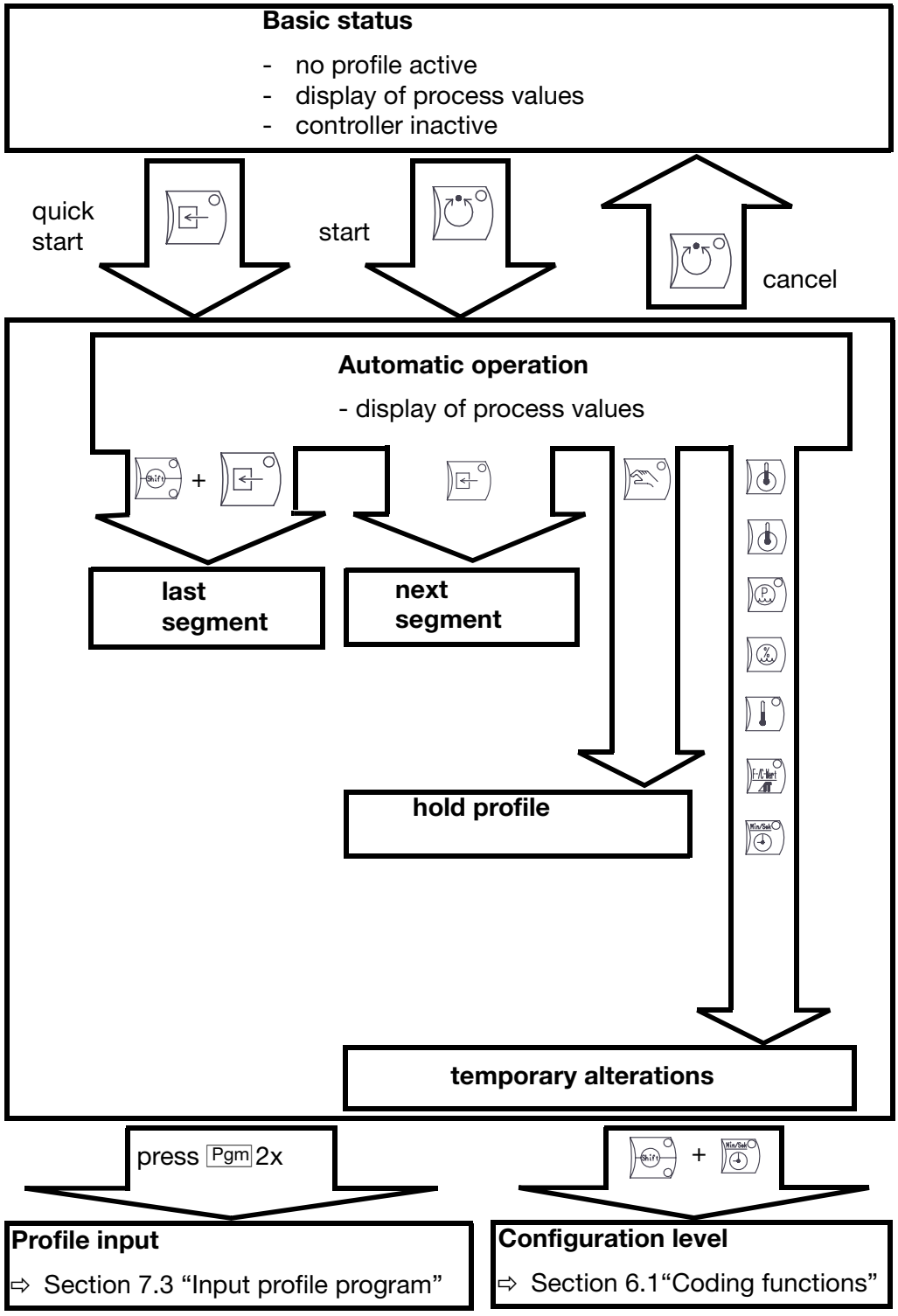
7.3.8 Input extra setpoint

* Switch to extra setpoint with (LED in key lights up)
* Input as explained under “Setpoints”
* Enter with Enter (setpoint for humidity flashes)

7.3.9 Quit profile input

☞ The input of the profile program can be aborted at any time with the key Pgm. All inputs entered with Enter are stored.

