Users guide for P4 devices
Process devices

48x24

72x24

72x36

96x24

96x48

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1. Brief description

The **P4** is fed by a signal in the current loop of 4...20 mA. The display shows process signals via a 4-digit 7-segment display.

2. Safety instructions

Please read the users guide before installation and keep it for future reference.

2.1. Proper use

The **P4** is intended for the display of process data in a current loop with a 4...20 mA signal.

Danger! Careless use or improper operation can result in personal injury and/or damage to the equipment.

2.2. Control of the device

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediatly of any damage.

2.3. Installation

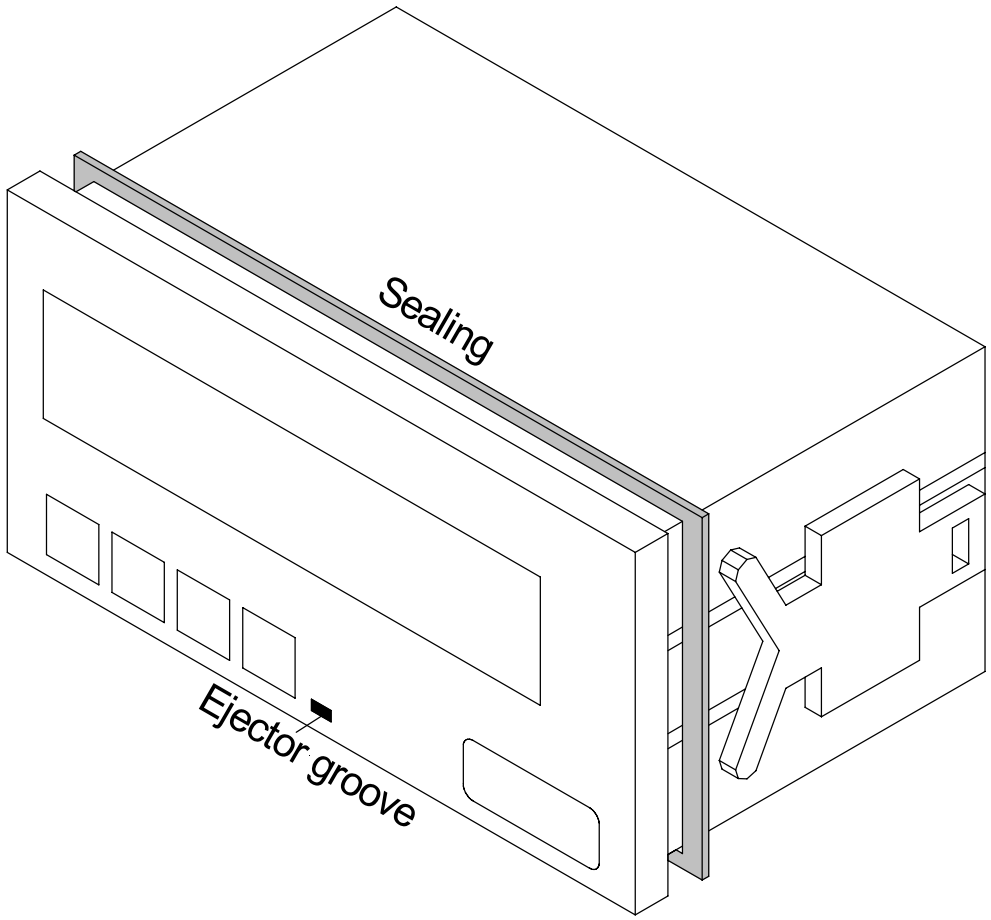
The **P4** must be installed by a suitably qualified specialist (e.g. with a qualification in industrial electronics).

2.4. Notes on installation

- ❑ There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.
- ❑ Do not install inductive consumers (relays, solenoid valves etc.) near the device and suppress any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes.
- ❑ Keep signal lines separate from control and supply lines. Position go and return lines next to one another. Where possible use twisted pair.
- ❑ The device is not suitable for installation in areas where there is a risk of explosion.
- ❑ Any electrical connection deviating from the connection diagram can endanger human life and/or can destroy the equipment.
- ❑ The device must not be mounted in the field of direct solar radiation.
- ❑ Do not install several devices immediately above one another (ambient temperature).

