



# Operating Instruction

## Process Controller

### PCD45

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## General Information

In the following you will find an explanation of the symbols used in this operating manual

*Explanation of symbols*

➔ This symbol stands for actions to be carried out.

● This symbol stands for additional technical information.



This symbol stands for those text sections that are of particular importance for ensuring the proper use of the PCD45 and excluding dangers.



This symbol stands for those text sections that provide additional information.

*Italics*

To help you quickly locate information, important terms are printed in italics in the left text column.

## 1 Safety Instructions

The electronic counting, control and monitoring device has been built in accordance with state-of-the-art technology.

Only use the device

- in proper technical condition,
- for the intended purpose,
- in a safety and danger-conscious manner, while observing the operating manual

*Proper use*

The display device may only be used as a built-in device indoors. The product is designed for use in industrial processes and controllers in production lines of the metal, wood, plastics, paper, glass and textiles industries etc., whereby the overvoltages the product is subjected to at the connection terminals must be limited to the value of Overvoltage Category II.

A description of the Overvoltage Category is provided in the German standard DIN VDE 0110 Part 2.

The device may only be operated when properly installed.

The device may only be operated in accordance with the chapter "Technical Data".



The device may not be used in hazardous areas, in medical equipment and in applications expressly named in accordance with EN 61010.

If the device is used to control machines or sequential processes with which damage to the machine or injury to the operating personnel is possible as a result of a failure or improper operation of the device, then appropriate safety precautions must be taken.

*Organizational measures*

Make sure that the personnel has read and understood the operating manual, and in particular the chapter "Safety Instructions". In addition to the operating manual, also observe and ensure generally applicable legal and other binding regulations for accident prevention and environmental protection.

<i>Safety-conscious work</i>	In chase of changes (including in the operating behavior) that impair safety, shut down the device immediately.
<i>Installation</i>	Installation may only be carried out using the procedure described in the chapter "Connecting". Always switch off the power supply when conducting installation work on the device. Installation work may only be carried out by specially trained personnel.
<i>Commissioning</i>	Following proper assembly and installation, the device is ready for operation.
<i>Service/ Maintenance/Troubleshooting</i>	Be sure to switch off the power supply of all devices involved. All work of this type may only be carried out by specially trained personnel. If troubleshooting is unsuccessful, the device may not continue to be used. Please contact your dealer.
<i>Familiarization</i>	After completing commissioning, familiarize yourself with the use of the device in the chapter "Getting to know the PCD45".

## 2 Getting to know the PCD45

The PCD45 consists of:

- 2 analog inputs
- 3 programmable analog outputs
- 2 programmable limit values
- 2 relay outputs
- Calculation functions

### Description

The PCD45 is used for the display and further processing of measured values, with signals present as voltage or direct current. The display is calibrated by the user with a keypad located on the front of the device. Two analog inputs enable the connection of two sensors, the information of which can be displayed with F1 and F2. The two measured variables F1 and F2 are processed further in the calculation block and displayed with F3.

The measured variables F1, F2 and F3 can be output as separate -10...+10 V / 0...+10 V analog output signals for the direct control of processes.

Two adjustable limits on "P1" and "P2", with free assignment, enable monitoring of production processes.

In addition, the PCD45 is also equipped with an electronic peak value memory (slave pointer), that can be programmed by the operator on F1, F2 or F3.



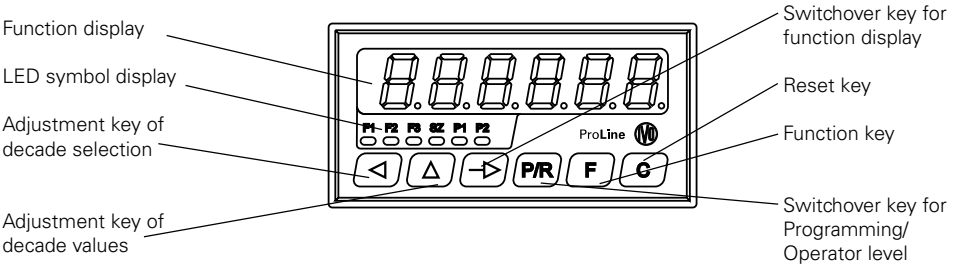
## 2.1 Components of PCD45

### Operating field

- Switchover key for function display
- Adjustment key of decade selection
- Adjustment key of decade values
- Switchover key for Programming/Operator level
- Function key
- Reset key

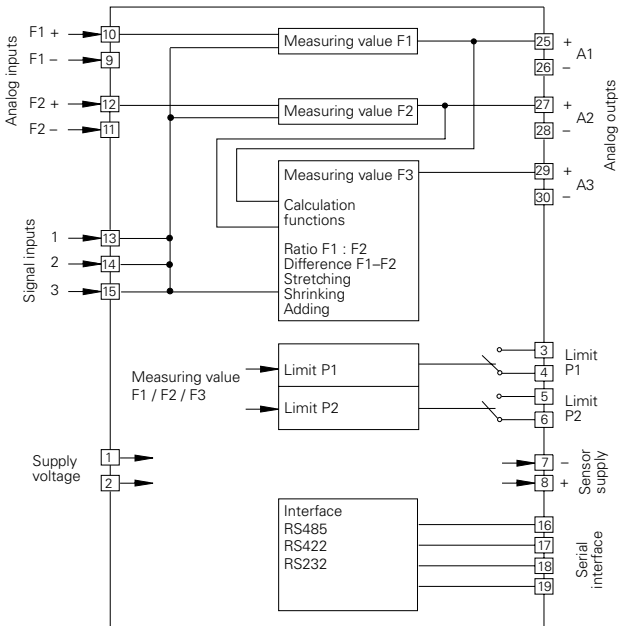
### LED symbol display

- F1 Display of Measured Value 1
- F2 Display of Measured Value 2
- F3 Display of calculation function
- SZ Display of "peak value memory"
- P1 Limit value 1
- P2 Limit value 2



## 2.2 Block diagram of PCD45

The block diagram shows the links of the PCD45. In addition, the connections of the PCD45 are also shown.





