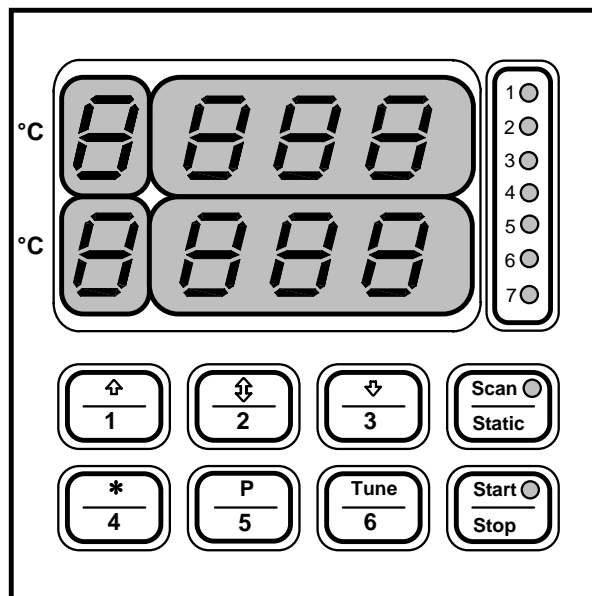


Multi-channel controller

Two-point controller

Program version: 11535



Read and observe these operating instructions before commissioning the unit (particularly the notes on installation, assembly and commissioning instructions).

Subject to technical and functional change

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Supplement A: The serial interface (RS 485)

(only for units with serial interface RS-485).

1. The installation of the unit:

1.1 General:

The unit DMP 96 C is a microprocessor controlled multi channel controller. The unit is obtainable in different devices. It contains 2 to 4 channels and between 0 and 8 freely configurable relays. The regulation function is configurable for each channel. In the following the maximum equipment with 4 channels and 8 freely configurable relays is described. At slighter equipment the parameters, which do not refer to available parts, are not adjustable. The unit may be served only by competent personnel.

1.2 Please note during installation:

Important: These directions for the installation of DOLD devices have to be adhered to:

If these directions are not adhered to the device may not work accurately, be destroyed or it may result in data being lost.

Read all directions carefully before connecting the device.

Connection to be carried out only by experts.

This device is not a safety device. Safety devices have to be installed according to the relevant directions for use.

Check if the power-supply voltage corresponds to rated voltage indicated on the identification plate before connecting and putting the device into operation. Fluctuations in the main voltage are only admissible within the indicated limits (specifications/identification plate).

The described device is designated for the installation of switchboards.

Electrical connections are to be carried out according to the connecting plan and the directions of the local electric supply company or the relevant regulations of the VDE respectively.

Other consumers must not be connected to the mains terminals.

In the event of mains interruptions, which lead to a malfunctioning of the device, relevant measures must be taken to avoid interruptions or interruptions must be filtered out by an external hum eliminator. The device is equipped with an internal hum eliminator.

On installation the sensor lines have to be shielded. The screen must be single-ended. With regard to thermocouple pick-ups the compensating lead has to be laid as far as the control terminals. The device and inductive consumers as well as sensor lines/signal lines and high tension lines have to be placed in such a way that any mutual interference is excluded (placed separately; not parallelly laid). go-and-return lines should be laid parallelly and, if possible, twisted.

Non-insulated sensors of a multi-channel control have to be adjusted to the same potential (max. potential difference: ± 3.5 V eff.). Otherwise insulated sensors must be used (Warning: Ceramics insulations (Al-Oxide) can be conducting ≥ 400 °C).

Post-connected contactors have to be equipped with RC protective allocations according to the manufacturer's instructions. If an internal protective allocation is mentioned in the connection plan of the device this has to be taken into account in the event of external allocation. If external allocation is missing short-term voltage peaks may result which lead to faster contact wear and may cause interference.

The preadjustment of all parameters has to be checked during operation and adjusted to the local conditions (installation)! Wrongly adjusted parameters may cause serious malfunctions!

Not all controlled systems can be controlled by parameters measured by means of self-optimising; therefore, on principle, control response is to be checked for stability.

The load circuits of the relays have to be protected against excessive currents in order to avoid the relay contacts becoming welded together.

The device must not be installed in an ex-area.

If used for purposes other than originally intended the device may be damaged and cause damage to connected installations.

The life time of the relays is limited to 10^6 switching cycles at a load of 500 VA. Thus it is to a high degree dependent on the frequency of switching cycles.

Time per switching cycle	Time after which 10^6 switching cycles are reached (operation: 8 hours/day at a load of 500 VA)
2 minutes	about 11.4 years
60 s	about 5.7 years
30 s	about 2.8 years
This table is invalid for Solid-State-Relay.	

At low loads life time increases with regard to the values indicated in the table.

The device is to be protected against moisture (especially condensing moisture) and excessive contamination. If this is not assured the device is liable to malfunctions.

Unplug connecting plugs only longitudinally to plug direction. Under no circumstances must the connecting plugs be plugged in or out obliquely!

Furthermore care must be taken that the surrounding temperature corresponds to the values shown in the specifications. Sufficient air circulation must be provided.

These operating instructions do not contain all directions to regulations, standards etc. which become effective when using this device in connection with other installations. These regulations, standards etc. must be ascertained and abided to by the purchaser.