3. Assembly

On front of the **P4** are the operating and display elements. On the sides are the fixing elements to mount the device in the panel. On the back are the terminals for all the electrical connections. A sealing strip is inserted between the contact surface of the front collar and the control panel.
The **P4** is intended for installation in a control panel. Before assembly, a cut-out must be made to accommodate the device. The sizes and tolerances are given in the technical data.



View of the **P4** (model 96 x 48)

3.1. Inserting in the panel cut-out

I. Before inserting the unit, the side fixing elements must be pulled from the rail. To do this, use a suitable screwdriver to slightly raise the locking catch of the fixing element and simultaneously pull it out backwards.

II. Lay the sealing strip around the unit and push it up against the front collar. Then push the unit from the front through the cut-out.

III. Then place the fixing elements into the guide rails from the rear. While doing this, hold the unit from the front securely in the cut-out. Then, using a slotted screw driver, push the fixing elements as far as possible towards the front panel from the rear. Check that the sealing strip is properly positioned between the front collar and the control panel and correct it if necessary.

IV. Then secure the unit by pushing the fixing elements from behind up against the control panel until the unit becomes firmly secured in the control panel.

3.2. Dismantling

To remove the unit, follow the same steps as described for Assembly in reverse order.

For the version featuring the protective system IP65, a new sealing strip must be used if the unit is replaced.

4. Electrical connection

The electrical connection is made on the rear of the unit. The unit is supplied from the current loop so that there is no need to connect any auxiliary power source.

4.1. Connection position

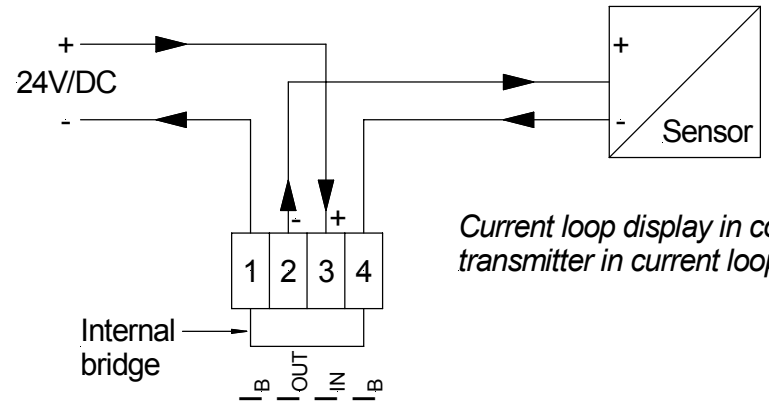
The following table lists the terminal positions for the various models.

Terminal	Function	Terminal description
1	Brücke	I_B
2	Signal-	I_{OUT}
3	Signal+	I_{IN}
4	Brücke	I_B

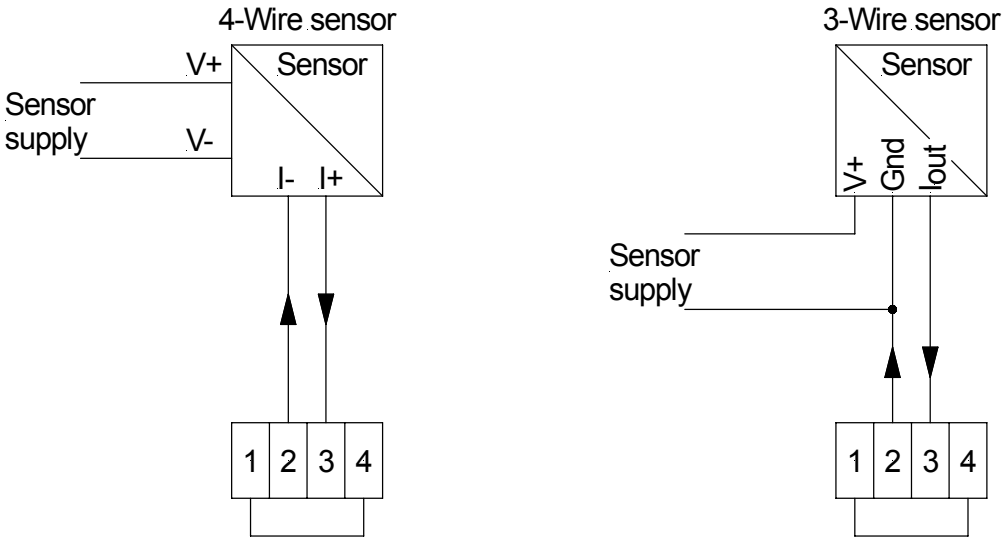
In the following section you will find a connection example for the **P4**.