### 3 Connecting PCD45

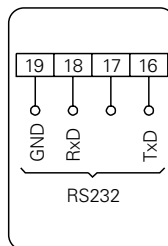
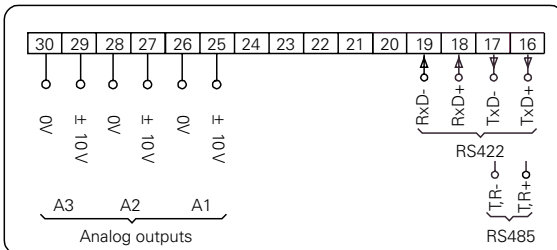
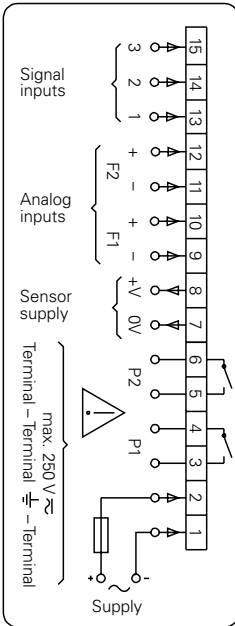
In this chapter the connection assignment and a few connection examples are presented first.

In the chapters 3.1 to 3.5 you will find specific information and technical data for the individual connections.

The electrical inputs and outputs are connected to two pluggable screw terminals. The two 15-pin screw terminals are coded pin-loss-free. This prevents the two screw terminals from being confused with each other.

#### Connection assignment

Connection	Function
1	Supply voltage
2	Supply voltage
3	Relay output P1
4	Relay output P1
5	Relay output P2
6	Relay output P2
7	Sensor supply 0 V
8	Sensor supply +V
9	Analog input F1 -
10	Analog input F1 +
11	Analog input F2 -
12	Analog input F2 +
13	Signal input 1
14	Signal input 2
15	Signal input 3
16	TxD+/T,R+
17	TxD-/T,R-
18	RxD+
19	RxD-
16	TxD
17	RxD
18	RxD
19	GND
25	A1 ± 10 V
26	A1 0 V
27	A2 ± 10 V
28	A2 0 V
29	A3 ± 10 V
30	A3 0 V





Flexible lead connection for reasons of shock-hazard protection as per VDE 0411 Part 100 only by means of wire end ferrules. Do not assign connections not assigned at the factory. It is recommended that all sensor connection lines be shielded and that the shielding be grounded on one end. Grounding on both ends is recommended with HF interference and if equipotential bonding cables are installed with greater distances. The sensor connection cables should not be routed in the same wiring harness as the mains supply and the output contact cables.

### 3.1 Connecting supply voltage

Two device versions are available for the voltage supply.  
 Direct voltage 18...30 VDC, max. 5 % residual ripple  
 Alternating voltage 85...265 VAC, 50 / 60 Hz

→ Connect the supply voltage to connections 1 and 2 in accordance with the terminal diagram.

#### Supply voltage external fusing

18...30 VDC		M 400 mA
85...265 VAC	50 / 60 Hz	M 315 mA



Fire protection:  
 Operate the device on the mains side via the external fuse recommended on the connection diagram. According to EN 61010, 8 A/150 VA (W) may never be exceeded in case of a malfunction.

Direct voltage connection:  
 Only connect interference-free supply voltage. Do not use the supply voltage for the parallel supply of drives, contactors, solenoid valves etc.

### 3.2 Assigning signal outputs for limit values (relay contacts)

The signal outputs (connections 3, 4 and 5, 6) are floating relay contacts. The signal outputs can be assigned in accordance with the connection diagram below.

Contact P2



Contact P1



Max. switching cap.	Max. switching voltage	Max. switching curr.
150 VA/30 W	250 V	1 A



The user must ensure that a switching load of 8 A/150 VA (W) is not exceeded in the case of a malfunction.  
 Suppression standard EN 55011, EN 50081-2 for the industrial sector.  
 In the case of a higher switching frequency, the owner must ensure radio interference suppression locally and on its own responsibility, taking the load to be switched into account.

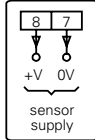
### 3.3 Connecting sensor power supply



Connect sensor power supply and connections 7 and 8. Do not use the sensor power supply to supply non-grounded inductances or capacitive loads.



The sensor power supply is short-circuit-proof.



	Connection	Voltage	Max. current
Ground connection	7	0 V	–
AC power supply	8	18 VDC ± 10 %	350 mA
DC power supply	8	2 VDC less than supply voltage	350 mA

### 3.4 Assigning analog inputs

Assign analog inputs on the connections as follows:

9 (-) and 10 (+) for F1

11 (-) and 12 (+) for F2

The display is calibrated (scaled) on the front via the input keypad, see Chapter 4.3 Two-point calibration.

Model	Input resistance
0(2)...10 V	20 kOhm
0(4)...20 mA	250 Ohm

### 3.5 Assigning control inputs

The connections 13, 14 and 15 are control inputs. The input logic is PNP.

The function of these control inputs are selected in the program lines 43, 44 and 45. The functions are: Hold, Reset, Peak value memory, , Deleting start-up blocking, Programming blocking, Keylock and Print.