7.4 Automatic operation



7.4.1 Start automatic operation

Select profile program and segment

* Press [↻]
* Input profile number (1—99) (display is flashing)
* Enter with [Enter]

If there is already a profile program, the word “yes” appears above the flashing profile number display, otherwise a “no”.

* Input segment number (1—99) (right display is flashing)
* Enter with [Enter]

Delay time (LPF-100)

For direct start:

* Enter delay “000” with [Enter] *or*
* Input required delay time
* Enter with [Enter]

Start with real-time clock (LPF-200)

A profile program can be started up to one month later.

* Input day
* Enter with [Enter]

If the day input is earlier than the day on the real-time clock, the input field for month is automatically moved on by one month.

* Input start time
* Enter with [Enter]

The controller now shows the clock time and waits until the starting time is reached.

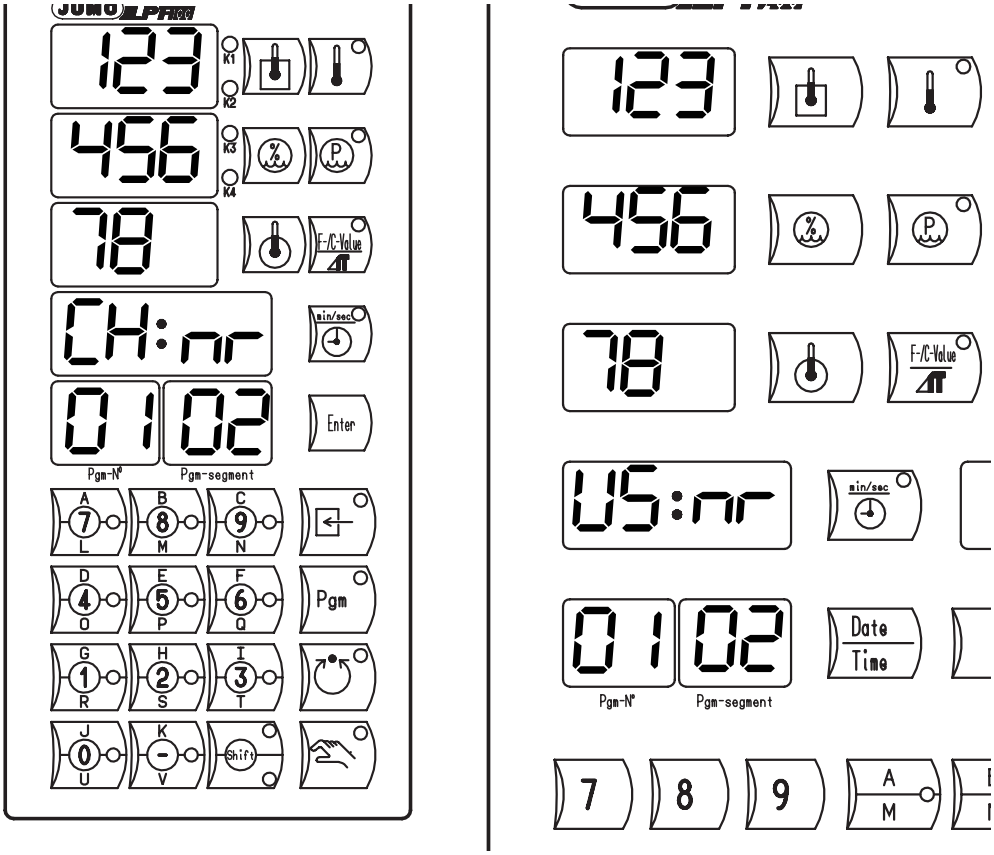
7.4.2 Quick start

* Press key [⊡] for an immediate start of the profile program which was selected last.The controller starts immediately with the profile and segment which was selected last and which was entered with [Enter] .

7.4.3 Enter batch no. and/or user no.

If this has been configured by Cd 27, then the batch no. and/or user no. must be entered here. Only the value which was typed last is used, which can be confirmed one position at a time (with “Enter”) or altered, by using the number keys.

The numbers can be read out by a supervisory system, via the interface.



7.4.4 Abort automatic operation

☞ The profile program can be aborted at any time with key ⏻; the profile controller returns to the basic status.