1.3 Identification plate:

When making technical enquiries the following details are important

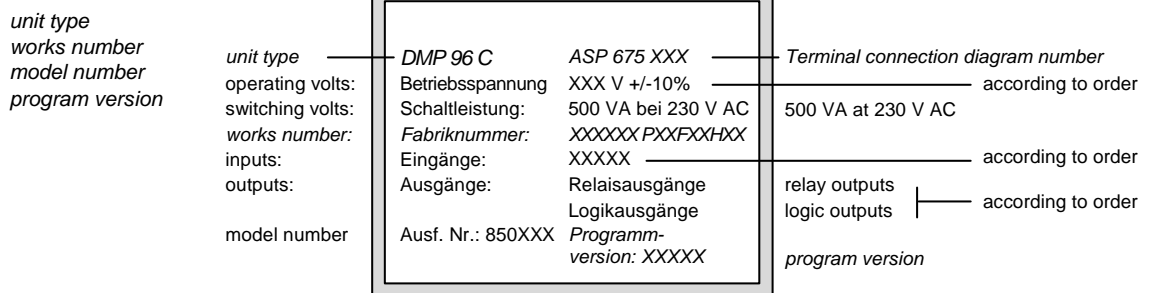


Figure 1: Identification plate DMP 96 C

1.4 Terminal connection diagram:

The connection diagram shows maximum terminal assignment for the controller when all connection possibilities are used. The appropriate terminal assignment (depending of the type of controller used) can be found in the accompanying connection diagram.

Connection diagram number according to identification plate: ASP 675XXX

1.5 Mechanical data:

Protection class:	II
Isolation group:	C as per DIN VDE 0110 b
Type of protection:	As per DIN VDE 0470 (replaces DIN 40 050) EN 60 529 / IEC 529
Front panel:	IP 50 (optionally: IP 54 with the proper mounting and a suitable sealing ring)
Housing:	IP 30
Connections:	IP 20
Housing:	Pull-out housing for mounting control panel as per DIN 43 700 with a B fastener as per DIN 43 835 (M 4 screw clamp)
Material:	PPO, glass-fiber reinforced (Noryl GFN2SE1), self-extinguishing,
Front panel dimensions:	96 x 96 mm DIN 43 700
Control panel cutout:	92 ^{+0.8} x 92 ^{+0.8} mm
Recess depth:	approx. 148 mm including screwed plug
Terminal connections:	Screwed socket strips, nominal cross section 2.5 mm ²
Weight:	approx. 420 g
Ambient conditions:	Operating temperature range: 0...+50°C Storage temperature range: -30...+70°C Climatic utilization category: as per DIN 40 040, corresponding to 75% relative humidity without moisture condensation

2. Inputs, technical data:

2.1 Inputs channel 1 to channel 4:

- according to order
- according to identification plate.

2.2 Possible inputs channel 1 to channel 4:

- Pt 100: Range: -100...600°C
- Pt 100: Range: -200...100°C
- Pt 100: input 1 and 2 in three wire lead, input 3 and 4 in two wire lead
- thermocouple Fe-CuNi: Range: 0...800°C
- thermocouple Ni-CrNi: Range: 0...1200°C
- standard signal voltage
- standard signal current
- mix of different inputs is possible

- other inputs on demand

2.3 Logic inputs

Logic inputs controlled with external, potential-free contacts, contact voltage approx. 5 V DC

Logic input 5: no function

Logic input 6: no function

Logic input 7: Start / Stop - function, controlled by level or by slope (configurable)

2.4 Technical data of the inputs:

Pt 100:	Sensor current:	constant 1 mA DC
	Calibration precision:	≤ 0,15 % F.S.
	Linearity error:	≤ 0,1% F.S.
	Temperature drift characteristics:	≤ 100 ppm/K
	Equipped with sensor breakage cutoff and short circuit fuse	
Pt 100 three-wire lead:	Automatic line resistance compensation via software (maximum permissible line resistance: 50 Ω per lead)	
Pt 100 two-wire lead:	Line resistance correction (line compensation) of maximum 11 Ω possible via software	
thermocouple:	Calibration precision:	≤ 0.15% F.S.
	Linearity error:	≤ 0.15% F.S.
	Temperature drift characteristics (without reference point compensation):	≤ 80 ppm/K
	Effect of line resistance:	≤ 2μV/Ω
	Reference point compensation	
	Error recognition using a controller reference point > 70°C	
	Sensor breakage cutoff	
standard signal:	Calibration precision:	≤ 0.15% F.S.
	Linearity error:	≤ 0,1% F.S.
	Temperature drift characteristics:	≤ 100 ppm/K
standard signal current:	input impedance:	R _i = 100 Ω
standard signal voltage:	input impedance:	R _i ≥ 10 kΩ
General:	Measurement cycle:	1 s
	Resolution:	≥ 14 bit
	RC and diode protection circuit for each input	
	Measuring-circuit monitoring:	Error shown on display
	Protective circuits:	Hardware watchdog and power-fail
	Data backup:	EPROM, semiconductor storage, Hardware-protected calibrated values.

2.4.1 Error-handling at inputs:

If the input signal is leaving the measurement range around more than approx. 10% (according to chapters 2.2), it will be recognized as an error and indicated in the display. The regulation of the corresponding entrance is stopped and the outputs, which are associated to this entrance, according to the configuration activates or deactivates.

3. Controller character:

The controller character of channel 1 to channel 4 is configurable:

- two point controller for heating with adjustable hysteresis
- two point controller for cooling with adjustable hysteresis
- two point controller for heating with PID controller characteristics
- two point controller for cooling with PID controller characteristics

4. Outputs:

Outputs as per identification plate and accompanying terminal connection diagram:

4.1 Potential-free relay contacts:

Contact load: ≤ 250 V AC, ≤ 8 A resistive load
at 500 VA typically 10^6 switching cycles

K 1 to K 4, K 6, K 8: configurable relay outputs, make contact
K 5, K 7: configurable relay outputs, change over
K 9: relay output, change over,
alarm contact, active in case of a sensor fault channel 1 to channel 4
(fault-messages 10, 11, 12, 13) or in case a hardware fault (fault-
messages 30, 31, 32)

The amount of available relays can be ordered between 1 and 8 relays. The controller functions and limit values functions are freely distributable to the available amount relays.

Please note: Alarm contact K 9 and relay contacts (limit contacts K 1 to K 8), which are inserted as alarm contacts, offer no protection against all possibilities of errors. If necessary the employment recommends itself a further, independent checking equipment.