4.2. Example of connection

The signal from the current loop is passed through the unit via two poles, which means that a terminal can be saved when running the line in a switchbox.



Current loop display in conjunction with a transmitter in current loop technique



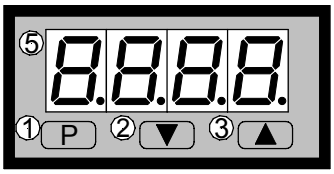
Current loop display in conjunction with a 3-/4- wire sensor

5. Operation

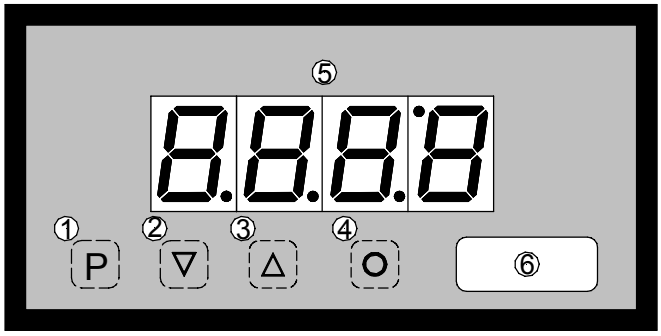
The units are configured via three keys; they feature a 4-digit 7-segment display of different height depending on the size of the housing.

5.1. Operating and display elements

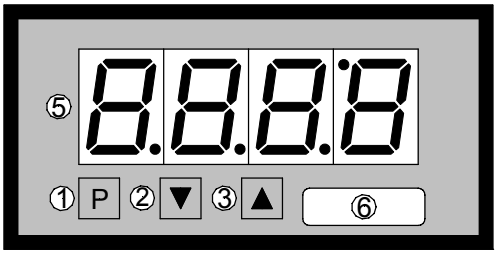
Housing size 48x24



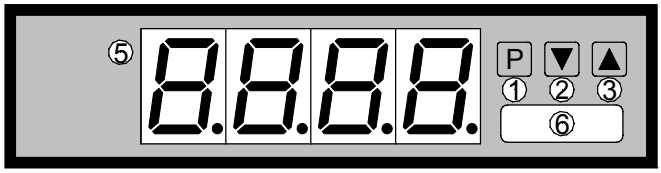
Housing size 96x48



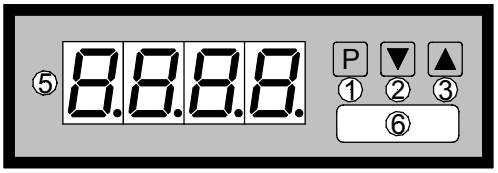
Housing size 72x36



Housing size 96x24



Housing size 72x24



Operating and display elements

1	Program key [P]	With the program key, you can call up the programming mode or perform various functions in the programming mode.
2	Minus key [DOWN]	The minus key is used in programming mode for setting parameters and call up of the minimum value.
3	Plus key [UP]	The plus key is used in programming mode for setting parameters and call up of the maximum value.
4	Tara key [○]	With the tare key, the display can be temporarily set to a parameterised value.
5	7-segment display	The 7-segment display shows the counted number or, during programming, the program numbers or parameters.
6	Dimension window	Here, a physical dimension can be inserted ex factory if desired.

5.2. Dimension strip

A dimension strip with a physical unit can be fitted ex factory if desired.