7.4.5 Step on to the next segment

* Press key ⊡+

7.4.6 Step back to the previous segment

* Press keys Shift ⊡+

7.4.7 Hold profile program

* Press key ⌓
* The profile run is stopped until key ⌓ is pressed again and the profile program then continues

☞ If an operating function has a pulsing action, this is continued in spite of the hold.

⇨ Section 7.3.5. “Set operating functions”

7.4.8 Temporary alterations/F-value and C-value display

If the setpoint keys are pressed while a profile program is running, the programmed setpoint is flashing for approx. 10 seconds and can be altered.
Temporary alterations apply only to this particular profile program run. If the profile program is re-started, the original values in the profile program are again active.

* Press setpoint key (display is flashing for approx. 10 seconds)
* Input new setpoint
* Enter with Enter

Altering delta value

* Press the ΔT-Value key until the display shows “d”)
* Input the required value (two places)
* Enter with Enter

Altering/ indicating F-value

* Press the F-Value key unitl the display shows “F” (display field is flashing)
* Input the required setpoint within 10 sec

After 10sec the display stops flashing and indicated the actual F-value.

Altering/ indicating C-value

* Press the C-Value key until the display shows “C“ (display field is flashing)
* Input the required setpoint within 10 sec

After 10 sec the display stops flashing and indicates the actual C-value.

Switch process

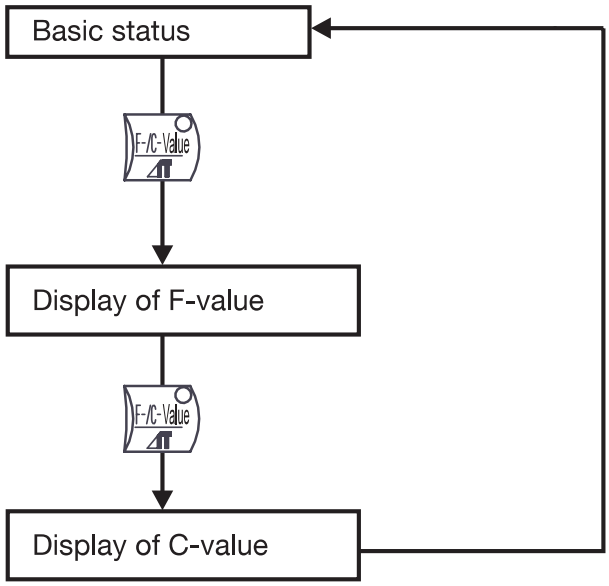
* The process which was selected is activated by the Pgm key.

⇨ Section 6.2.1 “Selection of process step designation (LPF-100)” and Section 6.2.2 “Selection of process step designation (LPF-200)”

With a temporary change of process step, only the operating functions will alter. Setpoints and times will remain in the original state.

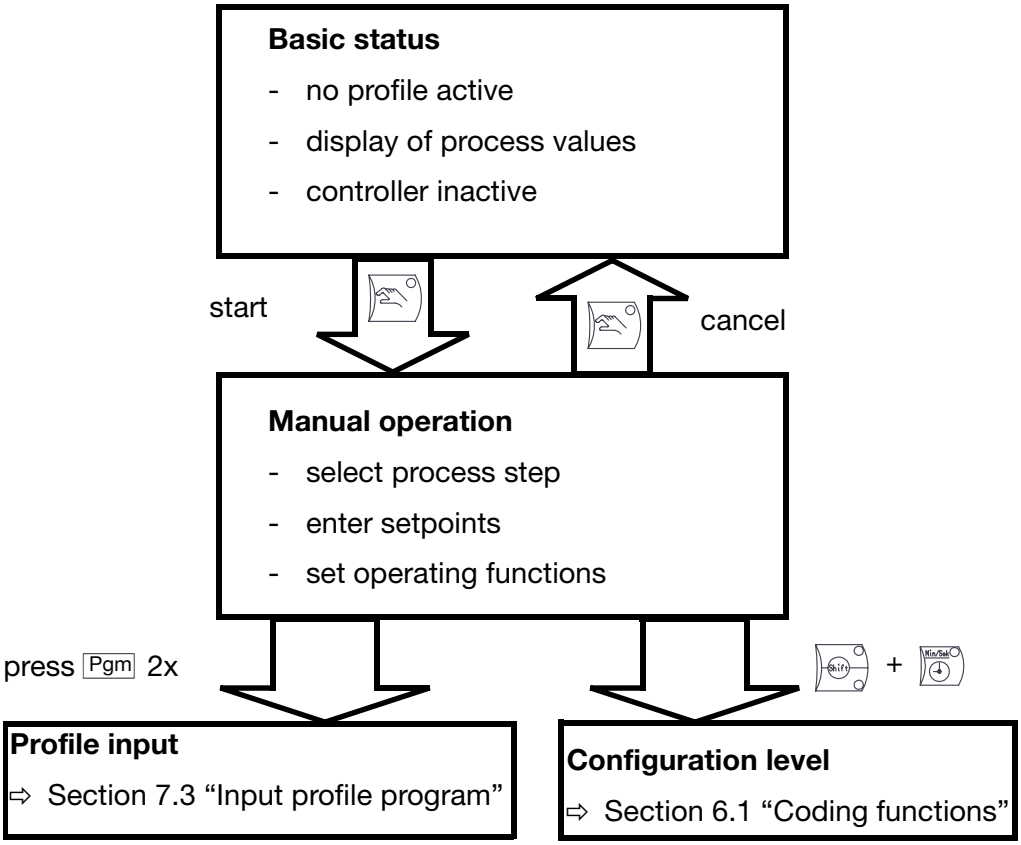
7.5 Indicate F- value and C-value after profile end

