Users guide for PB units
Interface unit, 4- or 6-digit

Contents

1. Brief description

The **PB** is triggered via an interface. It displays figures and/or characters on a 4- or 6-digit, 7-segment display.

The version with a serial interface RS232 / RS485 is addressable and can be operated in a bus system.

The version with a BCD input has a select input, and selection is address-coded. In addition, an SPS mode is supported in which the data are transmitted for display via a synchronous serial protocol. Several displays can be controlled separately via the select input.

2. Safety instructions

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

2.1. Proper use

The **PB** is intended for displaying figures and characters.

⚠️ **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 immediately of any damage.

2.3. Installation

The **PB** 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. [1]

❑ The fuse rating of the supply voltage should not exceed a value of 6A N.B. fuse.

❑ 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 input, output and supply lines separate from one another and do not lay them parallel with each other. 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)[1]

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[1] see technical data

3. Assembly

On front of the **PB** 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 **PB** 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.
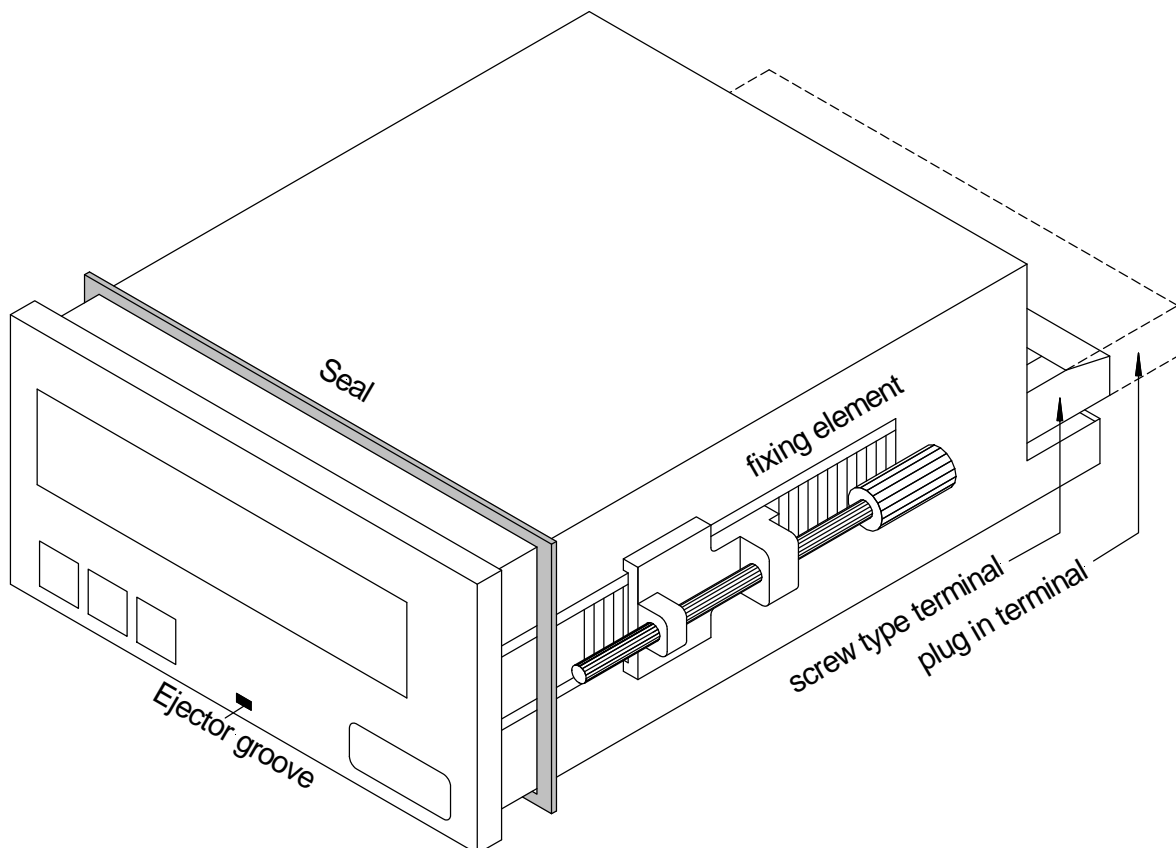
View of the **PB** (model 96x48)

3.1.   Insertion in the panel cut-out

I.   Before inserting the unit, the side fixing elements must be pulled from the rail. To do this, slightly raise the screw head of the fixing element and pull the fixing element backwards at the same time.