Input resistance	Selectable switching threshold
approx. 3 kOhms	3 V and 6 V

### 3.6 Connecting interfaces (option)

The serial port can run the following functions:

- Call data
- Program and call parameters

Port parameters are:

- the transfer speed (baud rate),
- the parity bit,
- Number of stop bits,
- the address with which the PCD45 is addressed by a master.

These port parameters can be set on the programming level (lines 51, 52, 53 and 54).

The following standard ports can be connected to the PCD45 as an alternative:

- RS232
- RS422/RS485



### Interfaces properties


- RS232* full-duplex transmission with the properties:
- asymmetrical
  - 3 lines
  - Point-to-point connection – 1 transmitter and 1 receiver
  - Data transfer length: max. 30 m
- RS422* full-duplex transmission with the properties:
- symmetrical
  - 4 lines
  - Multi-point connection – 1 transmitter and 32 receivers
  - Data transfer length: max. 1500 m
- RS485* half-duplex transmission with the properties:
- symmetrical
  - 2 lines
  - Multi-point connection – transmitter and receiver (max. 32 devices)
  - Data transfer length: max. 1500 m
  - ➔ Assign connections 16, 17, 18 and 19 a corresponding port.

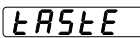
### 3.7 Conducting service routine

Here you will find a description of the service routine. With this routine all input variables can be requested and the output variables can be switched.


#### Testing display

- ➔ Press keys  and  simultaneously in the deenergized state.
- ➔ Switch on the PCD45 (press and hold above keys for this time). All display segments are automatically displaced consecutively and checked for their operability.

*Advanced test* ➔ Advanced test Check the keypad, the inputs, outputs and port consecutively with the  key.



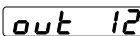
#### Testing keypad

- When a key is pressed, a bar lights up on the right in case of proper operation .






#### Testing control inputs

- The inputs can be controlled simultaneously or individually. In the controlled state the display is active. The symbol 1, 2, 3 lights up.



#### Testing relay outputs 1 and 2

- ➔ Press the keys  and .
- The outputs are activated. The outputs are reset with the .



No machine function may be connected when testing the outputs.

### Testing analog inputs

**1A0000**

Display: F1 analog input.

- The bit value of the converter is displayed (12 bits).

**2A0000**

Display: F2 analog input.

- Output of the input voltage at F1/F2 analog input in  
Value \* 1 bit value    V: 2.442 mV    I: 4.884  $\mu$ A

### Testing analog outputs 1, 2 and 3

**1A0 - 10**

The voltage -10 VDC is output on the analog output 1. It can now be tested whether the controlled device carried out the desired function. With the key  $\Delta$  analogous to this voltage values +10, +6, 0, -6 and -10 VDC (+10, 8, 5, 2 and 0) can be tested one after the other.

**2A0 - 10**

The voltage -10 VDC is output on the analog output 2. It can now be tested whether the controlled device carried out the desired function. With the key  $\Delta$  analogous to this voltage values +10, +6, 0, -6 and -10 VDC (+10, 8, 5, 2 and 0) can be tested one after the other.

**3A0 - 10**

The voltage -10 VDC is output on the analog output 3. It can now be tested whether the controlled device carried out the desired function.. With the key  $\Delta$  analogous to this voltage values +10, +6, 0, -6 and -10 VDC (+10, 8, 5, 2 and 0) can be tested one after the other.



No machine function may be connected when testing the outputs.

### Testing Interface

**SEr**

The interface test is ready.

➔  $\Delta$  appears **SEr 0**

The device transmits a 0 (zero) in ASCII code via the serial port. If the zero is properly received via the input, the device automatically transmits a 1 (one). This process is continued up to 9 (nine). If an error is discovered in this process, **SEr F** appears. If the test is successful, **SEr P** appears.

### Displaying program number/program version

**PO 1 1**

Program number and version number

**1.10**

Program version

After this display the device is switched back to the operator level by pressing the key  $\rightarrow$ .



The lines "Program number" and "Program version" are not tests. They only provide information on the exact counter type (program number) and the counter version (program version). These two lines can also be displayed directly. To do this the key  $\Delta$  must be pressed when switching on the power supply.



## 4 Operating PCD45

The device basically has an operator level and a programming level. This chapter describes the operator level of the PCD45.

- The PCD45 is automatically on the operator level after the supply voltage is switched on.

On the operator level the following is possible:


- Operator level*
- the measured value F1 can be read off;
  - the measured value F2 can be read off;
  - the calculation value F3 can be read off;
  - the peak value SZ can be read off and deleted if necessary;
  - the limit values P1 and P2 can be read off, deleted and changed.
  - the sensor calibration curves can be defined with a teach-in process

(The operator level can be limited with the lines 11-16 of the programming level.)




### 4.1 Key functions

*Read off parameters* The  key switches to the next operating parameter.

*Resetting peak value*

1. Display peak value "SZ".
2. Press  key.

*Setting limit value P1 and P2*

1. Display limit value P1, P2.
2. Press  key and select desired decade; selected decade position flashes.
3. Press  key and enter desired value. To set additional decades, repeat steps 2 and 3.
4. Acknowledge entered parameters with  key. If no acknowledgement is made within 15 s, the previously set value is retained.

