

Operating Instructions DPC III

Digital Temperature Controller, Type 17-8821-4.2222303.00



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1. Use in accordance with the intended purpose

The DPC III digital temperature controller serves to control temperature in explosion-proof or media-protected heating and heating circuits. In all cases, the DPC III must be installed outside the hazardous (potentially explosive) area. In use, a differentiation must be made between:

- **monitoring explosion-proof heating circuits:**
the DPC III is used together with the Pt100 Ex (Type 27-71..-3.....) resistance thermometer.
- **monitoring non-explosion-proof heating circuits:**
the DPC III is used along with a media protected Pt100 resistance thermometer, e.g. Pt100-resistance thermometer art. no. 03-9040/00.

As a basic rule, in order to ensure a reliable thermal coupling, the resistance thermometer must be attached with mechanical and temperature stability to the point to be measured. This should be done with the aid of aluminium adhesive tape or similar material with the right temperature resistance.

2. Product description

2.1 General points

The DPC III digital temperature controller is a microprocessor-controlled „single loop“ digital controller, with ON/OFF control (two-position controller) and PID with the functions of AUTOTUNING and the automatic calculation of the „FUZZY OVERSHOOT CONTROL“ parameters for PID control.

The controller has default parameterisation as a two-position controller (ON/OFF) controller.

It is possible to reprogram it as a PID controller (see chapter „Use as a PID controller“).

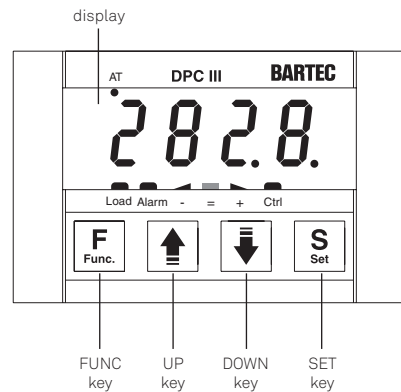
The PID control of the device has a special algorithm that optimises the control effect during process faults or during the alteration of setpoints.

The actual value is shown in the red 4-digit display. The device also has a programmable deviation display consisting of three LEDs.

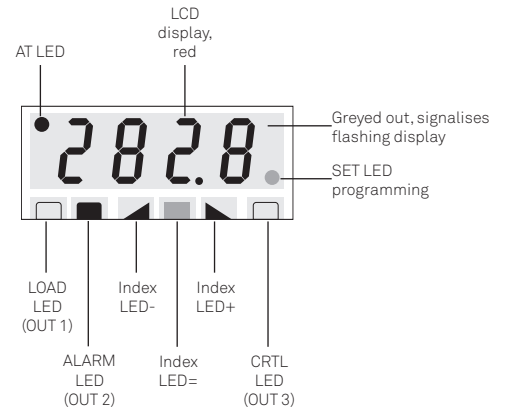
The LEDs show the status of the outputs. Up to 4 setpoints can be stored in the device. The DPC III has two relay outputs and a logic output to control the semi-conductor relay (SSR).

The DPC III series is completely downwardly compatible with the earlier DPC series.

Display and control elements



Details Display



2.2 Display and Control elements

SET key (S)	Access to the programming mode, fast setting and input confirmation.
DOWN key (↓)	This key is used to decrease the level being set. Holding this key down returns the user to the previous programming level until the programming mode is exited.
UP key (↑)	This key is used to increase the level being set. Holding this key down moves the user on to the next programming level until the programming mode is exited. Outside the programming mode, this key displays the controlling power at the output.
FUNC key (F)	holding this key down for a few moments deactivates/activates the control
LOAD LED	indicates the status of output 1 (OUT 1)
ALARM LED	indicates the status of output 2 (OUT 2)
INDEX LED (-, =, +)	indicates deviations from the setpoint
CRTL LED	indicates the status of output 3 (OUT 3)
AT LED	indicates that AUTOTUNING is in progress
SET LED	indicates access to the programming mode
4-digit red display	shows the actual value

3. Safety instructions

- The DPC III must always be installed outside the hazardous area.
- Before commissioning, please check the marking on the DPC to make sure that it is suitable for the intended purpose.
- When using electrical systems, the relevant installation and operation regulations must be followed also other relevant national regulations.
- All generally applicable statutory rules and other binding directives on workplace safety, accident prevention and environmental protection must be complied with.
- Before connecting the outputs to the consumer, it is essential to ensure that the set parameters actually conform to the required parameter levels and that the application functions correctly so that the system will not be affected by any faults that could harm people or damage equipment.
- The device may not be opened when connected to the voltage supply. Repairs may only be done by the manufacturer

4. Assembly, Installation and Commissioning

4.1 Assembly

The controller is fitted into a DIN enclosure with 4 horizontal pitches. The device is snapped onto a TS 35 rail (in conformance to DIN EN 60715 TH35).

It must be ensured that the device is ventilated sufficiently. Avoid installation in areas which have devices that could cause the controller to undershoot or overshoot the specified temperature range.