5.3. Starting sequence

The display begins with the initialisation sequence: segment test, type ("-P4-"), version number (e.g. "U1.00"), and then changes to operating/display mode. Each phase of the starting sequence is displayed for about 1 second.

5.4. MIN/MAX-memory

The measured minimum and maximum values are saved in a volatile memory in the unit.
You can call up the contents of the memory by pushing (shorter than 1 second) the [UP] or [DOWN] key. The relevant value is indicated for approx. 7 seconds. By briefly pressing the same key again, you will return immediately to the display mode.

[UP] ⇒ Display of the MAX value
[DOWN] ⇒ Display of the MIN value

You can erase the MIN- or MAX-value shown in the display by simultaneously pressing the [UP] & [DOWN] keys. The erasure is acknowledged by horizontal bars. The content of the memory is lost when the unit is switched off.

5.5. Overflow/Underflow

An overflow of the display is indicated by horizontal bars at the top of the 7-segment display. An underflow of the display is indicated by horizontal bars at the bottom of the 7-segment display.

5.6. Taring

With the tare function, the unit offers the possibility of setting the display temporarily to a parameterised value. This may be necessary with weighing applications or when differences are being measured.

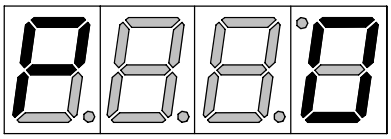
With the 96x48mm units, the tare function can be triggered via the [○] key. With all other housings, the [UP] & [DOWN] keys must be pressed simultaneously while in operating mode.

In the default configuration, the tare function is deactivated.

6. Programming

This section deals with the programming and parameterisation of the **P4**. It also describes the special features and effects of the individual parameters of the program numbers.
The keys are shown below the display, although their position may deviate from this in the actual layout of the unit. If so, you can take the position and function of the keys from the chapter *5.1 Operating and display elements*.

The display shows the program numbers (PN) right-aligned, as a 3-digit number with a **P** at the front.



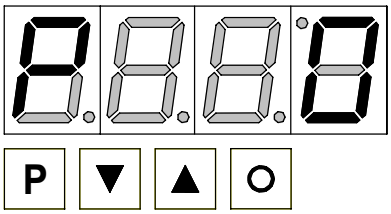
Example: Display of e.g. program number 0

6.1. Programming procedure

The entire programming of the **P4** is done by the steps described below.

Change to the programming mode

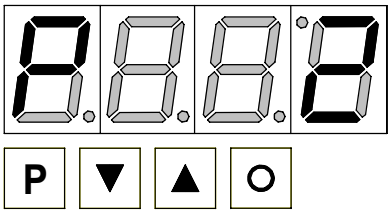
Push the [P] key to change into programming mode. The unit goes to the lowest available program number.



Example:
Change to programming mode by pushing key [P]. The first released program number (PN) appears, in this case PN0.

Changing to other Program numbers

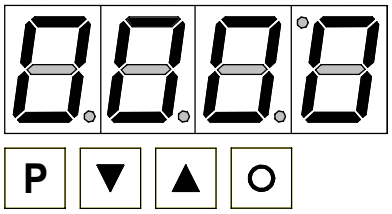
To change between individual program numbers, hold the [P] key down and push the [UP] key for changing to a higher program number or the [DOWN] key for changing to a lower number. By keeping the keys pushed, e.g. [P] & [UP], the display will begin, after approx. 1 second, to automatically run through the program numbers.



Example:
A 0 is parameterised under PN2.
Hold the [P] key down and press the [UP] key several times. PN2 appears in the display. Under this parameter, the starting value can be changed.

Change to the parameter

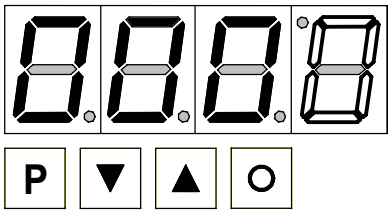
Once the program number appears in the display, you can push the [DOWN] or [UP] key to get to the parameters set for this program number. The currently stored parameters are displayed.



Example:
By pushing the [DOWN] or [UP] key, the currently stored value for PN2 appears in the display.
In this case, it is 0.