## 4.2 Operator level

### Measured value display F1

Read → Read off current value (scaled value)



### Measured value display F2

Read → Press key  
 → Read off current value (scaled value)



### Calculation function F3

Read → Press key  
 → Read off current value



### "Peak value"

Read → Press key  
 → Read off "Peak value"

Reset → Press key



### Limit value P1

Read → Press key  
 → Read off set value of limit value P1



Change → Enter limit value P1 with and ,  
 Sign, 6th decade after digit 9

→ Press key  
 Change is completed

### Limit value P2

Read → Press key  
 → Read off set value of limit value P2



Change → Enter limit value P2 with and ,  
 Sign, 6th decade after digit 9

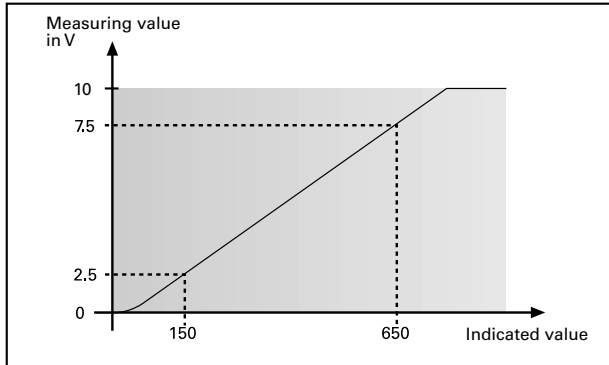
→ Press key  
 Change is completed



After 15 seconds without a key being pressed, the previous limit value is automatically displayed again.

### 4.3 Two-point calibration (teach-in)

*General information* General information The characteristics of the sensors that are decisive for the measured value inputs F1 and F2 can be linearized with a two-point calibration. With the two-point calibration the starting values (programming line 62 and 65) and the final values (programming line 63 and 66) of the measured value inputs F1 and F2 are assigned any desired analog values between 0 V/0 mA and 10 V/20 mA. The straight line determined by these two measured values (for F1 and F2 each) corresponds to the characteristic.








#### Conducting calibration

In the programming mode:

- ➔ Enter starting value (programming line 62, 65) and final value (programming line 63, 66) for the display values of the analog inputs F1 and F2 (150 and 650 in the diagram).

In the operating mode:

- ➔ Display measured value F1 with the  key.
- ➔ Press the  key for approx. 3 s. The device switches into the calibration mode Display: dnxxxx (xxxx = present analog value).
- ➔ Set lower analog value on input (2.5 V in graph).
- ➔ Press  key. Calibration is assumed.
- ➔ Set upper analog value on input (7.5 V in graph).
- ➔ Press  key. Calibration is assumed.

After approx. 1 s the calibration mode is automatically exited. With the  key the measured value F2 can be called and displayed and the calibration carried out as described above.

## 5 Programming PCD45

This chapter describes the programming level of the PCD45.

*Programming level* Operating parameters are set on the programming level. The programming level is divided into 3 programming fields. Access to the programming level is protected with a 4-digit code.

### 1st programming field

Here all operating parameters can be selected and changed. The operating parameters that are blocked for the operator are also displayed.


### 2nd programming field

Here the individual operating parameters are blocked or released for operator access.

### 3rd programming field

Here all machine-related functions and values, as well as the port parameters are programmed.

### Key function

*Switch on programming* ➔ Press the keys **PR** and **F** consecutively.  
 **Code** appears in the display.



No code number is set at the factor, and therefore this code request can be skipped by pressing the **→** key. The code is set in programming line 40. After a code has been set, the programming level can only be called by entering the correct code.

*Enter code* Enter the code with the keys **←** and **Δ**. Press the **→** key to acknowledge. The system switches from the operator level into the programming level.

*Wrong code* If an incorrect code is entered, then "Error" appears in the display **→** (as long as the key is pressed). After 15 s the system automatically switches back to the operator level.

*Korrekt Correct code unknown* Correct code unknown If the correct code is not know, please send the counter back to the supplier or carry out a reset to the factory setting.

*Select programming lines* Select the corresponding program line with the **→** key. The corresponding line number is displayed. For rapid scrolling, press and hold the **→** key.

*Scroll back programming lines* By pressing and holding the **Δ** key, it is possible to scroll back within the programming lines by pressing the **→** key.

*Change operating parameters* Select the decade to be changed with the **←** key. The selected decade flashes. Enter the value by pressing the **Δ** key. Press the **→** key to acknowledge.

*Exit programming* Programming can be ended at any time by pressing the **PR** key (changing to operator level).



*Reset to factory setting* Switch on the device and press the keys **←** and **Δ** simultaneously. All values already programmed are reset to the factory setting.  
**ClrPro** appears in the display.







### 5.1 Programming field 1



Here all operating parameters can be selected and changed. The operating parameters that are blocked for the operator are also displayed.



➔ Switch to the next programming line with the key.

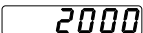

Line 1  Measured value F1  



Line 2  Measured value F2  


Line 3  Measured value F3  


Line 4  Peak-value memory  


Line 5  Limit value 1  


Line 6  Limit value 2  


Line 10  ● After the first programming field runs, a dashed line appears in the display as a dividing line.  
 ➔ Switch to programming field 2 with the key.

## 5.2 Programming field 2

Here the individual operating parameters are blocked or released for operator access.

**SEAL** appears in the display.

### Meaning of status numbers

- 0 free access* The operating parameters can be selected, read and changed or deleted on the operator level.
- 1 display only* The operating parameters can be selected and read on the operator level.
- 2 blocked* The operating parameters cannot be selected on the operator level. The corresponding function is retained.



The factory setting is marked in each case with a \*.

*Change status* Enter the corresponding status number with the keys **◀** and **▲**. The changed status number is automatically saved when the next programming line is selected with the key. A maximum of 5 lines can be assigned the status 2.