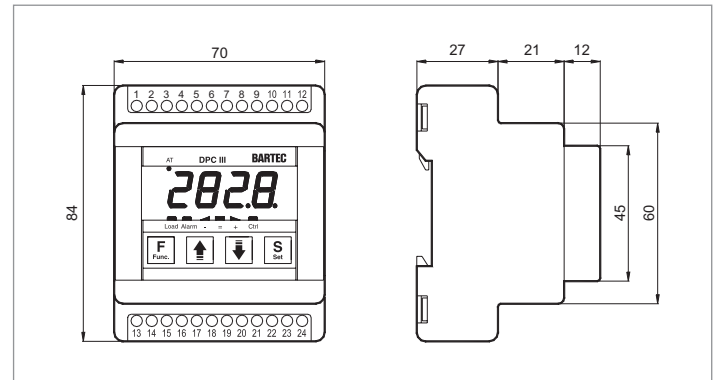
The device must be installed as far away as possible from sources that could cause severe electromagnetic interference (e.g. from motors).

When connecting multi-wired or fine-wired conductors, the ends of the conductors must be prepared accordingly.

Installation instructions for the assignment of the terminals

Conductor	Min. cross-section	Max. cross-section	Minimum length of wire and ferrule
rigid	0,2 mm ²	2,5 mm ²	
with wire end ferrule	0,25 mm ²	2,5 mm ²	10 mm
2 conductors, rigid	0,2 mm ²	0,75 mm ²	
2 conductors with non-insulated wire end ferrule	0,2 mm ²	0,75 mm ²	10 mm
2 conductors with TWIN wire end ferrule	0,5 mm ²	1,5 mm ²	10 mm

4.2 Dimensions



4.3 Installation

- The device must be connected in accordance with the wiring diagram with due consideration to the current/voltage specifications. It is essential to observe the specifications on the type label.
- As the device is provided for a permanent connection in a device, it has neither switches nor internal guards against overcurrent. For that reason a disconnecting device must be provided to interrupt the supply of power to the device.
- In addition, all circuits connected to the device must be protected by suitable devices (e.g. fuses) that are appropriate for the existing current levels

4.4 Commissioning

The device may only be operated if it is in a clean and perfect condition. If damage is visible, the device must be put out of operation and appropriate repair measures taken.

Commissioning must be done in the following order:

- Establish the electrical connections for the device
- Assign parameters for the setpoints
- Check that the device functions in the proper manner for the application. If used as a two-position controller, the switching rate must be checked. If the switching rate is high, the hysteresis must be increased (see Chapter 5.1)

5. Adjustment of the two-position controller

5.1. Setpoint inputs with the function

Fast setting“ (factory setting)