4.2 Logic outputs (optional):

Logic outputs for activating solid-state relays, (in place of relay outputs K 1 to K 4):
Open collector, not galvanically separated, short-circuit-proof,
typically: 0/10 V DC, maximum: 20 mA.

4.3 Output responses in cases of error:

Output response of the outputs K 1 to K 8 in cases of sensor error:

- the regulation of the faulty channel will be stopped
- outputs, which are associated to the faulty channel takes off the defined status to the configuration (configuration level)
- approx. 20 s after removal of the error, the error message is picked up and the relay function is released again
- the channels and relays who are not affected works continue duly.

4.4 Optional analogue outputs (only valid for optional plug in PCB "C"):

Voltage or current output according to purchase order (ranges according to configuration):

- Output 1: actual value output of range of channel 1
- Output 2: actual value output of range of channel 2
- Output 3: actual value output of range of channel 3

5. Auxiliary power:

Auxiliary power (operating voltage) as per identification plate:

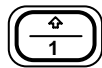
- Standard: 230 V AC ($\pm 10\%$), 48...62 Hz,
- Power consumption, depending on model: ≤ 15 VA,
- Not affected by voltage fluctuations within the defined range.

6. Display:

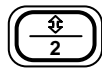
6.1 Upper 7-segment display:

shows according to status of controller:

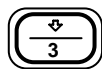
6.1.1 after pushing the according operating key:



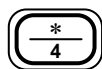
Channel number 1 and actual value channel 1



Channel number 2 and actual value channel 2



Channel number 3 and actual value channel 3



Channel number 4 and actual value channel 4

6.1.2. Scan - mode: switching automatically from channel to channel showing actual values and channel number one after another

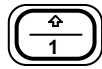
6.1.3. Static - mode: after pushing two channel number keys at the same time, the first actual value with its channel number is on display

6.1.4. Parameter symbols in input mode.

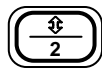
6.2 Lower 7-segment display:

shows according to status of controller:

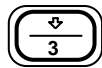
6.2.1. after pushing the according operating key:



set point value channel 1 (without channel number)



set point value channel 2 (without channel number)



set point value channel 3 (without channel number)



set point value channel 4 (without channel number)

6.2.2. Scan - mode: set point display (without channel number)

6.2.3. Static - mode: after pushing two channel number keys at the same time, the second actual value with its channel number is on display

6.2.4. Parameter symbols in input mode (4 digits).

6.3 LED's:

LED 1	yellow	lights up when output K 1 is active
LED 2	yellow	lights up when output K 2 is active
LED 3	yellow	lights up when output K 3 is active
LED 4	yellow	lights up when output K 4 is active
LED 5	yellow	lights up when output K 5 is active
LED 6	yellow	lights up when output K 6 is active
LED 7	yellow	lights up when output K 7 is active
LED 8	red	Scan / Static lights up in Scan - mode
LED 9	red	Start / Stop lights up when controller has been started.

7. Operation:

The program structure of the DMP 96 C controller has four clearly defined levels:

- the **Operation level** to alter set point values
- the **Extended Operation level** to alter limit contact outputs (optional)
- the **Parametrication level** to adapt the control parameters to the regulation requirements and set point value ranges
- the **Configuration level** to set up the line balance, the controller character, the error allocations, the interface (optional) and the limit contacts (optional).

Setting parameters on the various levels:current value: **+1**

and

current value: **+10**
after 3 s: **+100**current value: **-1**

and

current value: **-10**
after 3 s: **-100**

the value on display is entered.

After confirming the last parameter, return to normal operating mode.

If no key is pressed within 10 seconds, automatic return to normal operating mode, without accepting the changed parameters.

To activate the regulation:

this key will enable or disable the regulation, providing the Start/Stop key is not disabled in the configuration level.

To activate self-tuning ¹⁾:

To start or stop the self-tune operation in the respective channel set for with parameter "t.ch" ¹⁾ see 7.6. self-tuning.

Start up the self-tuning is only possible, if to the discontinued channel also at least one relay is configured as controller output on this channel.

Display mode:

Scan - mode: automatic display switch from one channel to the other for actual and set point values of all channels.

Static - mode: After pressing a channel select key the according actual channel and set point value will appear on display.

After pressing the same time two of the according channel select keys the according actual values are switched into the displays.