Line 11



### F1 - Measured Value 1

- 0 \* free access
- 1 display only
- 2 blocked

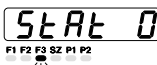
Line 12



### F2 - Measured Value 2

- 0 \* free access
- 1 display only
- 2 blocked

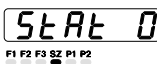
Line 13



### F3 - Measured Value 3

- 0 \* free access
- 1 display only
- 2 blocked

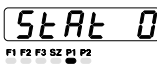
Line 14



### SZ - Peak-value memory

- 0 \* free access
- 1 display only
- 2 blocked

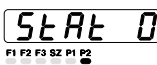
Line 15



### P1 - Limit value 1

- 0 \* free access
- 1 display only
- 2 blocked

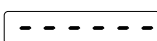
Line 16



### P2 - Limit value 2

- 0 \* free access
- 1 display only
- 2 blocked

Line 20



Line 20 After the first programming field runs, a dashed line appears in the display as a dividing line.

➔ Switch to programming field 3 with the **▶** key.



### 5.3 Programming field 3

Here all machine-related functions and values, as well as the interface parameters are programmed.

- Programming field 3 begins with programming line 21. The selected line number appears in the left display field. The programmed value is displayed in the right display field.
- ➔ Switch to the next programming line with the key.
- Pressing and holding the key and pressing the key, scrolls back within the programming lines.



The factory setting is marked in each case with a \*.

Line 21

**21 0**

#### Calculation function for F3

- 0 \* Ratio  $F3 = F1 : F2$
- 1 Sum  $F3 = F1 + F2$
- 2 Difference  $F3 = F1 - F2$
- 3 Stretching/Compression  $F3 = (F2-F1) : F1$

Line 24

**24 0**

#### Switching threshold for control inputs

- 0 \* Switching threshold 6 V
- 1 Switching threshold 3 V

Line 27

**27 6F3**  
  
**1.000**

#### Factor for calculation function F3

- 0.0001 Min.
- 1.0000 \* Default
- 9999.99 Max.

Line 28

**28 4**

#### Minimum update time for F1, F2 and F3

Time basis for the calculation of a new analog value for the inputs F1, F2 and the calculation function F3. The reaction time of the analog inputs, digital outputs and display therefore matches the time set here.

The corresponding input analog value is integrated in the background with the setting >0.

- 0 0,02 seconds
- 1 0,06 seconds
- 2 0,1 seconds
- 3 0,2 seconds
- 4 \* 0,5 seconds
- 5 1,0 seconds
- 6 2,0 seconds
- 7 3,0 seconds
- 8 5,0 seconds

Line 29

29	0
----	---

**Mean value formation for display and limit values**

Several input values are obtained and averaged in accordance with the selection. This can be used to calm the display. The setting in Line 28 is the basis for obtaining measured values. Here, e.g. when 29 = 2 is selected, the mean value is formed from the last 8 measured values in each case. The analog outputs are not affected by this.

- 0 \* no mean value formation
- 1 4 measured values are used for mean value formation
- 2 8 measured values are used for mean value formation
- 3 16 measured values are used for mean value formation

Line 32

32	0
----	---

**Assignment of peak-value memory**

- 0 \* F1
- 1 F2
- 2 F3

Line 33

33	0
----	---

**Assignment for limit value output 1**

- 0 \* Upper limit value F1
- 1 Lower limit value F1
- 2 Upper limit value F2
- 3 Lower limit value F2
- 4 Upper limit value for calculation function F3
- 5 Lower limit value for calculation function F3

Line 34

34	2
----	---

**Assignment for limit value output 2**

- 0 Upper limit value F1
- 1 Lower limit value F1
- 2 \* Upper limit value F2
- 3 Lower limit value F2
- 4 Upper limit value for calculation function F3
- 5 Lower limit value for calculation function F3

Line 35

35	0
----	---

**Output logic for limit value outputs**

- 0 \* Both outputs as normally open contact
- 1 Output 1 NC contact, Output 2 NO contact
- 2 Output 1 NO contact, Output 2 NC contact
- 3 Both outputs as normally closed contacts

Line 36

36	0
----	---

**Decimal point for display F1**

- 0 \* No decimal point
- 1 00000.0
- 2 0000.00
- 3 000.000

Line 37

37	0
----	---

**Decimal point for display F2**

- 0 \* No decimal point
- 1 00000.0
- 2 0000.00
- 3 000.000



Line 38 38 0 **Decimal point for display F3**  
 0 \* No decimal point  
 1 00000.0  
 2 0000.00  
 3 000.000

Line 39 39 0 **Selection of basic display**  
 An operating parameter can be preselected. The display automatically switches back to this basic value after approx.15 seconds in each case.  
 0 \* No switching to basic display  
 1 F1  
 2 F2  
 3 F3  
 4 SZ  
 5 P1  
 6 P2

Line 40 40 Cod **Code settings**  
 A 4-digit code can be selected  
 0000 \* Code not active  
 :  
 9999

Line 41 41 0 **Assignment of function key F**  
 The function key F makes a quick selection of an operating parameter.  
 0 \* Function key not assigned  
 1 F1  
 2 F2  
 3 F3  
 4 SZ  
 5 P1  
 6 P2

Line 42 42 0 **Output behavior at lower limit value**  
 Provides information on what the output behavior is to be in the range below the limit value. The "start-up blocking" prevents the immediate activation of the lower limit value during the start of a machine process.  
 0 \* With start-up blocking  
 1 Without start-up blocking

Line 43 43 0 **Control input 1 (see Chapter 3.5)**  
 0 \* Hold  
 1 Reset peak-value memory  
 2 Activate start-up blocking,  
 Deletes an activated lower limit value  
 3 Programming blocking  
 4 Keylock  
 5 Print



Line 44      **44**    **2**    **Control input 2 (see Chapter 3.5)**  
 0    Hold  
 1    Reset peak-value memory  
 2    \* Activate start-up blocking,  
      Deletes an activated lower limit value  
 3    Programming blocking  
 4    Keylock  
 5    Print

Line 45      **45**    **4**    **Control input 3 (see Chapter 3.5)**  
 0    Hold  
 1    Reset peak-value memory  
 2    Activate start-up blocking,  
      Deletes an activated lower limit value  
 3    Programming blocking  
 4    \* Keylock  
 5    Print

**Option for interface versions (Line 51-54)**

The lines 51-54 only appear when the device is equipped with a interface.