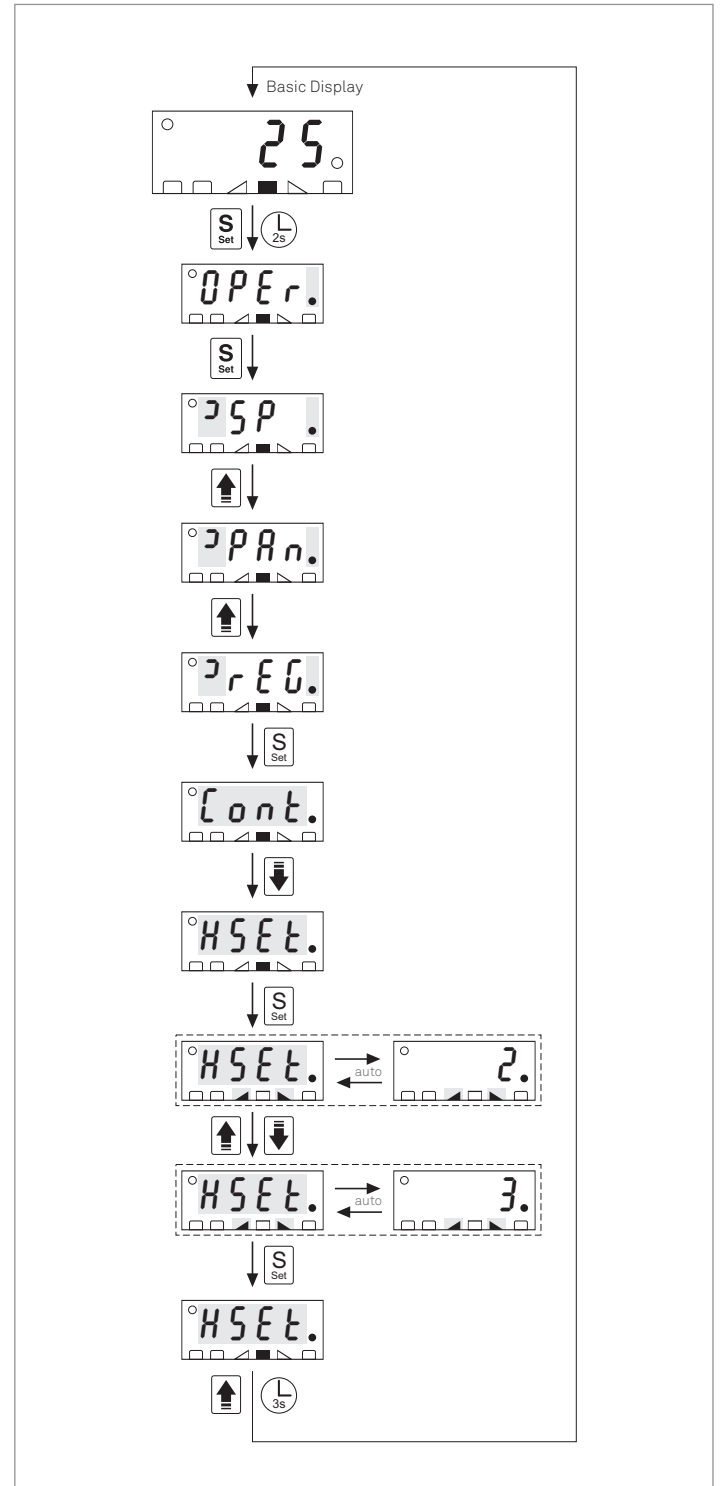
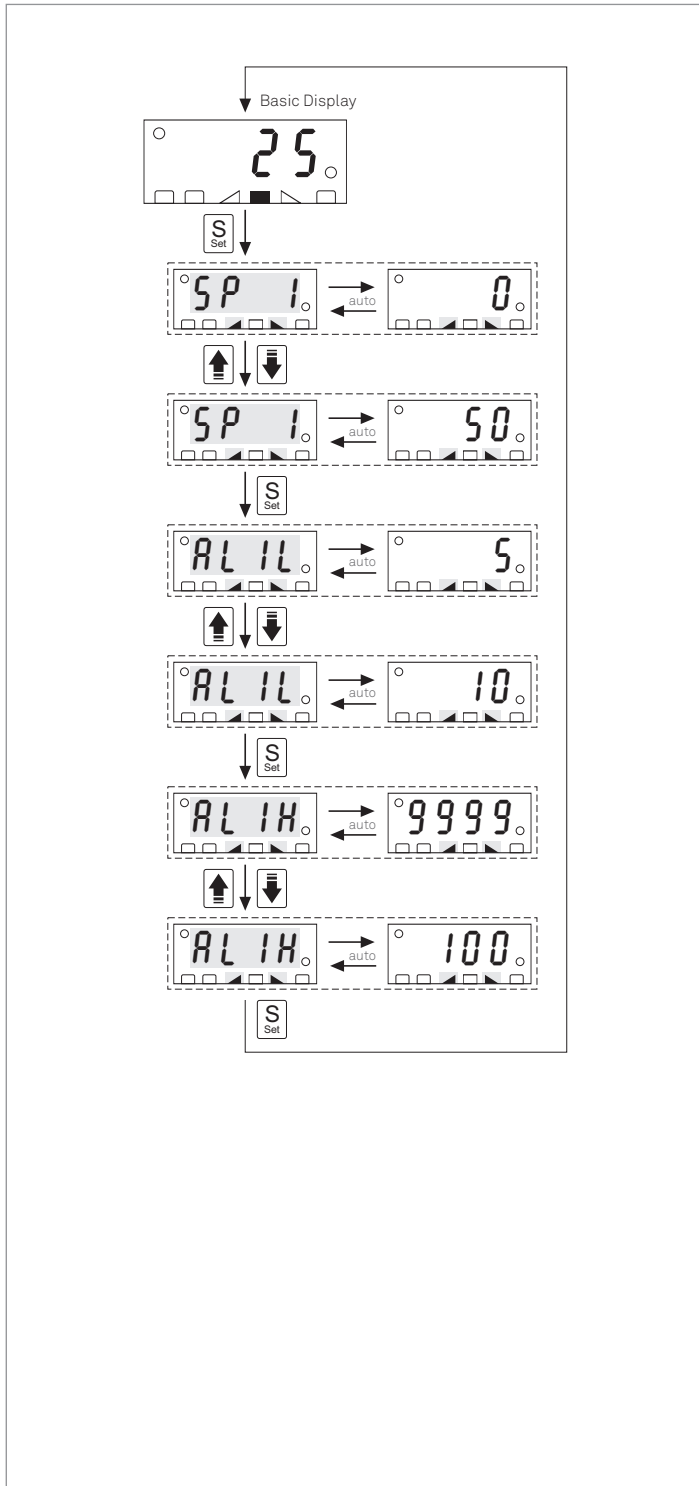
Example:

Setpoint (SP1 = 50 °C)

Low alarm (AL1L = 10 °C)

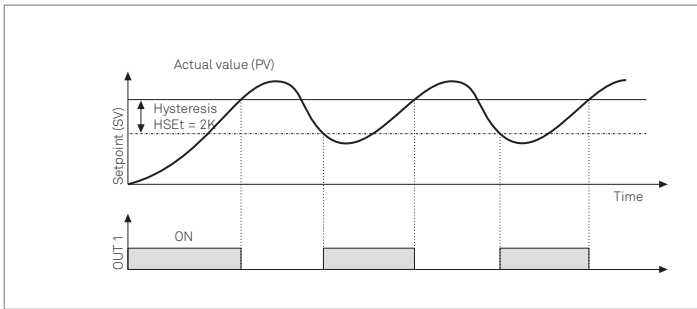
High alarm (AL1H = 100 °C)