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.   Finally secure the device by tightening the screws on the fixing elements until they turn freely. The fixing elements have a slip coupling to prevent any over tightening of the thread; they hold the unit tight with the optimum amount of force.

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 when the unit is replaced.

4. Electrical connection

The electrical connection is made on the back of the unit and depends on the type of unit. All the connections for the **PB** are listed below. To determine the correct position for the connecting terminal, compare the interface indicated on the unit with the following table and select the right terminal position for your unit.

4.1. Connection position serial RS232 / RS485

The following table lists terminal positions for the various models.

Terminal	Function	72x24 and 72x36 mm	96x24 and 96x48 mm
1	RS485	Data + (A)	Data + (A)
2		Data – (B)	Data – (B)
3		Data + (A)	Data + (A)
4		Data – (B)	Data – (B)
5		Term +	Term +
6		Term –	Term –
7	RS232	RxD	RxD
8		TxD	TxD
9		GND	GND
10	Supply	L- (24 VDC)	
11	voltage	L+ (24 VDC)	
10	Sensor		0V
11	supply		+24 V
12	NC*		
13	NC*		
14	Supply voltage		L+ (24 VDC)
			L (115 VAC)
			L (230 VAC)
15			L– (24 VDC)
			N (115 VAC)
			N (230 VAC)

* = not connected; this terminal must not be connected to any potential

The following sections describe the terminal positions based on various examples.

4.1.1. RS485

A maximum of 32 units can be connected to the RS485, arranged in a straight line to form a bus line. A termination is needed at both ends of the data line. Any termination existing in the control system must be activated. The maximum permissible length of the data line is 1,000 m.

To simplify the connection, the terminals are duplicated. On the last unit of the bus line, the possibility exists of switching the termination to the bus line with two bridges.
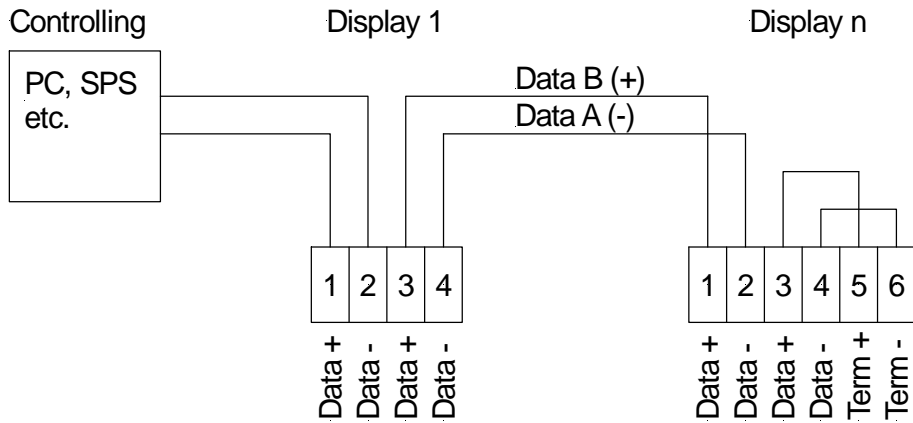
Connection of several displays to one RS485 bus line

4.1.2. RS232

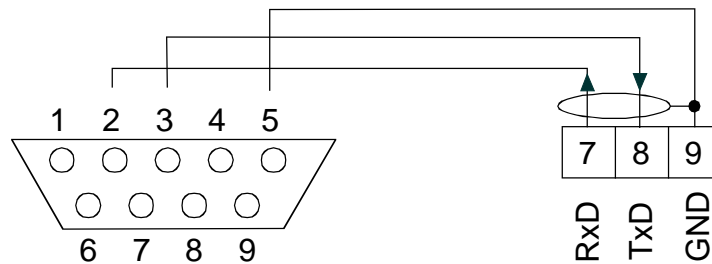A maximum of 1 unit up to a distance of max 3 m can be connected to the RS232 . The RxD and TxD lines are, in the following example, consistently labelled with the signal designation of the PC layout.

Default setting a
seriell interface
of a PC

2 RxD
3 TxD
5 GND

Example of a connection to the serial interface of a PC

4.2. Electrical connection BCD and SPS

The following table shows terminal positions for the various models.