Line 51      **51**    **0**    **Baud rate**  
 0    \* 4800 baud  
 1    2400 baud  
 2    1200 baud  
 3    600 baud

Line 52      **52**    **0**    **Parity**  
 0    \* Even Parity  
 1    Odd Parity  
 2    No Parity

Line 53      **53**    **0**    **Stop bits**  
 0    \* 1 Stop bit  
 1    2 Stop bits

Line 54      **54**    **0**    **Device address**  
 Required when the device is connected to a bus.  
 00 \* Minimum value  
      :  
 99 Maximum value



Line 60

**60** **0**

**Specification of characteristic of analog inputs**

- 0 \* The linear characteristic of the analog inputs is specified with two points. The lower and upper limit value of the measuring range of the analog inputs must be specified. The two values are specified in programming line 62 and 63 (for F2 in line 65 and 66).
- 1 The linear characteristic of the analog inputs is specified with a teach-in process. For this purpose any two known measuring points are moved to on the operator level. The two measuring points are in turn specified in line 62 and 63 (for F2 in lines 65 and 66).

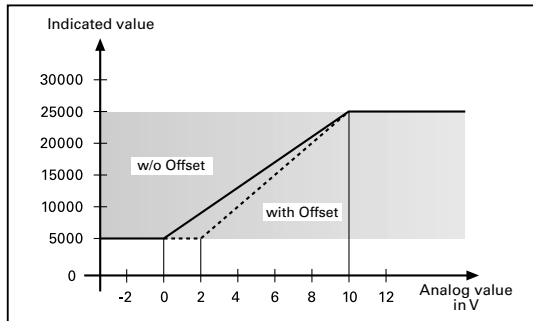
Line 61

**61** **0**

**Offset F1**

In lines 61 and 64 it is specified whether the device is to be operated with or without an offset. The following two settings are possible:

- 0 \* no offset  
The entire analog range from 0-10 V or 0-20 mA is shown on the display in the area of the display calibration line 62, 63 or 65, 66.



This picture shows the curve of the display value for the measured value input F1 in the operating mode with and without offset. For the display calibration, the starting value = 5000 (line 62) and final value = 25000 (line 63) are set.

- 1 Offset 2 V/4 mA with monitoring <2 V/4 mA  
The analog range of from 2-10 V or 4-20 mA is shown on the display, as shown in the upper picture. If the minimum value (2 V/4 mA) is dropped below at the analog input, the display will be switched into the flashing mode to indicate that the limit has been dropped below. The display value matches the programmed starting value (line 62 or 65) when the limit is dropped below.



Line 62

**62 0**

**Display calibration for starting value of input F1**

The display range for the analog starting value of 0 V/0 mA, or 2 V/4 mA with offset, and the analog final value (normally 10 V/20 mA) is specified with the display calibration. If the lower analog value (0 V/0 mA, or 2 V/4 mA with offset) is dropped below, the starting value (line 62 or 65) is displayed. If the upper analog value (10 V/20 mA) is exceeded, the final value (line 63 or 66) is displayed.

The display calibration for the lower and upper value can be set in the range from -99999 to +999999 in each case.

- 9999 minimum value
- 0 \* Default
- 999999 maximum value

Line 63

**634095**

**Display calibration for final value of input F1**

- 99999 minimum value
- 4095 \* Default
- 999999 maximum value

Line 64

**64 0**

**Offset F2**

- 0 \* no offset
- 1 Offset 2 V/4 mA with monitoring  
(if the input <2 V/4 mA, then the display flashes)

Line 65

**65 0**

**Display calibration for starting value of input F2**

- 99999 minimum value
- 0 \* Default
- 999999 maximum value

Line 66

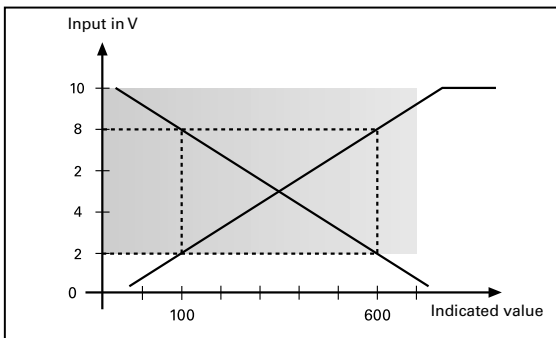
**668190**

**Display calibration for final value of input F2**

- 99999 minimum value
- 8190 \* Default
- 999999 maximum value

The curve of the display value can be inverted as follows:

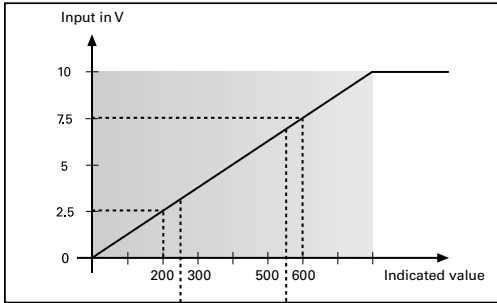
1. By exchanging the starting and final value during display calibration (line 62, 63 and 65, 66).
2. The higher analog value is assigned to the lower input value and the lower analog value to the upper input value with two-point calibration.