5.2. Altering the hysteresis

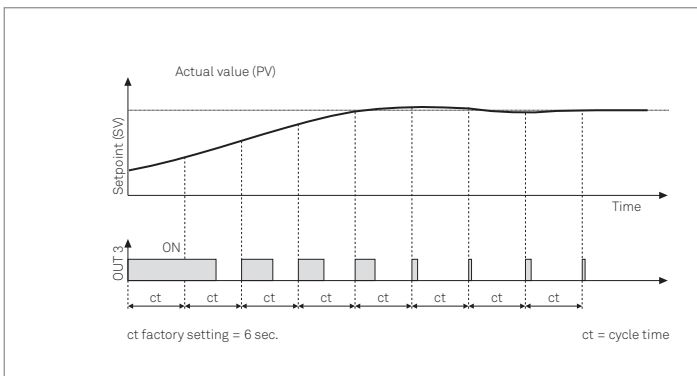


6. Mode of operation of the controller

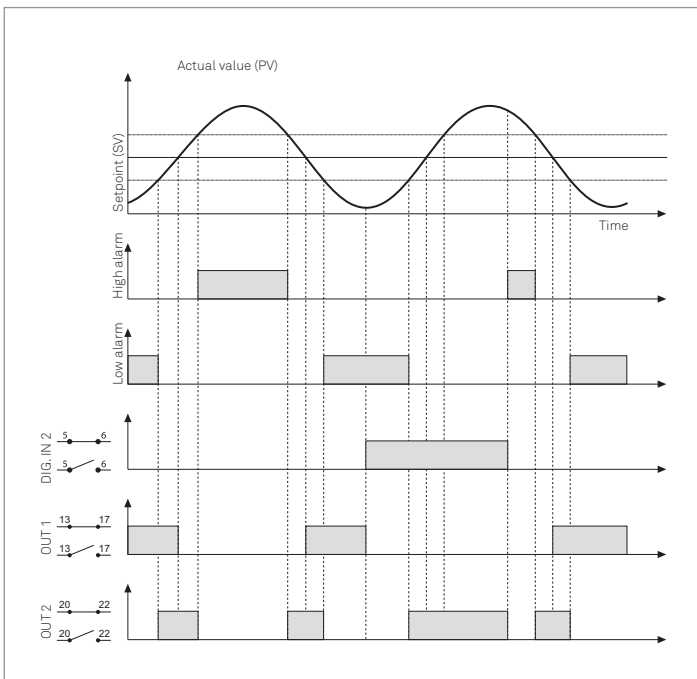
6.1. Function diagram two-position controller (factory setting)