7.1 The Different levels:

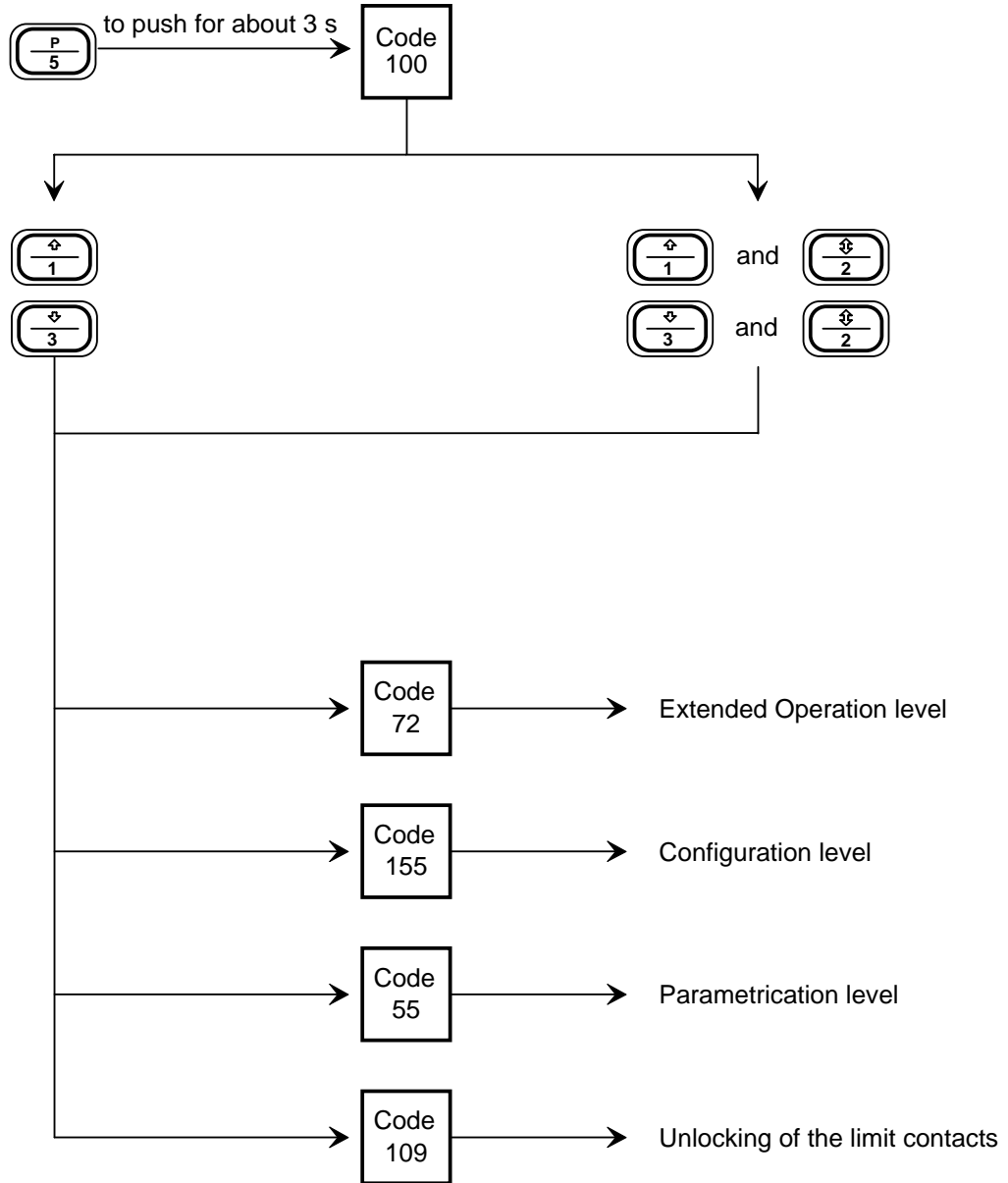
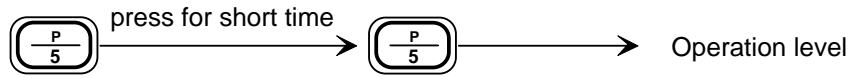


Figure 2: The various levels

7.2 Operation level:

Set point adjustments:



press for short time and jump to operation level

Range:	Parameter:	Display:	Works setting:
" 1.rdo "... 1.ruP "	Common set point for channel 1 to channel 4 (if configuration "4.SPt" = 0)	" SP.1 "	0.0°C
" 1.rdo "... 1.ruP "	Set point channel 1	" SP.1 "	0.0°C
" 2.rdo "... 2.ruP "	Set point channel 2	" SP.2 "	0.0°C
" 3.rdo "... 3.ruP "	Set point channel 3	" SP.3 "	0.0°C
" 4.rdo "... 4.ruP "	Set point channel 4	" SP.4 "	0.0°C
0...4	Self-tuning for channel 1 to channel 4 0: no self-tuning possible for channel 1 to channel 4 (Channel adjustment only possible if parameter "no.t" = 0, see parametrication level) (parameter only can be activated if regulation output is set for PID - control characteristic)	" t.ch "	0

7.3 Extended Operation level:

Adjustment of the set point values of the configurable limit contacts:

Set point values setting is only possible, when corresponding output is configured for limit contact.



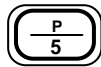
display to show: " Cod "
100

Key in code number: Code 72 with the keys

Range:	Parameter:	Display:	Works setting:
"rdo" ... "rup" (in dependent of the selected chan- nel)	Set point value or spreading of the limit contact	" x.Li X " x: 1-8	20.0°C
X: depending upon configuration	"Li - " limit contact absolute make contact		
	"Li - " limit contact absolute break contact		
	"Li = " limit contact relative to minus make contact		
	"Li = " limit contact relative to minus break contact		
	"Li = " limit contact relative to plus make contact		
	"Li = " limit contact relative to plus break contact		
	"Li = " limiting comparator make contact		
	"Li = " limiting comparator break contact		
	"Li - " limit contact absolute make contact with locking		
	"Li - " limit contact absolute break contact with locking		
	"Li = " limit contact relative to minus make contact with locking		
	"Li = " limit contact relative to minus break contact with locking		
	"Li = " limit contact relative to plus make contact with locking		
	"Li = " limit contact relative to plus break contact with locking		
	"Li = " limiting comparator make contact with locking		
	"Li = " limiting comparator break contact with locking		
0.5...50.0°C	hysteresis limit contact	" x.HYS " x: 1 - 8	1.0 °C

7.3.1 Unlocking the limit contacts:

After setting the code number the configured limit contacts can be unlocked.