**Output behavior**

The next graph shows an example of the behavior of an analog input relative to an analog output.

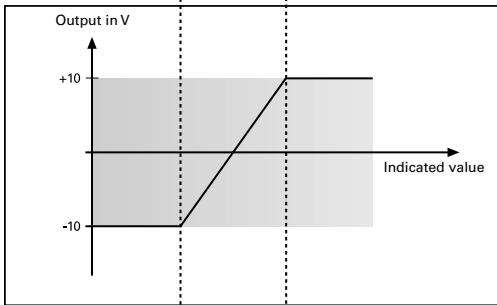


**Measured value input F1**

Analog input is calibrated as follows:

Lower value 2.5 V ➔ Display 200 (line 62)

Upper value 7.5 V ➔ Display 600 (line 63)



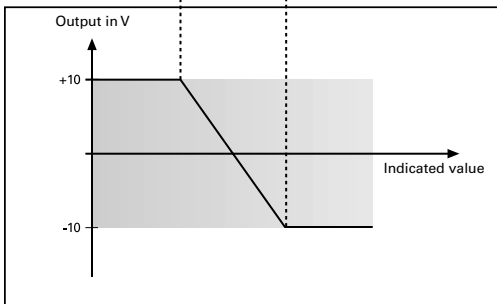
**Measured value output F1**

Starting value < final value

Display calibration:

Starting value 250 (Line 72)

Final value 550 (Line 73)



**Measured value output F1 (inverted)**

Starting value > final value

Display calibration:

Starting value 550 (Line 72)

Final value 250 (Line 73)



Line 72 72 0 **Lower analog value of output 1**  
 -99999 minimum value  
 0 \*Default  
 999999 maximum value

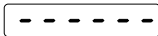
Line 73 734095 **Upper analog value of output 1**  
 -99999 minimum value  
 4095 \*Default  
 999999 maximum value

Line 75 75 0 **Lower analog value of output 2**  
 -99999 minimum value  
 0 \*Default  
 999999 maximum value

Line 76 768190 **Upper analog value of output 2**  
 -99999 minimum value  
 8190 \* Default  
 999999 maximum value

Line 78 78 0 **Lower analog value of output 3**  
 -99999 minimum value  
 0 \*Default  
 999999 maximum value

Line 79 79 100 **Upper analog value of output 3**  
 -99999 minimum value  
 100 \* Default  
 999999 maximum value



● After these program lines have run, a dashed line appears in the display. The dashed line represents the end of the 3rd program field.

*Switching back programming lines* ➔ Press and hold the **[Δ]** key and press the **[▶]** key repeatedly.

*Deactivate programming* ➔ Press the **[PR]** key.  
 ● The PCD45 is on the operator level.

*Program PCD45 back to factory setting* ➔ Switch on the device and press keys **[◀]** and **[Δ]** simultaneously.  
 ● All values already programmed are programmed back to the factory setting. **[ClrPro]** briefly appears in the display.



## 6 Technical Data

Display	7-segment LED display, 6-digit with pre-zero suppression with minus symbol
Digit height	14 mm
Supply voltage	85...265 VAC (50 / 60 Hz) 18...30 VDC
Power consumption	7 VA, 5 W
Sensor power supply	18 VDC $\pm$ 10 % / max. 350 mA
Control inputs	PNP logic
Input resistance	Approx. 3 kOhms
Max. input level	+/- 40 V
Signal outputs	Relay for limit values 1 and 2
Max. switching voltage	250 VAC / 110 VDC
Max. switching current	1 A
Max. switching capacity	150 VA / 30 W
Data storage	> 10 years (with EEPROM)
Mounting	With clamping frame
Dimensions	DIN casing 96 x 48 mm, Casing from front panel installation
Connections	Pluggable screw terminals
Wire cross-section	Max. 1,5 mm <sup>2</sup>
Casing material	Polycarbonate black, UL 94V-0
Weight	Approx. 300 g
Ambient temperature	0...+60 °C
Storage temperature	-20...+70 °C
Humidity	Max. relative humidity 80%, at 25 °C non-condensing
Protection	Front IP 65 to DIN 40050
General rating	EN 61010 Part 1 - Protection class II - Overvoltage category II - Contamination factor 2
Interference immunity	EN 61000-6-2
Emitted interference	EN 50081-1

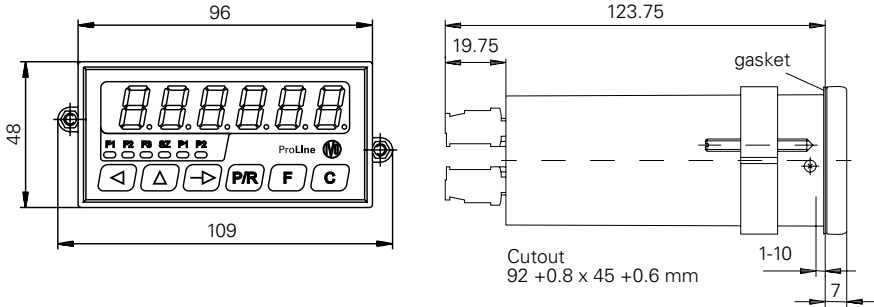
### Analog input

Resolution	12 bits (4096 steps)
Input ranges for voltage input	0...10 V 2...10 V (programmable with keypad)
Input resistance for voltage input	20 kOhms 0...20 mA 4...20 mA (programmable with keypad)
Input resistance	250 Ohms
Accuracy	$\pm$ 0,1 % on final value
Non-linearity	Max. $\pm$ 2 LSB
Temperature coeff.	Typ. $\pm$ 20 ppm / °C