Changing a parameter

After changing to the parameter, the lowest digit of the respective parameter flashes on the display. The value can be changed with the [UP] or [DOWN] key. To move to the next digit, the [P] key must be briefly pushed. Once the highest digit has been set and confirmed with [P], the lowest digit will begin to flash again.

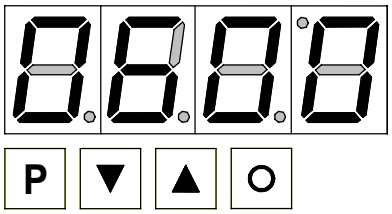


Example:
The 0 is flashing; this is the lowest value digit and, by flashing, it is asking for a figure to be entered. In our example, the value is to be changed from 0 to 600.
Press the [P] key twice briefly to move two places towards the front. The 0 will begin to flash. Change it to 6 using the [UP] or [DOWN] key. Press the [P] key to move to the next digit. In this case, the 0 does not need to be changed.

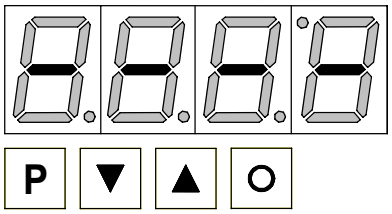
Saving parameters

All parameters must be acknowledged by the user by pushing the [P] key for approx. 1 second. The changed parameters are then taken over as the current operating parameters and saved in the EEPROM. This is confirmed by horizontal bars lighting up in the display. Prior to that, the display remains dark for about 1 second.

Example:



Save the parameters by pushing [P] for 1 second. This functions only when the stored value is shown in the display!



All the newly entered data are confirmed by the unit. If no confirmation is received, the relevant parameters have not been saved.

Example:
You receive confirmation from the unit that the changes have been saved through the appearance of horizontal bars in the middle segments.

Change to the operating mode

If no key is pressed in programming mode for approx. 7 seconds, the unit automatically returns to operating mode.

6.2. Functions of program numbers

6.2.1. Measuring input PN0

For the basic configuration of the unit, you must parameterise the right measuring input for your application under this program number.
You can choose between the factory calibration (PN0 =1) and a sensor calibration (PN0=0).

6.2.2. Scaling PN1 and PN2

The two program numbers 1 and 2 serve to scale the display; with these two parameters, the zero point and end value are parameterised.
With sensor calibration (PN0=0), the relevant sensor signal must also be applied.

6.2.3. Decimal point PN3

By changing this parameter, the position of the decimal point in the display is changed. With temperature measurements, the physical unit can also be added.

6.2.4. Indication time PN4

With this parameter, you set the time interval after which the display is updated or after which the set points are updated. An arithmetic mean is calculated via the set measuring time.

6.2.5. Zero point stabilisation PN5

With this parameter it is possible to make the display show "0" when the input signals are very weak. You enter the figure up to which you want the display to show "0".
This function can be used, for example, to make the display show "0" when, with an analogue rev counter, there is a temperature drift in the measuring section. In addition, the display of negative speeds is suppressed.

6.2.6. Taring PN6

The tare function with the keys on the front can be activated or deactivated with this parameter.

6.2.7. TARE value PN7

With the TARE value, you define the value to be displayed by the unit after the taring operation. When taring, an offset shift occurs in the configured characteristic line. If the display is used, for example, to display weights, and if the empty scales are to be tared to a display value of –5.0, then this value should be set under PN7.

6.2.8. Security settings, User levels PN50 and PN51

Access to the input parameters is only possible when the programming lock PN50 corresponds to the parameterised authorization code PN51. With the programming lock activated, the display always changes to PN50 when the [P] key is pressed.
In chapter 7 (Program number table) you can enter your own personal authorization code or call it up if you have previously entered a code.