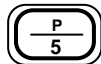


display to show: " Cod "

100

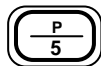
Key in code number: Code

109



code number confirmed, enter to operation level

7.4 Configuration level:

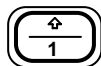


display to show: " Cod "

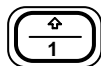
100

Key in code number: Code 155

with the keys:



current value +1

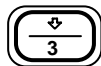


and

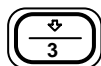


current value +10 after about 3 s +100

or



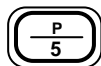
current value -1



and



current value -10 after about 3 s -100



code number confirmed, jump to configuration level

Range:	Parameter:	Display:	Works setting:
1...20	Low-pass filter , cycle time always is 1 s 1: direct measurement 2: two measurements are averaged 20: 20 measurements are averaged standard preadjustment is three, three measurements are averaged, the latest measure will be replaced	" ti.Fi "	3
2...maximum number of channel	Number of active channel	"CH.no"	according to order
-30.0...+30.0°C	Line balance channel 1 , offset value will be added to actual value	" 1.Lin "	0.0°C
-30.0...+30.0°C	Line balance channel 2 , offset value will be added to actual value	" 2.Lin "	0.0°C

Range:	Parameter:	Display:	Works setting:
-30.0...+30.0°C	Line balance channel 3 , offset value will be added to actual value	" 3.Lin "	0.0°C
-30.0...+30.0°C	Line balance channel 4 , offset value will be added to actual value	" 4.Lin "	0.0°C
0...1	Standard signal channel 1 , parameter only appears in configuration of standard signal 0: 0...20 mA or 0...10 V DC 1: 4...20 mA or 2...10 V DC	" 1.i_4 "	0
0...1	Standard signal channel 2 , parameter only appears in configuration of standard signal 0: 0...20 mA or 0...10 V DC 1: 4...20 mA or 2...10 V DC	" 2.i_4 "	0
0...1	Standard signal channel 3 , parameter only appears in configuration of standard signal 0: 0...20 mA or 0...10 V DC 1: 4...20 mA or 2...10 V DC	" 3.i_4 "	0
0...1	Standard signal channel 4 , parameter only appears in configuration of standard signal 0: 0...20 mA or 0...10 V DC 1: 4...20 mA or 2...10 V DC	" 4.i_4 "	0
0...1	Set point channel 1 to channel 4 0: one common set point for channel 1 to channel 4 1: separate set points for channel 1 to channel 4	" 4.SPt "	1
0...3	Configuration of controller type , controller output: channel 1 channel 2 channel 3 channel 4 0: heating controller with PID-character 1: cooling controller with PID-character 2: cooling controller with hysteresis setting 3: cooling controller with hysteresis setting	" 1rtY " " 2rtY " " 3rtY " " 4rtY "	according to order
0...28	Configuration relay 1 to relay 8	" rEL.1 " - " rEL.8 "	5
0; 6-8; 13-16; 21-24	no function (output deactivated)		
	1: limit contact absolute, to close on rising temperature 17: just as with locking		
	2: limit contact tracking to minus, to close on rising temperature, 18: just as with locking		
	3: limit contact tracking to plus, to close on rising temperature, 19: just as with locking		

Range:	Parameter:	Display:	Works setting:
	4: limit comparator, closed in good band, 20: just as with locking		
	5: the output takes over the controller function heating or cooling belonging to the configured channel		
	9: limit contact absolute, to open on rising temperature, 25: just as with locking		
	10: limit contact tracking to minus, to open on rising temperature, 26 just as with locking		
	11: limit contact tracking to plus, to open on rising temperature, 27 just as with locking		
	12: limit comparator, open in good band 28: just as with locking		
1 - 4	Channel selection for the corresponding output , the output works with the setting channel 1: channel 1 2: channel 2 3: channel 3 4: channel 4	"r1.Ch" - "r8.Ch"	
0...2	Analogue output of actual value (optional) channel 1 channel 2 channel 3 0: voltage 0...10 V DC current 0...20 mA 1: voltage 0...5 V DC current 0...10 mA 2: voltage 0...2 V DC current 0...4 mA 3: voltage 2...10 V DC current 4...20 mA voltage / current according to order	" 1dAc " " 2dAc " " 3dAc "	
0...1	Automatic start - function 0: no automatic start if controller is switched on 1: controller automatically starts when switched on	" Auto "	0
0...1	Start/stop - key - function 0: normal start/stop-function via key 1: no start/stop-function, controller automatically starts if switched on (independent of parameter "Auto")	" noSt "	0
0...2	Start/stop - function with logic input 7 0: no function 1: controlled by level 2 controlled by slope	" Et.St "	0

Range:	Parameter:	Display:	Works setting:
0...1	Display resolution 0: without 1/10 1: with 1/10	"diSP"	depending upon range
0...1	Fault/error definitions 0: output in case of fault disabled 1: output in case of fault active output K 1 output K 2 output K 3 output K 4 output K 5 output K 6 output K 7 output K 8	" r1.FE " " r2.FE " " r3.FE " " r4.FE " " r5.FE " " r6.FE " " r7.FE " " r8.FE "	0 0 0 0 0 0 0 0
0...96	Baud rate 0: interface disabled 3: 300 Baud 6: 600 Baud 12: 1200 Baud 24: 2400 Baud 48: 4800 Baud 96: 9600 Baud all other settings will result in 300 baud	" bAUd "	0
1...32	Device address	" Adr "	1
0...2	Parity 0: none 1: odd 2: even	" PAri "	0

In case of parameter " 4.SPt " is reconfigured (one common set point or 4 different set points) the set point adjustments in the operation level have to be checked.

Optional: in case of limit contactors are reconfigured its adjustments have to be checked in the extended operating level.

7.5 Parametrication level:

Setting of control parameters:



display to show:

" Cod "

100

Key in code number: Code 55

with the keys:



current value

+1



and

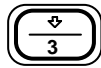


current value +10

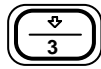
after about 3 s

+100

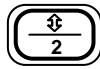
or



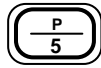
current value -1



and



current value -10 after about 3 s -100



code number confirmed, jump to parameterization level

Range:	Parameter:	Display:	Works setting:
0...30°C	Tune difference from set point	" t.di "	0.0°C
0...1	Define self-tune channel 0: self-tuning for channel 1 to 4 1: disable the input of a self-tune channel "t.ch"	" no.t "	0
0...60 s	Scan - time display	" Sc.t "	3

According to the configuration of the controller outputs (according to the purchase order) only those parameters are on display which correspond to the according function!