F-value and C-value are always being calculated in the background during standard cooking processes. The final value can be called up after the end of the profile by pressing the F-Value and C-Value keys.



7 Operation

7.6 Manual operation



7.6.1 Features

A process step is selected by pressing one of the marked keys, e.g. “S”; the LED in the Shift key indicates whether the upper or the lower process step is active. Process steps 23—99 (LPF-100) or 25—99 (LPF-200) are selected using the number keys.

The number of the process step then appears in the segment display.

Setpoints which have already been entered by the equipment manufacturer are active but can be indicated and altered with the appropriate setpoint keys.

Operating functions can be altered similarly provided these functions are not inhibited.

7.6.2 Start manual operation

* Press key

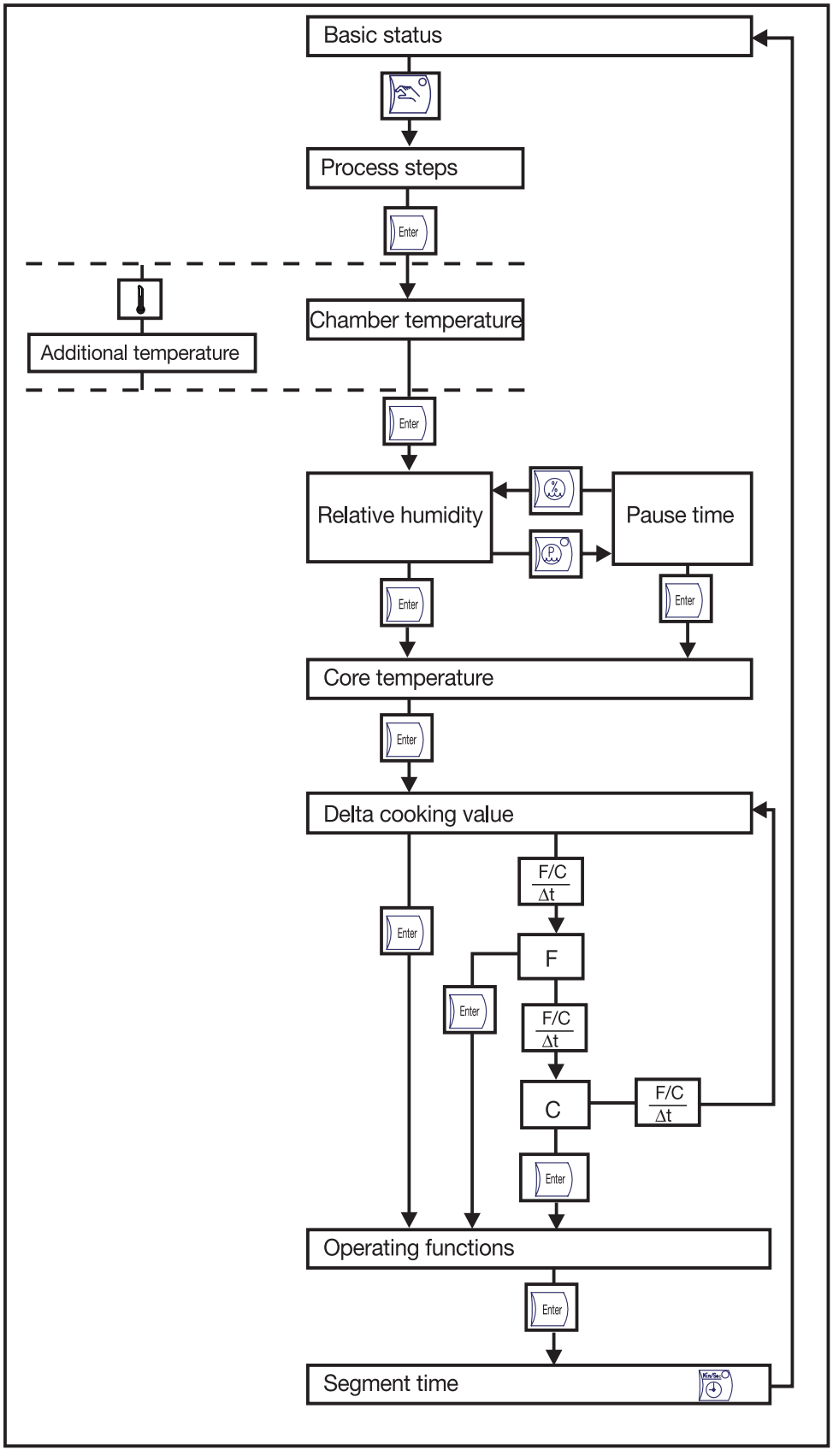
7.6.3 Select process step