6.2.9. Linearisation PN100...PN130

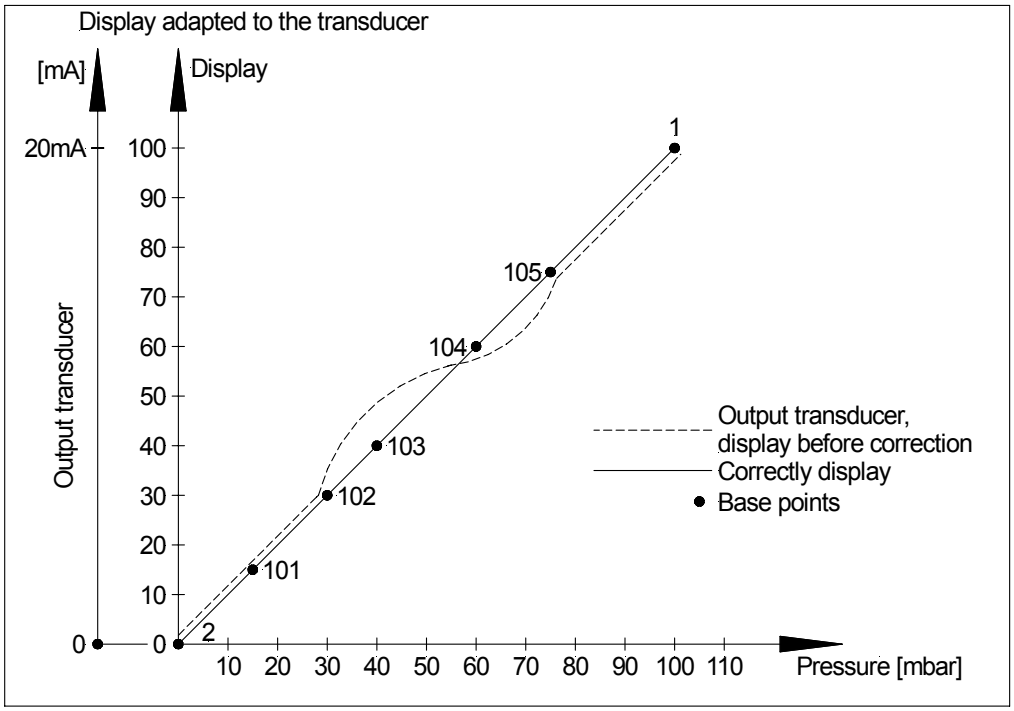
With the linearisation function, the **P4** offers the possibility of programming up to 30 additional calibration points via the two standard calibration points (PN1, PN2). To do this, you must enter the desired number of additional calibration points under program number PN100. They can only be parameterised by sensor calibration via the program numbers PN101 to max. PN130.

Example:
To program e.g. 5 additional calibration points, five calibration points must be entered under PN100.
Then, for each one of the calibration points, the relevant current must be applied to the unit and the respective display value programmed under the following program numbers PN101 – PN105.
The sensor signal must be constantly parameterised during this process. A gap of at least +1 digit to the previous display value must be adhered to, otherwise the input will be refused and no confirmation of the saving will be given – see chapter *Saving parameters*.
Linearisation of a pressure transducer for 0...100 mbar with an output of 0...20 mA.
The display value before correction can either be calculated from the known characteristic line of the transducer or determined empirically.

In our example, the real sensor has an offset error of 0.4mA at 0 bar, and is highly non-linear in the pressure range between 30 and 75 mbar. The offset error is compensated directly in the calibration of PN2 and PN1. For the non-linear range, 5 more calibration points are added via PN100. The calibration points PN101 to PN105 are then calibrated in the previously mentioned range, thereby minimising the sensor error.

Example table

Base point (PN)	Pressure [mbar]	Output transducer [mA]	Display before correction (IN)	Desired display (OUT)
2	0	4.40	2.5	0.0
101	15	6.64	16.5	15.0
102	30	8.96	31.0	30.0
103	40	11.36	46.0	40.0
104	60	13.12	57.0	60.0
105	75	15.76	73.5	75.0
1	100	20.00	100.0	100.0



7. Program table

The program table lists all the program numbers (PN) with their function, range of values and default values.