Function of controller:

Two point controller with hysteresis setting

Range:	Parameter:	Display:	Works setting:
according to purchase order or name plate	Range start channel 1 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 1.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 1 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 1.rt^- "	according to type of sensor
" 1.rt_ "... " 1.rt^- "	Lower set point limit channel 1	" 1.rdo "	according to type of sensor
" 1.rdo "... " 1.rt^- "	Upper set point limit channel 1	" 1.ruP "	according to type of sensor
0.2...10.0°C	Switching hysteresis channel 1	" 1-HY "	0.5% of set point range
according to purchase order or name plate	Range start channel 2 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 2.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 2 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 2.rt^- "	according to type of sensor
" 2.rt_ "... " 2.rt^- "	Lower set point limit channel 2	" 2.rdo "	according to type of sensor
" 2.rdo "... " 2.rt^- "	Upper set point limit channel 2	" 2.ruP "	according to type of sensor
0.2...10.0°C	Switching hysteresis channel 2	" 2-HY "	0.5% of set point range
according to purchase order or name plate	Range start channel 3 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 3.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 3 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 3.rt^- "	according to type of sensor

Range:	Parameter:	Display:	Works setting:
" 3.rt_ "... 3.rt ⁻ "	Lower set point limit channel 3	" 3.rdo "	according to type of sensor
" 3.rdo "... 3.rt ⁻ "	Upper set point limit channel 3	" 3.ruP "	according to type of sensor
0.2...10.0°C	Switching hysteresis channel 3	" 3-HY "	0.5% of set point range
according to purchase order or name plate	Range start channel 4 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 4.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 4 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 4.rt ⁻ "	according to type of sensor
" 4.rt_ "... 4.rt ⁻ "	Lower set point limit channel 4	" 4.rdo "	according to type of sensor
" 4.rdo "... 4.rt ⁻ "	Upper set point limit channel 4	" 4.ruP "	according to type of sensor
0.2...10.0°C	Switching hysteresis channel 4	" 4-HY "	0.5% of set point range

Two point controller with PID control characteristics:

Range:	Parameter:	Display:	Works setting:
according to purchase order or name plate	Range start channel 1 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 1.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 1 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 1.rt ⁻ "	according to type of sensor
" 1.rt_ "... 1.rt ⁻ "	Lower set point limit channel 1	" 1.rdo "	according to type of sensor
" 1.rdo "... 1.rt ⁻ "	Upper set point limit channel 1	" 1.ruP "	according to type of sensor
0.1...99.9%	Proportional band channel 1 Pb = 0.1...99.9% refer to range " 1.rt_ "... 1.rt ⁻ "	" 1-Pb "	10.0 %
0...499 s	Time derivative channel 1 (set 0 = value 0)	" 1-td "	100 s
0...2000 s	Time integral channel 1 (set 0 = value 0)	" 1-ti "	400 s
0...100%	Maximum integral channel 1	" 1-IE "	30 %
2...60 s	Cycle time channel 1	" 1 CY "	30 s relay 5 s logic
according to purchase order or name plate	Range start channel 2 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 2.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 2 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 2.rt ⁻ "	according to type of sensor
" 2.rt_ "... 2.rt ⁻ "	Lower set point limit channel 2	" 2.rdo "	according to type of sensor
" 2.rdo "... 2.rt ⁻ "	Upper set point limit channel 2	" 2.ruP "	according to type of sensor

Range:	Parameter:	Display:	Works setting:
0.1...99.9%	Proportional band channel 2 Pb = 0.1...99.9% refer to range " 2.rt_ "... 2.rt ⁻ "	" 2-Pb "	10.0 %
0...499 s	Time derivative channel 2 (set 0 = value 0)	" 2-td "	100 s
0...2000 s	Time integral channel 2 (set 0 = value 0)	" 2-ti "	400 s
0...100%	Maximum integral channel 2	" 2-IE "	30 %
2...60 s	Cycle time channel 2	" 2-CY "	30 s relay 5 s logic
according to purchase order or name plate	Range start channel 3 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 3.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 3 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 3.rt ⁻ "	according to type of sensor
" 3.rt_ "... 3.rt ⁻ "	Lower set point limit channel 3	" 3.rdo "	according to type of sensor
" 3.rdo "... 3.rt ⁻ "	Upper set point limit channel 3	" 3.ruP "	according to type of sensor
0.1...99.9%	Proportional band channel 3 Pb = 0.1...99.9% refer to range " 3.rt_ "... 3.rt ⁻ "	" 3-Pb "	10.0 %
0...499 s	Time derivative channel 3 (set 0 = value 0)	" 3-td "	100 s
0...2000 s	Time integral channel 3 (set 0 = value 0)	" 3-ti "	400 s
0...100%	Maximum integral channel 3	" 3-IE "	30 %
2...60 s	Cycle time channel 3	" 3-CY "	30 s relay 5 s logic
according to purchase order or name plate	Range start channel 4 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 4.rt_ "	according to type of sensor
according to purchase order or name plate	Range end channel 4 , range setting according to type of sensor; with input standard signal -200...1000 Digit	" 4.rt ⁻ "	according to type of sensor
" 4.rt_ "... 4.rt ⁻ "	Lower set point limit channel 4	" 4.rdo "	according to type of sensor
" 4.rdo "... 4.rt ⁻ "	Upper set point limit channel 4	" 4.ruP "	according to type of sensor
0.1...99.9%	Proportional band channel 4 Pb = 0.1...99.9% refer to range " 4.rt_ "... 4.rt ⁻ "	" 4-Pb "	10.0 %
0...499 s	Time derivative channel 4 (set 0 = value 0)	" 4-td "	100 s
0...2000 s	Time integral channel 4 (set 0 = value 0)	" 4-ti "	400 s
0...100%	Maximum integral channel 4	" 4-IE "	30 %
2...60 s	Cycle time channel 4	" 4-CY "	30 s relay 5 s logic

7.6 Self-tuning:

For matching the regulator to the regulator path, the DMP 96 C is provided with a tuning facility.