The LEDs in the process step keys are flashing and request an input.

* With the Shift key toggle between the upper and the lower process step (The LED in the key indicates which process step is active)
* Press the key for the required process step (LED lights up)
* In the case of process steps above 22 (on LPF-100) or 24 (on LPF-200) input the process step with the number keys and enter with Enter .

7.6.4 Input setpoints

Existing setpoints are active.
By operating the setpoint keys, e.g. ⇩, they can be indicated or altered.
After 10 seconds the display returns to process values.

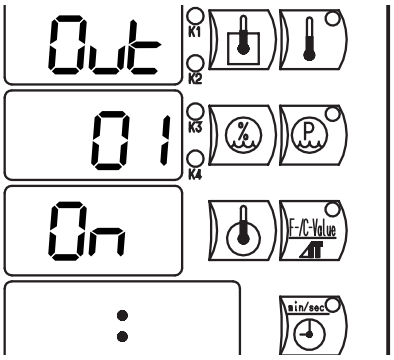

Basic status
Process steps
Enter
Chamber temperature
Additional temperature
Enter
Relative humidity
Pause time
Enter
Enter
Core temperature
Enter
Delta cooking value
F/C
Δt
Enter
F
Enter
F/C
Δt
C
F/C
Δt
Enter
Operating functions
Enter
Segment time

7.6.5 Set operating functions

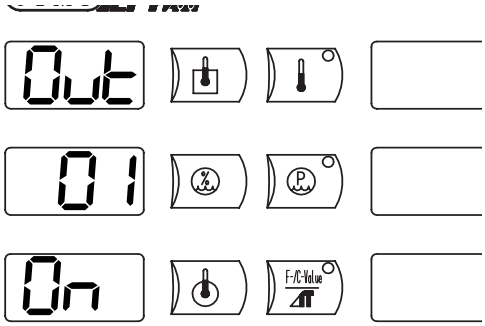
☞ These functions may be inhibited!