PN	Function	Range of values	Default
	Input		
0	Measuring input Parameter 1 makes use of the factory calibration.	0 = Sensor calibration 1 = 4...20 mA	0
1	Fullscale (end value)	-999...9999	1000
2	Offset (start value)	-999...9999	0
3	Position of decimal point or selection of dimension The decimal point can be moved or a ‘C or ‘F can be displayed at the end.	1= 8 2= 888‘C 3= 888‘F 4= 8.888 5= 8.88 6= 8.8	8
	General settings		
4	Display/ averaging time in seconds	0.5 ... 10.0	1.0
5	Zero point stabilization (plus/minus range at which zero is displayed)	0 ... 100	1
6	Deactivate/activate taring function	0 = deactivated 1 = activated	0
7	TARE-value	-999...9999	0
	Security settings		
50	Programming lock	0000...9999	0000
51	Authorization code	0000...9999	0000
	Linearisation		
100	Number of base points	0...30	0
101... 130	Base point programming	-999...9999	0
	Informations		
200	Serial number	0...9999	0

7.1. Personal authorization code

Here you can enter your personal authorization code:

Default (PN51)	**0**	**0**	**0**	**0**
Personal authorization code (PN51)				

8. Technical data

Housing

Dimensions	48 x 24 x 42 mm (WxHxD) including screw terminal
approx.	$45.0^{+0.6}$ x $22.2^{+0.3}$ mm assembly cut out
	72 x 24 x 43 mm (WxHxD) including screw terminal
	$68.0^{+0.7}$ x $22.0^{+0.6}$ mm assembly cut out
	72 x 36 x 43 mm (WxHxD) including screw terminal
	$68.0^{+0.7}$ x $33.0^{+0.6}$ mm assembly cut out
	96 x 24 x 43 mm (WxHxD) including screw terminal
	$92.0^{+0.8}$ x $22.0^{+0.6}$ mm assembly cut out
	96 x 48 x 66 mm (WxHxD) including plug in terminal
	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm assembly cut out
Weight (48 x 24)	approx. 70 g
Weight (72 x 24)	approx. 80 g
Weight (72 x 36)	approx. 90 g
Weight (96 x 24)	approx. 120 g
Weight (96 x 48)	approx. 140 g
Wall thickness	0...5 mm
Fixing	Snap in clip element
Housing material	PC/ABS-plastic blend, black, UL94V-0
Protection	Standard IP40, optional IP65 (front), IP00 (back)
Connection	Screw terminal; line cross section up to 1.5 mm^2

Display

Digit height	14 mm (96x48; 96x24 and 72x36 mm)
	10 mm (72x24 and 48x24 mm)
Segment colour	red
Number of digits	4

Input

Measuring range	4...20 mA
Voltage drop	approx. 4.5 VDC
Measuring error with measuring time = 1 second	0.3% of measuring range ±2 digit
Temperature drift	100 ppm/K
Measuring time	0.5...10.00 seconds
Measuring principle	successive approximation
Resolution	12 bit

Memory	Parameter memory EEPROM
Data life	>100 years

Ambient conditions

Working temperature	0...60 °C
Storing temperature	-20...80 °C
Climatic resistance	rel. humidity ≤75 % on year average without dew
EMV	EN61326-1 (1997) A1, A2
CE-sign	Conformity to 89/336/EWG
Safety standard	EN61010-1 (1998) A1, A2

9. Error elemination

Following list gives the recommended procedure for dealing with faults and locating possible cause.

9.1. Questions and answers

I. The display of the unit is dark.

- Check the measuring current of the unit.
- The unit has a fault that can only be eliminated by the manufacturer.

II. The word "HELP" is shown in the 7-segment display of the unit.

- The unit has a fault in the configuration memory. Perform a reset to the default settings and reconfigure the unit in accordance with your application.

9.2. Reset to default settings

To return the unit to a defined basic status, it is possible to perform a reset to the default settings.

You should proceed as follows:

- ✔ Switch off the loop current of the unit
- ✔ Press the [P] key
- ✔ Switch on the loop current (at least 10 mA) and press the [P] key for approx. 2 seconds

The reset loads the default settings from the program number table and uses them for subsequent operation. As a result, the unit is returned to the original settings it had when it left the factory.

Note! This can only be done when the programming lock PN50 allows access to all PNs or HELP is displayed. The loop current must be at least 10 mA.

Caution! All application-related data are lost.