6.2 Function diagram PID-controller



6.3 Function diagram digital input

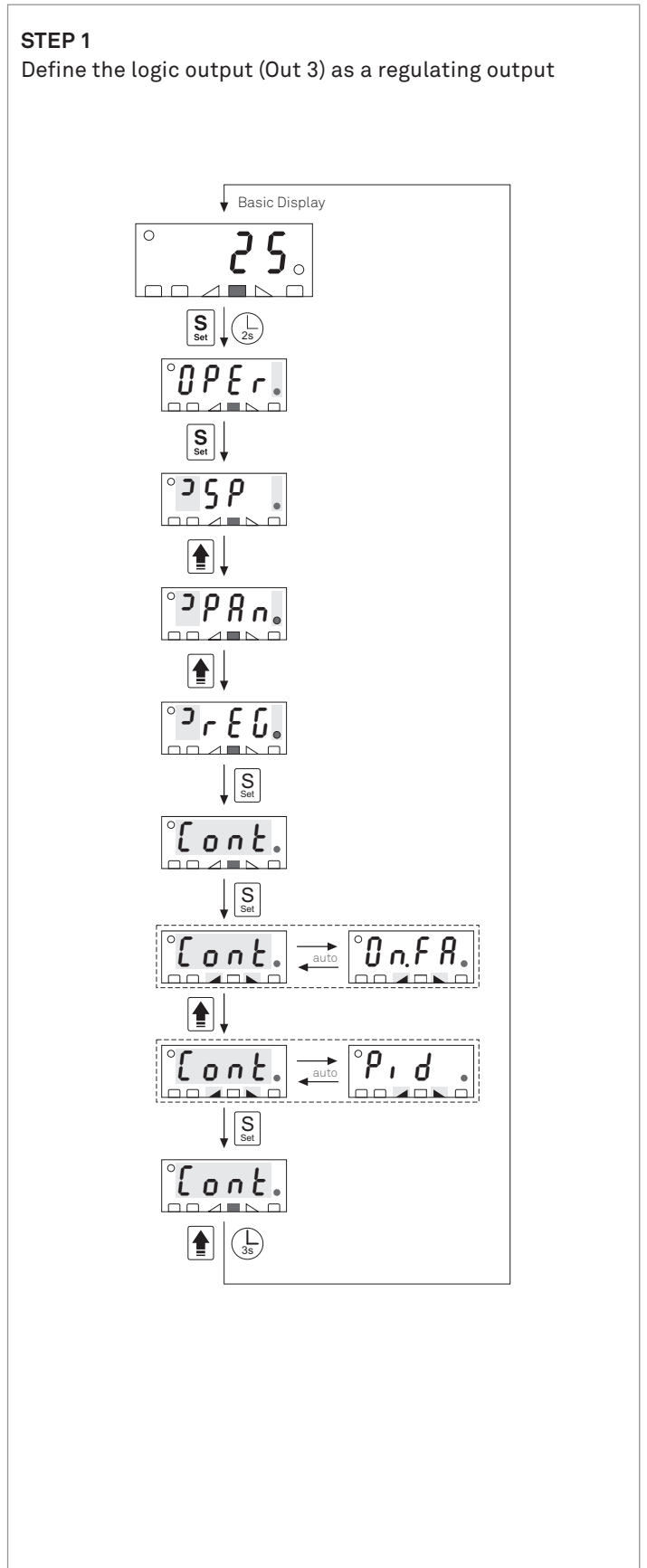


7. Use as a PID controller

This type of control can be set in the following three steps:

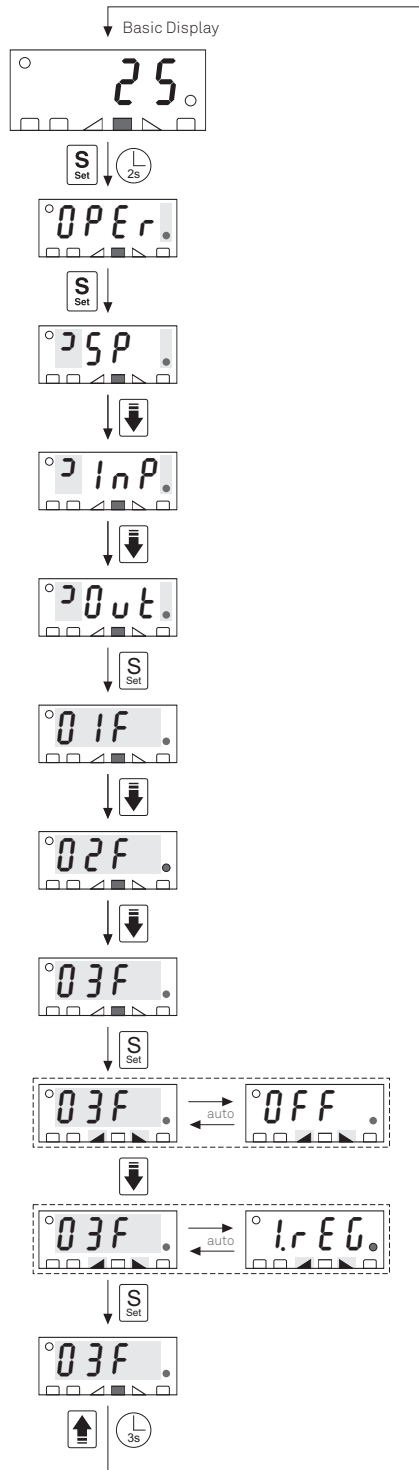
STEP 1

Define the logic output (Out 3) as a regulating output



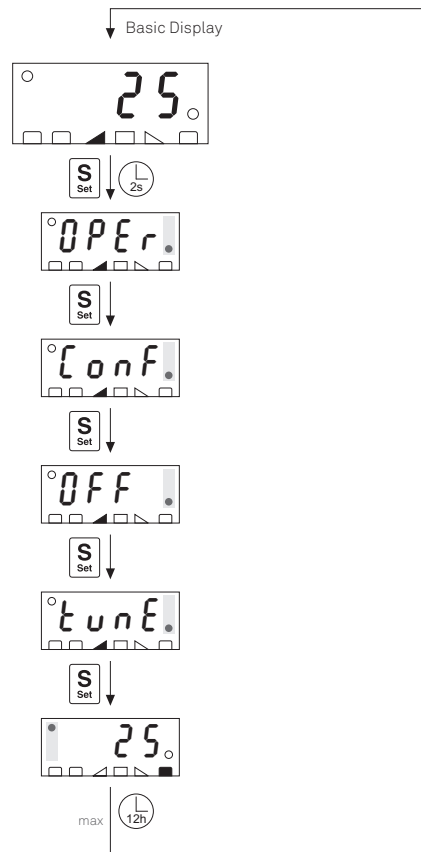
STEP 2

Select the PID type of control



STEP 3

If you so wish, the factory-set standard PID parameters can be determined automatically by means of AUTOTUNING and saved in the device.



8. Operation, Maintenance

The owner/managing operator of an electrical system must ensure that the operating equipment is in proper condition, operate it in accordance with instructions, monitor it and carry out preventative and corrective maintenance.

Each piece of electrical equipment must be selected according to its suitability.

Before being put into operation again, the applicable laws and directives must be observed. The safety instructions given must be followed before maintenance work is done or failures rectified.