* Select number with the number keys (1—36)
* Enter with [Enter]
* Select first contact status (On/OFF) with [Shift]
* Enter with [Enter]

LPF-100



LPF-200



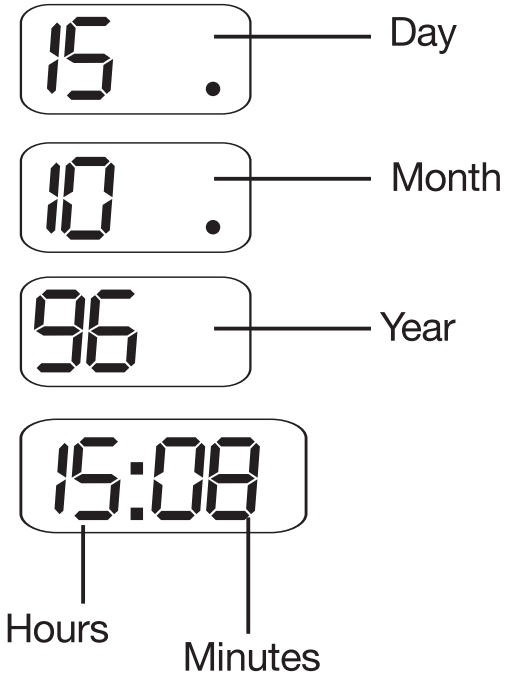
7.6.6 Terminate manual operation

☞ The profile program can be aborted at any time with the key [⏎] and the profile controller returns to its basic status.
The conditions for aborting manual operation are the same as for stepping on to the next segment during auto operation.

7.7 Set real-time clock (LPF-200)

* Press key Date/Time twice (day is flashing)
* Input day with the number keys
* Enter with Enter (month is flashing)
* Input month with number keys
* Enter with Enter (year is flashing)
* Input year with number keys
* Enter with Enter (hours, minutes are flashing)
* Input hours and minutes
* Enter with Enter

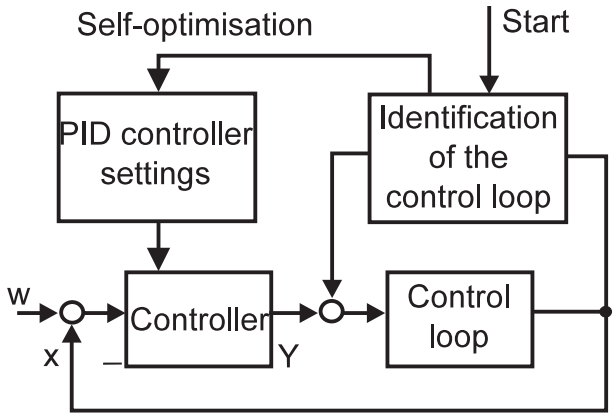
☞ Programming of time can be aborted at any time with key Date/Time. Only inputs which have been entered are stored.



8 Self-optimisation

General note

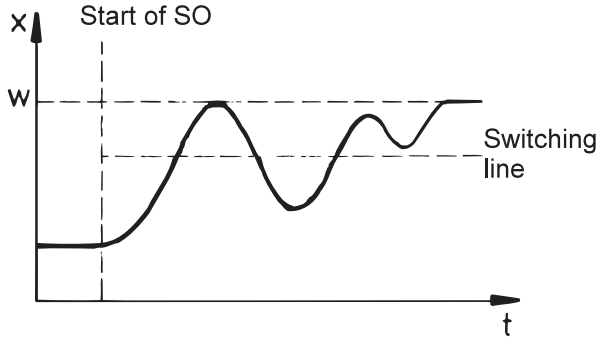
The self-optimisation function (SO) is purely a software function and is incorporated in the controller. SO employs a special procedure to analyse the response of the control loop to steps in control output.
Using the control loop response (process value) an extensive computing algorithm determines the controller parameters for a PID controller and stores them. If a double-setpoint controller has to be optimised, the algorithm determines two separate proportional bands (Xp1 and Xp2). In case of a switching double-setpoint controller the switching cycle time Cy2 is also calculated.
The SO procedure can be repeated as often as desired.



☞ ⇨ SO can be activated through Cd 08 aktiviert. With cascade control, the controller of the inner control loop has to be optimised first.
(⇨ Section 6.1.1. “General instrument data”)

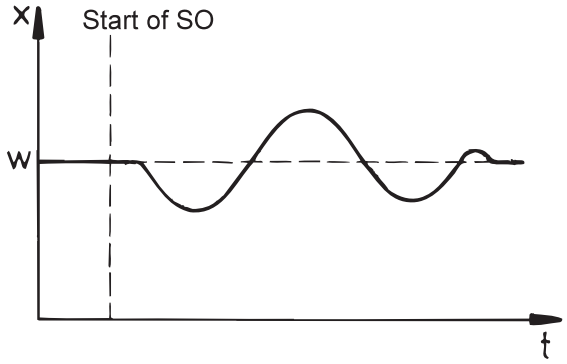
Process value far away from setpoint

SO operates according to two different procedures which are selected automatically depending on the dynamic state of the process value and its distance from the setpoint at the start of SO. SO can be performed starting from any dynamic course of the process value. If process value and setpoint are far apart when SO is activated, a switching line is determined and the controlled variable is made to perform a forced oscillation about this line during the self-optimisation procedure.