Terminal	Function	72x24 and 72x36 mm BCD	/ SPS	96x24 and 96x48 mm BCD	/ SPS
1	Select	Select	/ Select	Select	/ Select
2	Address	A 2	/ –	A 2	/ –
3		A 1	/ –	A 1	/ –
4		A 0	/ –	A 0	/ –
5	Data	Data 3	/ –	Data 3	/ –
6		Data 2	/ –	Data 2	/ –
7		Data 1	/ Clock	Data 1	/ Clock
8		Data 0	/ Data	Data 0	/ Data
9		GND		GND	
10	Supply	L– (24 VDC)			
11	voltage	L+ (24 VDC)			
10	Sensor			0V	
11	supply			+24 V	
12	NC*				
13	NC*				
14	Supply voltage			L+ (24 VDC) L (115 VAC) L (230 VAC)	
15				L– (24 VDC) N (115 VAC) N (230 VAC)	

* = not connected; this terminal must not be connected to any potential

4.2.1. BCD

The following section describes the positions of the terminals with the aid of an example.

Via Select, select the display for receiving data. This signal is LOW-active, which means that the line can also remain unswitched.
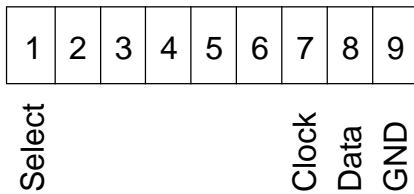Lines A2...A0 are for selecting the display position.
Via the Data3...Data0 lines, characters are transmitted.
The GND connection is the common reference for all signals.

4.2.2. SPS

The following diagram shows the terminal pattern for the SPS control.

1	2	3	4	5	6	7	8	9
Select						Clock	Data	GND

4.2.3. Sensor supply

The sensor supply is only available with the 96x24 and 96x48 mm models, where it is optional.

4.2.4. Power supply

Depending on the size of the housing, the auxiliary voltage and power supply are connected to different terminals. The 72 mm wide units are connected to terminals 10 and 11, while the units with a width of 96 mm are connected to terminals 14 and 15. It should be pointed out that the 72 mm units are intended only for operation with DC voltage.
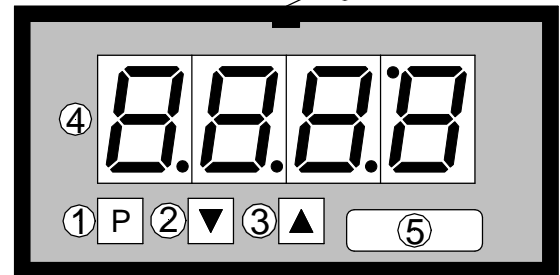
5. Operation

The units are configured with two or three keys. Depending on the size of the housing, the unit has a 4- or 6-digit 7-segment display.

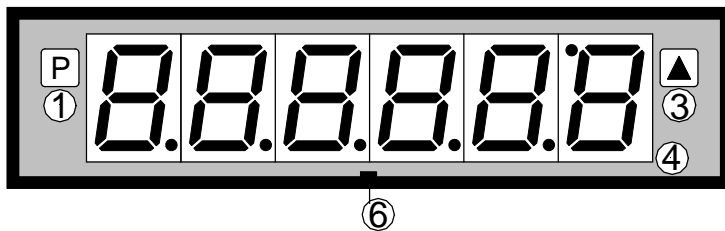## 5.1. Operating and display elements

Housing size 96x48
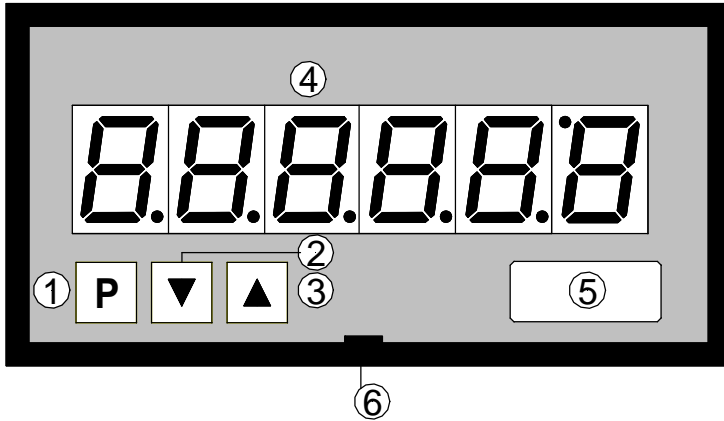
Housing size 72x36

Housing size 96x24
Operation behind the front

Housing size 72x24
Operation behind the front
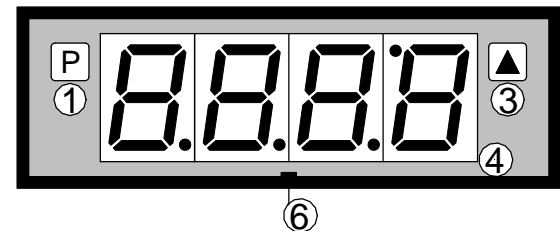
Operating and display elements