9. Alarm management

9.1 Measuring circuit monitoring

The connected temperature sensor system (Pt100) is monitored for the following faults:

- Short-circuit sensor
- Interruption sensor
- Sensor undershooting or overshooting of the measuring range

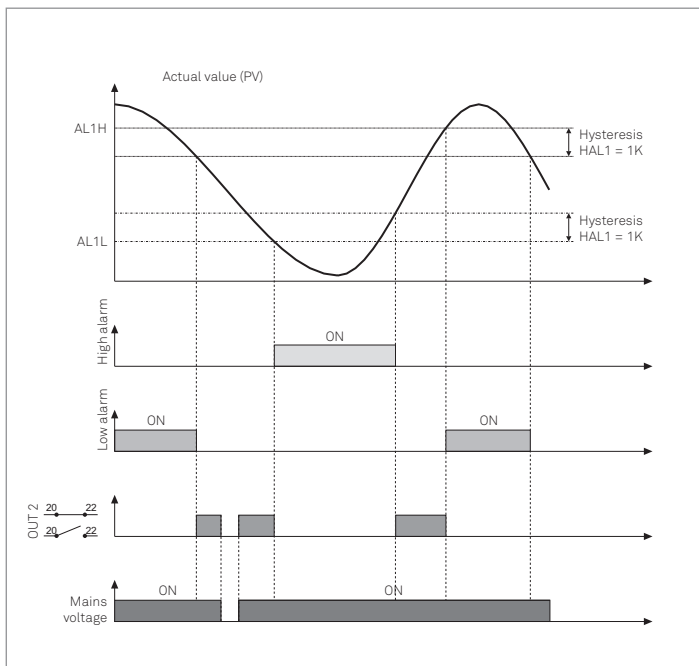
When one of these faults occurs, the device reacts as follows:

- Contact load relay (OUT 1) opens
- Contact alarm relay (OUT 2) opens
- Logic output (OUT 3) switches off

9.2 Temperature alarms

The floating relay output OUT 2 is factory-set as a group alarm output in the „normally energised /NC = normally closed“ mode of operation. Accordingly, the contact remains closed (relay activated) as long as there isn't any fault. This principle of action allows wire breakage and power failure to be detected.

The following shows this effect in detail:



10. Technical data

Types of control	two-position (ON/OFF), PID
Serial interface	Only Version Monitor: RS485 with Modbus RTU protocol
Display	1-line, red display (h = 12 mm, 4 digit); some green status LEDs
Measuring and display accuracy	0.5 %
Ambient temperature range	0 °C up +50 °C
Storage temperature	-10 °C up +60 °C
Enclosure	Plastic UL 94 V0
Terminals	Terminal screws; max. 2.5 mm ² (see also the Chapter on Assembly)
Dimensions	Length: 70 mm Width: 84 mm Mounting depth: 60 mm
Installation dimensions	4 DIN horizontal pitches (45 x 70 mm)
Protection class	IP 40 (front plate)
Installation position	Horizontal on TS 35 rail
Weight	ca. 230 g

11. Electrical data

Voltage supply (see type label)	AC 100 to 240 V, +/- 10 %, 50/60 Hz or AC/DC 24 V, +/- 10 %
Digital inputs	Floating contacts required
Output 1	Relay (normally-open contact) AC 250 V 16A (ohmic load)
Output 2	Relay (change-over) AC 250 V 8A (ohmic load)
Output 3	Logic output for SSR control (DC 11 V/20 mA)
Power consumption	Max. 5 VA
Measuring circuit	$U_{max} = 5 \text{ V}, I_{max} = 0.15 \text{ mA}$
Electrical safety	EN 61010-1 :2010
Electromagnetic compatibility	EN 61326-1

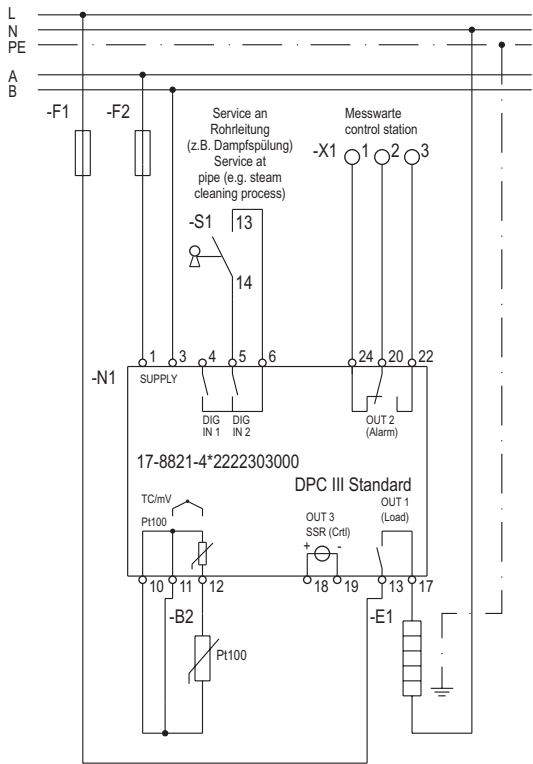
12. Electrical Connection

Electrical Connection	Device Connections
Terminals 1, 3	Mains connection
Terminals 4, 5, 6	Digital inputs
Terminals 7, 8, 9	RS485 interface
Terminals 13, 17	Floating normally-open contact OUT 1 (Regulating output for ON/OFF control)
Terminals 20, 22, 24	Floating change-over OUT 2 (Group fault alarm)
Terminals 18, 19	Logic output for SSR OUT 3 (Regulating output for PID control)
Terminals 10, 11, 12	Sensor connection for: <ul style="list-style-type: none"> - BARTEC resistance thermometer Pt100 Ex, (2 or 3-conductor version) - BARTEC resistance thermometer Pt100 M, (2 or 3-conductor version) - Thermocouple J, K, S - Voltage signal 0 to 50 mV 0 to 60 mV, 12 to 60 mV