Process value close to setpoint

If there is only a small deviation between setpoint and process value, e.g. when the control loop has stabilised, a forced oscillation is produced about the setpoint. Using the recorded process loop data of the forced oscillation, the calculation determines the controller parameters T_n, T_v, Xp1, Xp2, Cy1, Cy2 and also the optimum filter time constant for this control loop for filtering the process value.
SO is then successfully concluded.



☞ If after stabilisation a switching controller exhibits permanent process value oscillations in synchronism with the switching action, it is recommended to reduce Cy further.

9 What to do, if ...

What happened ?	Remedy	Information
LED H102 or H103 lights up continuously	Module is faulty; Service required	⇨ Section 4.3.5 “LEDs and keys on the compact unit”
LED H102 or H103 flashes	A “wink command” is being transmitted from the JUMO mTRON-iTOOL project design software, to identify the module (duration approx. 10 sec).	⇨ Section 4.3.6 “LEDs and keys on the split version”
Display flashes: OOO	A transducer is faulty, or a signal input is short-circuited, so that an **overrange** occurred. ✱ Replace faulty transducer ✱ Check control/setpoint ranges	⇨ Section 6.1.5 “Control ranges (setpoint and process value limits)”
Display flashes: UUU	A transducer is faulty, or a signal input is short-circuited, so that an **underrange** occurred. ✱ Replace faulty transducer ✱ Check control/setpoint ranges	⇨ Section 6.1.5 “Control ranges (setpoint and process value limits)”
Display flashes: ----	Cable break in the LON network ✱ Check network leads	⇨ Section 4.3.1 “Indication of a faulty network connection”
LED flashes in the ⏱ key	Response to supply interruption is set to “stop” (Cd 01)	⇨ Section 6.1.1 “General instrument data”
All LED-segments light up, one after another, regularly	Display/keyboard test is switched on (Cd 07) ✱ Press Shift + Enter	⇨ Section 6.1.1 “General instrument data”
Instrument does not respond to pressing keys, or program does not start properly	✱ Check whether the keys are inhibited (Cd 95)	⇨ Section 6.1.11 “Logic inputs”
Relay 12 energized	✱ A condition for the combination alarm has occurred	⇨ Section 6.1.8 “Combination alarm”
Relay for cooling does not respond (double-setpoint controller)	Check Cd 40 and 55 Cd 55 must be set to -100 for double-setpoint controllers.	⇨ Section 6.1.6 “Controller configuration” ⇨ Section 6.1.7 “Controller parameters”
During program entry or temporary changes, the operating contacts cannot be set	Check Cd 98, whether the operating contacts are inhibited.	⇨ Section 6.1.11 “Logic inputs”

M. K. JUCHHEIM GmbH & Co

Street address:
Moltkestraße 13 - 31
36039 Fulda, Germany
Delivery address:
Mackenrodtstraße 14
36039 Fulda, Germany
Postal address:
36035 Fulda, Germany
Phone: +49 (0) 661 60 03-0
Fax: +49 (0) 661 60 03-5 00
E-Mail: mail@jumo.net
Internet: www.jumo.de

JUMO Instrument Co. Ltd.

JUMO House
Temple Bank, Riverway
Harlow, Essex CM20 2TT, UK

Phone: +44 (0) 1279 63 55 33
Fax: +44 (0) 1279 63 52 62
E-Mail: info@jumoinstruments.fsnet.co.uk

JUMO PROCESS CONTROL INC.

735 Fox Chase,
Coatesville, PA 19320, USA
Phone: 610-380-8002
1-800-554-JUMO
Fax: 610-380-8009
E-Mail: info@JumoUSA.com
Internet: www.JumoUSA.com