The tuning algorithm is based on modified Ziegler-Nichols rules, whereby the nominal data of the path are determined following an oscillation test in a closed control loop.

These nominal data - in particular the oscillation cycle and amplitude - form the basis for calculating the relevant parameters.

Initiation self-tuning:

The tuning process can be activated at any time, if the controller has been started,

by pressing the key  (5 seconds).

Tuning is then effected on the channel selected by the parameter "t.ch".

The tune facility must be cleared at the parametrication level.

Tuning Example - heating

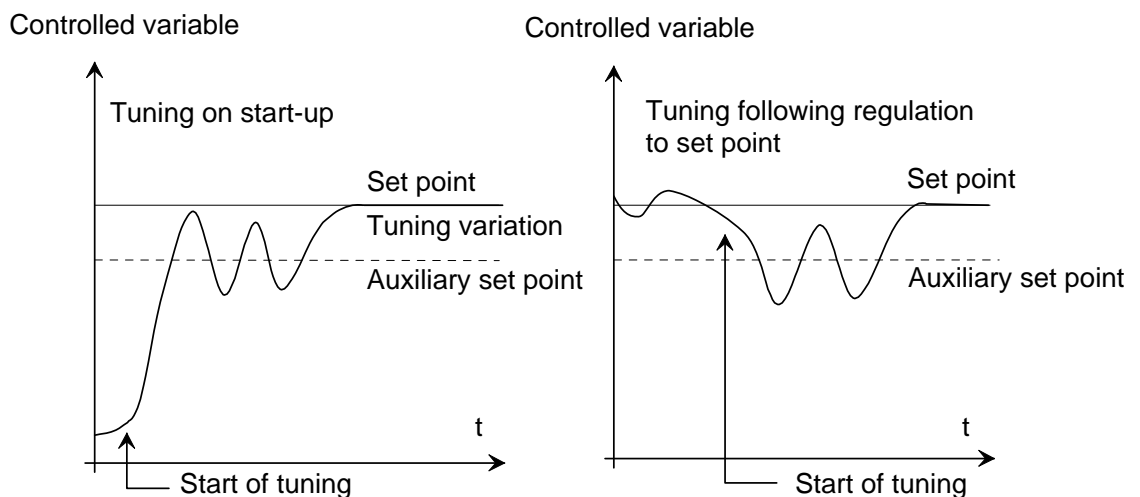


Figure 3: Tuning example

In the tuning procedure, the algorithm employs an auxiliary set point value, which diverges from the set point value by the amount preset in the parametrication level.


Auxiliary set point = set point - "t.di"

During the tuning procedure, the controller works with the P-regulating characteristic ($P_b = 0,1\%$), and as an optical check, the set point and the "OPt" are shown alternately on the lower display.


In order to calculate the parameters, the controller requires two oscillations following which it runs the control variable to the set point.

Once the tuning procedure is finished, only the current set point appears on the lower display. The calculated parameters are saved to the EEPROM where they are protected against power failure. They can now be called up at any time and altered manually.

Aborting tuning:

The tuning procedure can be aborted at any time by pressing  (5 seconds).

The regulator confirms the aborted status by dimming the lower display.

The key  must then be cleared to return the regulator to the normal mode.

7.6.1 Monitoring the optimization process:

The diagrams show possible incorrect settings with suggestions as to how to correct them.