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 **[▼]**	The minus key (if available) is used only in programming mode for setting parameters.
3	Plus key **[▲]**	The minus key is used only in programming mode for setting parameters.
4	7-segment display	The 7-segment display shows digits/characters as they are received, or, during the programming operation, program numbers or parameters.
5	Dimension window	Here, a physical unit can be inserted. A dimension window can be inserted ex works, but subsequent installation by the user is also possible.
6	Ejector groove	Point for inserting a screw driver

5.2. Levering out the front panel and inserting it again

It may be necessary to remove the front of the unit for a short time to make adjustments or insert a dimension window.

I.   To remove the front, use a slotted screwdriver of size 00 or 0.

II.   Insert the screwdriver in the recessed groove as indicated and lever the front out of the front collar of the unit.

III.   To replace it, lay the front flat up against the front cover and press the bottom first, and then the top into the front collar until it audibly clicks into place.

⚠ **Caution!** With units having an IP65 protective system, the front must not be removed. Removing the front will permanently damage the seal.

5.3. Inserting a dimension window

A dimension window can only be inserted with models having front dimensions 72x36 and 96x48 mm.

I.   Remove the front panel from the housing as described above.

II.   On the back of the front panel is a slit near to the outer edge in which the dimension window must be inserted.

6. Programming

This section deals with the programming and parametrisation of the PB. It also describes the special features and effects of the individual parameters of the program numbers.

The 4-digit display is always used in these examples. 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 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.
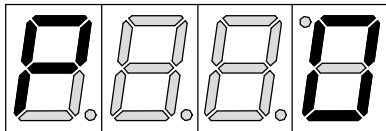
Example: Display of e.g. program number 0

6.1. Programming procedure

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

Change to programming mode

Push the **[P]** key to change into programming mode. The unit goes to the lowest available program number. If the programming lock is activated, the key must be pushed for at least 1 second.
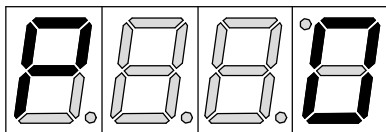
Example:
Change to programming mode by pushing key **[P].** The first released program number (PN) appears, in this case PN0.

Changing to other program numbers

To change between individual program numbers, hold the **[P]** key down and push the **[▲]** key for changing to a higher program number or the **[▼]** key for changing to a lower number. By keeping the keys pushed, e.g. **[P]** & **[▲]**, the display will begin, after approx. 1 second, to automatically run through the program numbers.
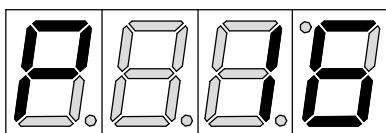
Example:
A 40 is parameterised under PN16.
Hold the **[P]** key down and press the **[▲]** key several times. PN16 appears in the display. Under this parameter, you can change the number of plus and minus signs to be ignored.

Change to the parameter

Once the program number appears in the display, you can push the **[▼]** or **[▲]** key to get to the parameters set for this program number. The currently stored parameters are displayed.
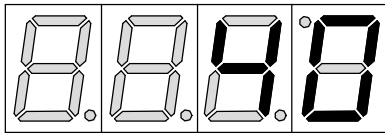
Example:
By pushing the **[▼]** or **[▲]** key, the currently stored value for PN16 appears in the display.
In this case, it is 40.

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 **[▲]** or **[▼]** 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.
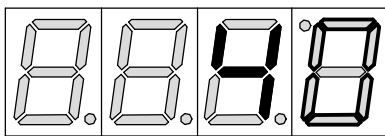
Example:
The 0 is flashing this is the lowest digit and asks if you want to change it. Let us assume the figure is to be changed from 40 to 60.
Briefly push the **[P]** key to move to the next digit.
The 4 begins to flash. Change the figure by pushing **[▲]** or **[▼]** key to change the digit from 4 to 6.

## Saving parameters

All parameters must be acknowledged by the user by pushing the **[P]** key for one 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.
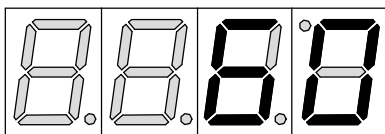
Example:
Save the parameters by pushing **[P]** for 1 second.

All the **newly entered data are confirmed** by the unit. If no confirmation is received, the relevant parameters have not been saved.
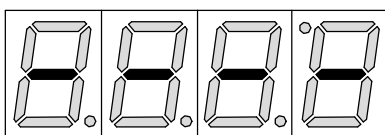
Example:
You receive confirmation from the unit that the changes have been saved through the appearance of horizontal bars in the middle segments.