Note: In the Pt100 two-conductor version terminals 2 and 3 must be bridged – as the sensor will otherwise malfunction!

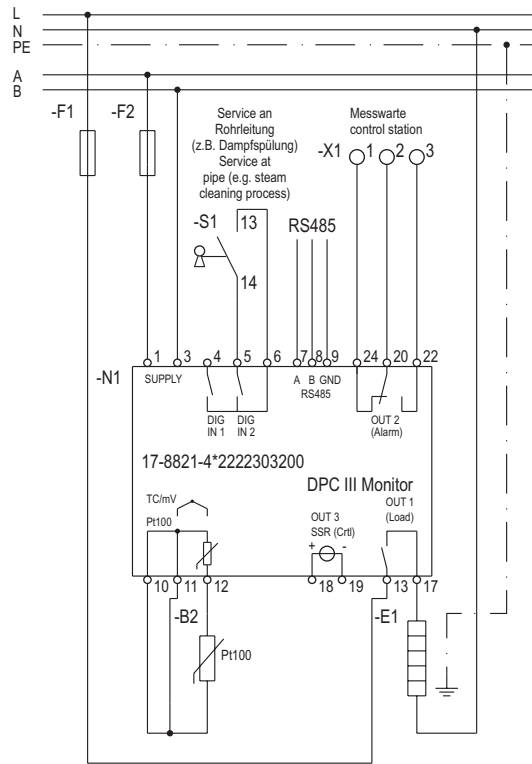
12.1 Wiring diagrams DPC III Standard

DPC III standard as two-position controller (ON/OFF)
Supply voltage A-B see type label

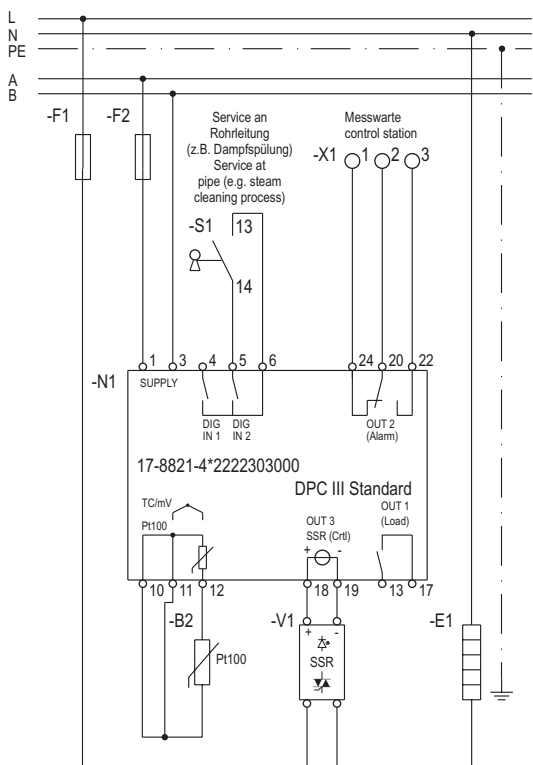


12.2 Wiring diagrams DPC III Monitor

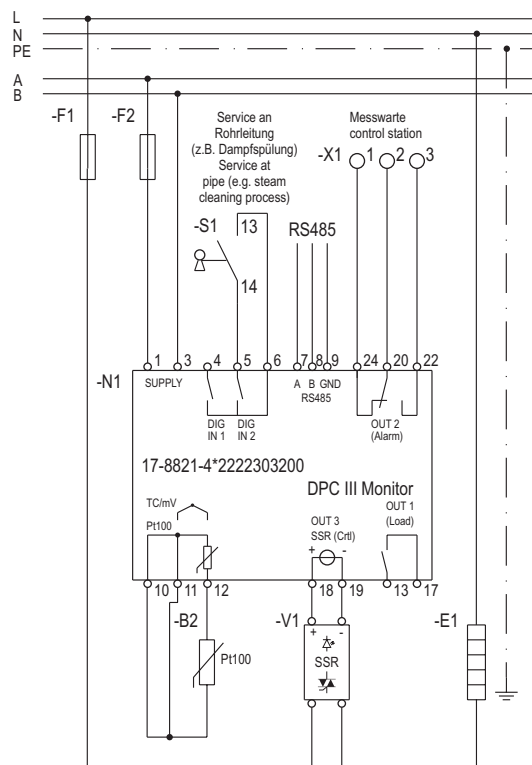
DPC III Monitor as two-position controller (ON/OFF)
Supply voltage A-B see type label