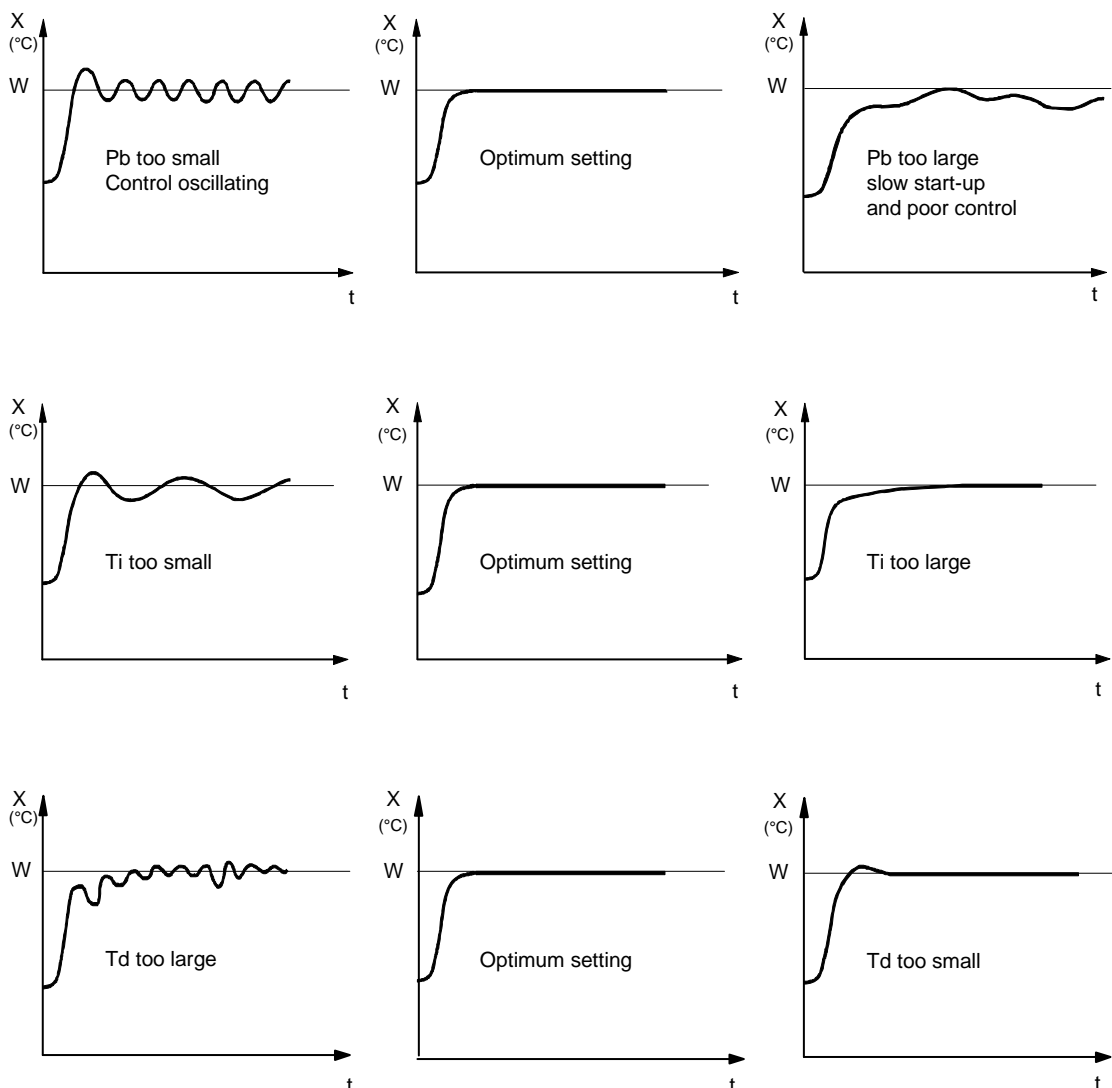


Figure 4: Incorrect settings of the feedback parameters

8. Line Balancing, Zero Point Correction:

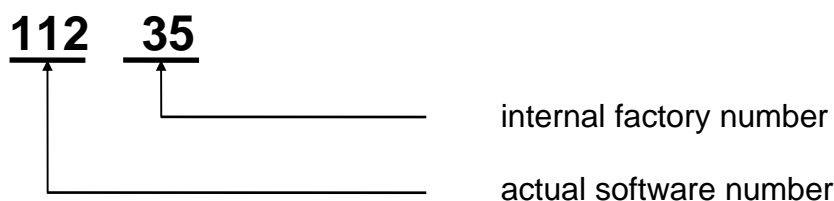
Line balancing or zero point correction can be effected to the respective channel with the parameters "1.Lin" to "4.Lin" (channel 1 to channel 4).
When the actual value is calculated, the offset value set is either added to, or subtracted from it.

9. Error and Faults:

9.1 List of possible error messages (display):

Error-displayed:	Cause:	Action /Description:
1	Writing error I ² C-bus	Switch unit off/on
2	Attempted division by zero	Switch unit off/on
3	Wrong low-pass filter entered (parameter "ti.Fi")	Re-enter parameter "ti.Fi" and switch unit off/on
10	Sensor error channel 1 or sensor error channel 1 to 4 during self-tuning	Check sensor
11	Sensor error channel 2	Check sensor
12	Sensor error channel 3	Check sensor
13	Sensor error channel 4	Check sensor
30	Reading error E ² prom	Switch unit off/on
31	Device not calibrated	Return unit for calibration
32	Calibration faulty	Return unit for calibration

10. Program version:



actual software and program numbers:

- Version 010 22.12.93 basic version: multi channel PID controller
- Version 020 08.03.94 added: limit contacts 1 to 5 (optional)
- Version 021 09.05.94 added: configuration according to purchase order: heating or cooling PID controller, heating or cooling controller with adjustable switching hysteresis; for max. three analogue outputs.

- Version 022 03.06.94 added: separate set points for channel 1 to 4, operation level changed.
correction: 09.06.94: name of parameters "X.rdo" and "X.ruP" in the operation instructions.
- Version 023 22.06.94 correction: two point controller with hysteresis setting: start up self-tuning disabled.
- Version 024 05.08.94 new function: error acknowledgement by code 110; each relay can take off controller functions or limit values functions. The channel who refers the function, can be discontinued in the configuration level.
Units with 2 and 3 channels and free numbers of relay are disposable;
units with analogue outputs current 4...20 mA are deliverable.
- Version 025 05.08.94 correction: controlling of limit contacts 1 to 5.
- Version 030 02.02.95 new function: insert a new interface routine for visual software, revision of the software program.
- Version 031 09.02.95 new function: limit contacts with locking configurable.
- Version 110 23.05.95 new function: Pt 100: channel 1 and channel 2 always three wire lead,
controller character channel 1 to channel 4 configurable,
error-handling of the outputs changed,
no total locking of the outputs in case of an input error.
- Version 111 18.03.96 correction: by switching on the unit in auto start - function the relays don't attract shortly.
- Version 112 22.09.97 new function: start/stop - function by logic input 7,
set point value setting by pressing the key for short time,
parameter for lower range and upper range according to type of sensor,
range of standard signal value configurable (0...20 mA / 4...20 mA or 0...10 V DC / 2...10 V DC).
- Version 113 18.05.98 new function: interface software expanded (parameter higher 0x3ff now describable via interface).
immunity added to operating manual.
- Version 114 23.07.98 new function: additional parameters now accessible via interface,
releasing function of the integrator changed.
- Version 115 23.09.98 correction: evaluation of the logic inputs changed.
- Version 115 21.08.07 change Company-Logo and-Address

11. Immunity:

The noise immunity of the controller has been tested using noise immunity test equipment of the Schaffner company (CH).

- Type NSG 222A: interference simulator with fast interference pulses, a wide band interference spectrum, a very short rise time and little energy

testdata:	puls polarity:	± 2500 V
	rise time:	5 ns
	symmetrical and asymmetrical coupling	

- Type NSG 225A: burst simulator with a wide band interference spectrum and a very short rise time

testdata:	step 3:	2000 V
	frequency:	5 kHz

- Type NSG 203A: test with mains line interruption

testdata:	100% mains line interruption:	50 ms
	frequency:	1 Hz