Change to operating mode

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

6.2. Units with a serial interface

Units with a serial interface are parameterised via program numbers. The main program numbers are described in detail below. Further information and value ranges are given in the program number table.

Basic settings PN0 for interface units

With the basic setting (PN0), presets or a predefined configuration are loaded as given under "Default" in the program number table.

In the simplest case, a preset is loaded with which a communication can be built up. Should it be necessary to adjust the parameters of a preset, a preset should be loaded which is the nearest to the requirements. The selected preset configuration is not stored but is reset to zero when a renewed change is made to the parameter. By altering the parameter, the current configuration is saved as the user configuration. This configuration can now be adapted according to requirements.

Interface PN1 = 0

The interface (PN1) can be switched to various operating modes. This is useful, for example, when configuring a unit outside the target application.

This means that the unit, which is in principle equipped with RS232 and RS485, can, for configuration via the RS232, be switched to the configuration mode that allows complete access to all parameters of the unit via a simplified protocol.

Interface PN1 > 0

If the interface (PN1) is parameterised to 1 (RS232) or 2 (RS485), all the communication parameters of the unit are activated and must be adhered to. Only in these two modes is normal display operation possible.

After an update of settings for the interface, switch the device **OFF** and **ON** again, so the just adjusted values are taking over and the device starts with the current settings.

6.3. Units with BCD input

Mode PN1

With BCD units, the BCD-Multiplex (PN1 = 1) and SPS (PN1 = 2) modes can be selected via PN1.

Character set PN9

With units having a BCD input, the character set can be altered via PN9 because the units do not have the full ASCII character set. The possibilities for display are given in Chapter 11, *Appendix "A" BCD.*

7. Program table

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

| PN	Function	Range of values	Default 0 1 2 3			
Basic function						
0	Basic configuration (Default configuration)	0 = user configuration 1 = preset 1 2 = preset 2 3 = preset 3	0	0	0	
1	Interface (**only interface**)	0 = RS232 in configuration mode 1 = RS232 2 = RS485	0	0	0	
1	Operating mode (**only BCD / SPS**)	0 = BCD – multiplex 1 = SPS	0	0	0	
2	Baudrate	1 = 300 baud 2 = 1200 baud 3 = 2400 baud 4 = 4800 baud 5 = 9600 baud 6 = 19200 baud 7 = 38400 baud 8 = 57600 baud	5	5	5	
3	Data format	1 = 7 bit + parity + 2 stopbits 2 = 7 bit + no parity + 2 stopbits 3 = 8 bit + no parity + 2 stopbits 4 = 8 bit + no parity + 1 stopbit 5 = 8 bit + no parity + 1 stopbit 6 = 7 bit + parity + 1 stopbit	3	3	3	
4	Parity	1 = even 2 = odd	2	2	2	
5	Address length	0 = no address 1 = binary address via a byte (0..255) 2 = two-digit ASCII address 3 = three-digit ASCII address	0	2	0	

6	Address (only where P5 > 0)	[0]00 = address 0
		[0]01 = address 1
		      ... etc. up to
		[9]99 = all addresses in the
		          data string are accepted
			[0]00			

7	Decimal point	0 = no decimal point 1 = decimal point in the 1st decade 2 = decimal point in the 2nd decade ... etc. up to 8 = decimal point in the 8th decade	0	0	0	

PN	Function	Range of values	Default 0 1 2 3			
8	Decimal point (only where PN7 = 0)	0 = Suppress decimal points 1 = Decimal point can be given at any desired position and in any desired number in the string 2 = Position is given at the end of the string as an ASCII value 3 = Position is given at the end of the string as a bit position		1	1	1
9	Character set (**only BCD / SPS**)	0...9 See *Appendix A*		0	0	0
Protocol definition						
10	Protocol	1 = None/ CR (Start/Stop) 2 = STX / EXT (Start/Stop) 3 = User-defined stop symbol 4 = User-defined start/stop symbol		1	2	0
11	Start symbol (only where PN10 = 4)	ASCII value (decimal)		0	0	0
12	Stop symbol (only where PN10 = 3/4)	ASCII value (decimal)		0	0	0
13	Protocol reply	1 = none 2 = STX/ETX 3 = User-defined answer byte 4 = User-defined answer/error byte		1	1	1
14	Answer byte (only with PN13 = 3/4)	ASCII value (hexadecimal)		0	0	0
15	Error reply byte (only with PN13 = 4)	ASCII value (hexadecimal)		0	0	0
16	Number of ignored symbols	0...63		0	0	0
17	Symbol suppression (uncounted)	0 = No symbol suppressed >0 = ASCII symbol (decimal), which is completely ignored by the unit	LF	0	0	
18	Symbol suppression (counted)	0 = No symbol suppressed >0 = ASCII symbol (decimal), which is automatically replaced by a blank		0	0	0
19	Time-out until display of horizontal bar	0 = No time-out 1...60 = Number of seconds until time-out		0	0	0
20	Pre-zero suppression	0 = Pre-zeros are displayed ("000,0") 1 = Pre-zeros are faded out (" 0,0")		1	1	1
21	Flash function	0.0 = No flashing 0.1 ... 2.0 s flashing interval	0,0			
22	Flashing character	0 = Constant flashing (when PN21 > 0.0) >0 = Select ASCII symbol (decimal) for flash function		0	0	0