DPC III Standard PID Controller
Supply voltage A-B see type label



DPC III Monitor as PID-Controller
Supply voltage A-B see type label



13. List of Parameters

Display Parametername	Group of parameters	Description	Levels Setting range	Factory setting	Version Standard	Version Monitor
SP 1	SP	Setpoint 1 heating (regulating output)	-1999 °C to +9999 °C	0 °C	+	+
AL1L	AL 1	Setpoint low alarm (alarm output)	-1999 °C to AL1H	5 °C	+	+
AL1H	AL 1	Setpoint high alarm (alarm output)	AL1L to 9999 °C	9999 °C	+	+
Add	SEr	Device address for serial interfacec	0 to 255	1		+
bAud	SEr	Transmission speed of the serial interface 19.2 / 38.4	1200 / 2400 / 9600 /	9		+
PACS	SEr	Access control through serial port "LoCl" = can only be programmed with keypad; LorE = can be programmed with keypad and interface	LoCl/LorE	LorE		+

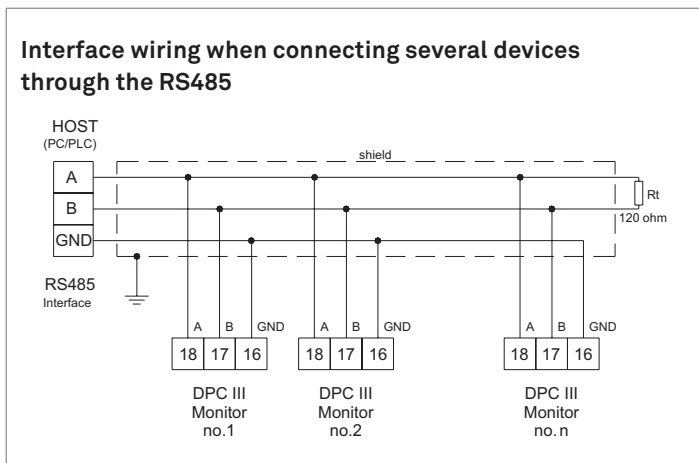
14. Fault signals / fault clearance

Display of the fault in the display	Description	Fault clearance procedures
	Interruption sensor	Check and if necessary replace the sensor. The fault signal is automatically reset once the fault has been rectified.
	The temperature measured is lower than the sensor limit level.	Check and if necessary replace the sensor. The fault signal is automatically reset once the fault has been rectified.
	The temperature measured is higher than the sensor limit level.	Check and if necessary replace the sensor. The fault signal is automatically reset once the fault has been rectified.
	Autotuning cannot be carried out.	Set the controller to OFF and then activate the automatic regulation (rEG) to eliminate the fault. Repeat autotuning once the cause of the fault has been found.
	Autotuning could not be repeated within a period of 12 hours.	Check sensor and heating circuit for operability and then repeat autotuning.

15. Type Designations

Type	Description
17-8821-4722/2230 3000	DPC III Standard; AC 100 to 240 V
17-8821-4C22/2230 3000	DPC III Standard; AC/DC 24 V
17-8821-4722/2230 3200	DPC III Monitor; AC 100 to 240 V, with RS485
17-8821-4C22/2230 3200	DPC III Monitor; AC/DC 24 V, with RS485

Example type label



EU Konformitätserklärung
 EU Declaration of Conformity
 Déclaration UE de conformité



Nº 11-8821-7C0001_B

Wir	We	Nous
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BARTEC GmbH
 Max-Eyth-Straße 16
 97980 Bad Mergentheim
 Germany

erklären in alleiniger Verantwortung, dass das Produkt Digitaler programmierbarer Regler DPC III	declare under our sole responsibility that the product Digitaler programmierbarer Regler DPC III	attestons sous notre seule responsabilité que le produit Digitaler programmierbarer Regler DPC III
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Typ 17-8821-42/2230 3*****

auf das sich diese Erklärung bezieht den Anforderungen der folgenden Richtlinien (RL) entspricht EMV-Richtlinie 2014/30/EU NS-Richtlinie 2014/35/EU RoHS-Richtlinie 2011/65/EU und mit folgenden Normen oder normativen Dokumenten übereinstimmt	to which this declaration relates is in accordance with the provision of the following directives (D) EMC-Directive 2014/30/EU LV -Directive 2014/35/EU RoHS-Directive 2011/65/EU and is in conformity with the following standards or other normative documents	se référant à cette attestation correspond aux dispositions des directives (D) suivantes Directive CEM 2014/30/UE Directive BT 2014/35/UE Directive RoHS 2011/65/UE et est conforme aux normes ou documents normatifs ci-dessous
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EN 60730-1:2019

EN 60730-2-9:2020

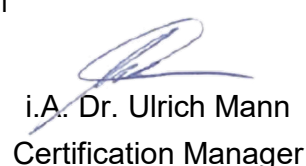
Verfahren der internen Fertigungskontrolle	Procedure of internal control of production	Procédure de contrôle interne de fabrication
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Bad Mergentheim, 06.12.2021


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