PN	Function	Range of values	Default 0 1 2 3
30	Test total	0 = No test total 1 = 8 bit test total by addition over the entire telegram 2 = 16 bit test sum through 16 bit addition over entire telegram 3 = 8 bit test total through simple XOR link-up	0 0 0
31	Starting value of the test total	Byte value 00h...FFh for test total start value	00
40	Number of segments counted from the lowest digit position upwards	1 = 1 segment active 2 = 2 segments active 3 = 3 segments active 4 = 4 segments active 5 = 5 segments active 6 = 6 segments active 7 = 7 segments active 8 = 8 segments active	max. active segments
50	Programming lock	00...99	00
51	Authorisation code	00...99	00
52	Programming mode enable/disable	0 = Configuration mode **NOT** activatable via interface 1 = Configuration mode activatable via interface	0 0 0
60	Serial number		fix

8. Interface protocol

The display can have 4 or 6 digits (decades), ones, tens...counted from right to left.

HT ZT T H Z E
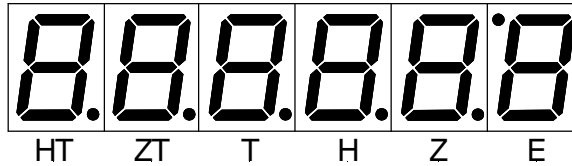
8.1. Seriell RS232/RS485

The sequence of the data packages must correspond in their basic structure to the following example. On the display, "123456" is to be shown on a unit with "Address 25". The suppression of plus or minus signs is not described in this example. The test total (PN30) is formed from the sum of the transmitted symbols, which is standardised to a value smaller than 256 (8 bit).

Total (data bytes 0...8) = 414 (dec.)

$\Rightarrow$ 414 > 256

$\Rightarrow$ 414 – 256 = 158 (test total)

Data byte	0	1	2	3	4	5	6	7	8	9	10
	Start sign	Address		HT	ZT	T	H	Z	E	Check sum	END
PN	PN10 = 2	PN6 = 25								PN30 = 1	PN10 = 2
Byte (dec.) ASCII	2 STX	50 „2"	53 „5"	49 „1"	50 „2"	51 „3"	52 „4"	53 „5"	54 „6"	158	3 ETX

In a display with 4 decades, the data bytes 3 and 4 must not be transmitted.

8.2. BCD address-coded

The data must be transferred according to the following procedure:

I. Switch the BCD code to the relevant lines.
II. Subsequently or simultaneously address the display position via the three address lines.
III. To conclude the communication, switch select to LOW and the data from the unit directly to the display.
IV. The address signal must be ready unchanged for at least 10 ms together with the activated 10 ms select signal, so the symbol can be received. Otherwise, symbols selected via the data lines are ignored. If the level changes on one of the lines, the address is not correctly recognised and the holding time t_1 will restart.

Signalling process for transmitting a BCD Code

optionally select   t2 min = 1ms
                     t2 max = 5ms

adress   t3 min = 10ms

data   t1 min = 0s
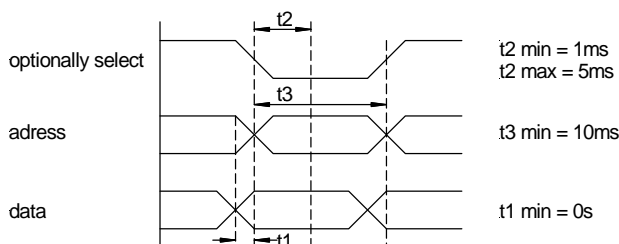
3 Address lines   A0, A1, A2
4 Data lines   Data0 (2^0), Data1 (2^1), Data2(2^2), Data3 (2^3)

	A2	A1	A0
No input	0	0	0
Ones	0	0	1
Tens	0	1	0
Hundreds	0	1	1
Thousands	1	0	0
Ten **T**housands	1	0	1
Hundred Thousands	1	1	0
Decimal point	1	1	1

Parameter	min.
Holding time for 1 address (t_1)	10 ms
Pause between 2 addresses	3 ms

The BCD code must be available at the positive edge of the address lines

An overview of the various character sets and depictable symbols can be found in the *Appendix A BCD*. The decimal point can be freely positioned, whereby a 1 on the data lines in the units position (for e.g. „°C"), a 2 in the tens position, represents a decimal point. The decimal point is erased again when a character is written in the decimal point position.

8.3. SPS

The following timing diagrams apply for the control.

PARAMETER		min.
Delay Select–Clock	t_1	1,5 ms
Delay Select		10 ms
Holding time	t_2	1,5 ms
Pause time	t_3	1,5 ms
Data must be available at the positive edge of the CLOCK signal.		
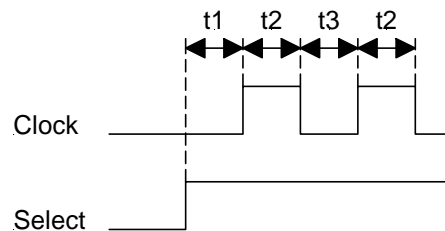
Timing diagram for PB6-devices (6-digit digital meter). The diagram will be reduced by the HT- and the ZT-digit for 4-digit devices (PB4).
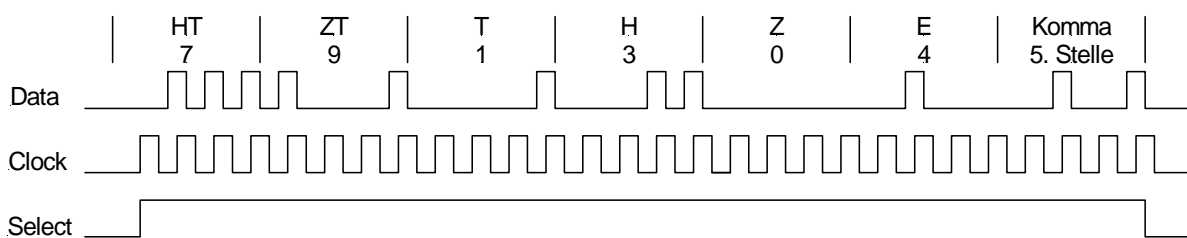
The 'Select' signal can be given after the last positive clock edge or after its respective negative edge of the last clock signal. 'Select' must be active during the entire transmission phase and must contain the right number of positive clock edges so that the data can be accepted. Every display position is coded in 4 bits, and the highest value bit must be transmitted first. The respective form of the display corresponds to the BCD control and is character set-dependent, see *Appendix "A" BCD*.

9. Technical data

Housing

Dimensions	72 x 24 x 103 mm (WxHxD) including screw terminal
	72 x 24 x 115 mm (WxHxD) including plug in terminal
	68.0 $^{+0.7}$ x 22.0$^{+0.6}$ mm / assembly cut out
	72 x 36 x 103 mm (WxHxD) including screw terminal
	72 x 36 x 115 mm (WxHxD) including plug in terminal
	68.0$^{+0.7}$ x 33.0$^{+0.6}$ mm / assembly cut out
	96 x 24 x 134 mm (WxHxD) including screw terminal
	96 x 24 x 148 mm (WxHxD) including plug in terminal
	92.0 $^{+0.8}$ x 22.0$^{+0.6}$ mm / assembly cut out
	96 x 48 x 134 mm (WxHxD) including screw terminal
	96 x 48 x 148 mm (WxHxD) including plug in terminal
	92.0 $^{+0.8}$ x 45.0$^{+0.6}$ mm / assembly cut out

Weight (72x24)	ca. 0,12 kg
Weight (72x36)	ca. 0,14 kg
Weight (96x24)	ca. 0,25 kg
Weight (96x48)	ca. 0,40 kg

Wall thickness	0...50 mm
Fixing	Snap in screw element
Material	PC/ABS-plastics blend, black, UL94V-0
Protective system	Standard IP54, optional IP65 (front), IP00 (back)
	Protection IP65 only with 72x36 and 96x48 mm
Connection	Screw/plug-in terminal; line cross section up to 2.5 mm^2

Display

Digit height	14 mm
Segment colour	red
No. of digits	4 or 6

Output

Sensor supply	10 VDC 15 mA
(galvanic separated)	24 VDC 15 mA

Interface serial

Protocol	Parameterisable ASCII protocol
Baudrates	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600
Interfaces	RS232 / RS485 parameterisable
Line length RS232	max. 3 m
Line length RS485	max. 1000 m
Bus users	max. 32
Termination	activatable via connection terminal

Interface BCD

HIGH / LOW	≥ 4.5 V / ≤ 2.4 V

Interface SPS
HIGH / LOW $\geq$ 4.5 V / $\leq$ 4.0 V

Power supply
Supply voltage   230 VAC / 50/60 Hz / $\pm$10 %
(galvanic separated)   115 VAC / 50/60 Hz / $\pm$10 %
                                 24 VDC / $\pm$10 %
Power consumption   max. 5 VA

Memory   Parameter memory EEPROM
Data life   >30 years

Ambient conditions
Working temperature   0...60 °C
Storage temperature   -20...80 °C
Climatic resistance   rel. humidity $\leq$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

10. Error elemination

The following list gives the recommended procedure for dealing with faults and locating their possible cause.

10.1. Questions and answers

I.   After switching on, the unit constantly shows: segment test – Pb xx – U x.x

➢ Send a valid command to the unit.

➢ Check the setting of the unit address.

II.   The unit does not respond to commands via the serial interface.

➢ Check the connection (interface cable) between the control device and the unit.

➢ Check the settings for baudrate and interface.

➢ Check the setting of the unit address.

III.   The unit does not respond to data via the BCD input.

➢ The unit is not being contacted via the "Select signal" to receive the data.

➢ No decade has been selected via the address.

➢ The signals are inadequate.

IV.   The unit's display is dark.

➢ Check the auxiliary voltage of the unit.

➢ Change to programming mode by pressing the [P] key. If a change is possible, the unit will permanently receive blanks.

➢ The unit has a defect that can only be remedied by the manufacture.

11. Appendix A BCD

Appendix A lists the various character sets of the **PB** with BCD input. By selecting a different character set, the depictable symbols can be adapted to the particular requirements. The character sets are designed in such a way that the display spectrum is as broad as possible.

Decimal value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HEX value	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
BCD value	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
Character set																
0	0	1	2	3	4	5	6	7	8	9	U	F	°	-	E	
1	0	1	2	3	4	5	6	7	8	9	r	o	°	-	E	
2	0	1	2	3	4	5	6	7	8	9	H	L	P	-	E	
3	0	1	2	3	4	5	6	7	8	9	H	L	F	-	E	
4	0	1	2	3	4	5	6	7	8	9	‾	-	_	°	C	
5	0	1	2	3	4	5	6	7	8	9	‾	-	_	°	F	
6	0	1	2	3	4	5	6	7	8	9	A	P	F	U	L	
7	0	1	2	3	4	5	6	7	8	9	'	-	'	_	F	
8	0	1	2	3	4	5	6	7	8	9	n	F	u	t	o	
9	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F

In the character sets 0...8, the 15th symbol is always a blank.

Examples:
Character set 0   °F, OFF
Character set 1   Error, °
Character set 2   HELP
Character set 3   HILFE, OFF
Character set 4   °C, ‾(heat), –(soll), _(cool)
Character set 5   °F, ‾(heat), –(soll), _(cool)
Character set 6   A(mpere), FULL, OFF, PA(scal), P1 (for pos.1)
Character set 7   OFF, function control: rotating segments ▱

Segments:
Character set 8   OFF, on, On, out, no
Character set 9   Display of the HEX characters

12. Appendix B hexadecimal

The following table shows the ASCII symbols in decimal form, as they are needed for parameterising the unit.

Decade 2 u. 3	Decade 1									
	0	1	2	3	4	5	6	7	8	9
00	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT
01	LF	VT	FF	CR	SO	SI	DLE	DC1	DC2	DC3
02	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS
03	RS	US	SPACE	!	"	#	$	%	&	'
04	(	)	*	+	,	-	.	/	0	1
05	2	3	4	5	6	7	8	9	:	;
06	<	=	>	?	@	A	B	C	D	E
07	F	G	H	I	J	K	L	M	N	O
08	P	Q	R	S	T	U	V	W	X	Y
09	Z	[	\	]	^	_	´	a	b	c
10	d	e	f	g	h	i	j	k	l	m
11	n	o	p	q	r	s	t	u	v	w
12	y	z	{			}	~	DEL			