### Analog output

Resolution	12 bits (4096 steps)
Input ranges	0...10 V -10...10 V
Min. resistance	5 kOhms
Accuracy	$\pm$ 0,1 % on final value
Non-linearity	Max. $\pm$ 1 LSB
Temperature coeff.	Typ. $\pm$ 20 ppm / °C

### 6.1 Dimensions and cutout sizes



### 6.2 Factory setting

The following parameters are programmed in the PCD45 at the factory:

P1 limit value 1 to	1000
P2 limit value 2 to	2000
Calculation function	Ratio F1 : F2
Evaluation F3	1.0000
Min. update time F1, F2, F3	Every 0,5 s
Assignment of slave pointer	To F1
Assignment of limit value 1	Upper limit value of F1
Assignment of limit value 2	Upper limit value of F2
Output logic for	
Limit value outputs	Both outputs as NO contact
Decimal point F1, F2, F3	No decimal point
Selection of basic display	No resetting after 15 sec.
Code setting	No code set
Assignment of function key	Function key not assigned
Output behavior	Does not switch until lower limit value is dropped below

<i>Option</i>	Baud rate	4800 baud
	Parity	Even Parity
	Stop Bit	1 Stop bit
	Device address	0

### 6.3 Error messages

<i>Error message of the PCD45</i>	<b>Err 1</b>	Error in RAM
	<b>Err 2</b>	Error in EEPROM
	<b>Err 8</b>	Error at data storage
	<b>Err 9</b>	Error in analog inputs
	<b>Err 10</b>	Error in analog outputs

Hardware errors must be rectified at the factory.



**6.4 Programming lines / Short outline**

Line	Factory Setting	Customer Program	Description
01	<input type="text" value="0"/>		F1 – Measured value display F1
02	<input type="text" value="0"/>		F2 – Measured value display F2
03	<input type="text" value="0"/>		F3 – Measured value display F3
04	<input type="text" value="0"/>		SZ – Peak-value memory
05	<input type="text" value="1000"/>		P1 – Limit value 1
06	<input type="text" value="2000"/>		P2 – Limit value 2
10	<input type="text" value="-----"/>		Separating line
11	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	F1 – Status of measured value display F1
12	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	F2 – Status of measured value display F2
13	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	F3 – Status of measured value display F3
14	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	SZ – Status of peak-value memory
15	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	P1 – Status of limit value 1
16	<input type="text" value="SLAE 0"/>	<input type="text" value="SLAE"/>	P2 – Status of limit value 2
20	<input type="text" value="-----"/>		Separating line
21	<input type="text" value="21 0"/>	<input type="text" value="21"/>	Calculation functions
24	<input type="text" value="24 0"/>	<input type="text" value="24"/>	Input logic for control inputs
27	<input type="text" value="27 bF3"/>	<input type="text" value="27"/>	Factor for calculation function F3
28	<input type="text" value="28 4"/>	<input type="text" value="28"/>	Update time (display repetition)
29	<input type="text" value="29 0"/>	<input type="text" value="29"/>	Mean value formation for display and limit values
32	<input type="text" value="32 0"/>	<input type="text" value="32"/>	Assignment of peak-value memory
33	<input type="text" value="33 0"/>	<input type="text" value="33"/>	Assignment of digital output 1
34	<input type="text" value="34 2"/>	<input type="text" value="34"/>	Assignment of digital output 2
35	<input type="text" value="35 0"/>	<input type="text" value="35"/>	Output logic for digital output
36	<input type="text" value="36 0"/>	<input type="text" value="36"/>	Decimal point F1
37	<input type="text" value="37 0"/>	<input type="text" value="37"/>	Decimal point F2
38	<input type="text" value="38 0"/>	<input type="text" value="38"/>	Decimal point F3
39	<input type="text" value="39 0"/>	<input type="text" value="39"/>	Selection of basic display
40	<input type="text" value="40 Cod"/>	<input type="text" value="40"/>	Code
41	<input type="text" value="41 0"/>	<input type="text" value="41"/>	Assignment of function key
42	<input type="text" value="42 0"/>	<input type="text" value="42"/>	Output behavior at lower limit value
43	<input type="text" value="43 0"/>	<input type="text" value="43"/>	Function of control input 1 (connection 13)
44	<input type="text" value="44 2"/>	<input type="text" value="44"/>	Function of control input 2 (connection 14)
45	<input type="text" value="45 4"/>	<input type="text" value="45"/>	Function of control input 3 (connection 15)
51	<input type="text" value="51 0"/>	<input type="text" value="51"/>	Baud rate
52	<input type="text" value="52 0"/>	<input type="text" value="52"/>	Parity
53	<input type="text" value="53 0"/>	<input type="text" value="53"/>	Stop bits
54	<input type="text" value="54 0"/>	<input type="text" value="54"/>	Address
60	<input type="text" value="60 0"/>	<input type="text" value="60"/>	Calibration of analog input
61	<input type="text" value="61 0"/>	<input type="text" value="61"/>	Offset of input F1
62	<input type="text" value="62 dA1"/>	<input type="text" value="62"/>	Lower analog value of input F1
63	<input type="text" value="63 oA1"/>	<input type="text" value="63"/>	Upper analog value of input F1
64	<input type="text" value="64 0"/>	<input type="text" value="64"/>	Offset of input F2
65	<input type="text" value="65 dA2"/>	<input type="text" value="65"/>	Lower analog value of input F2
66	<input type="text" value="66 oA2"/>	<input type="text" value="66"/>	Upper analog value of input F2
72	<input type="text" value="72 dA1"/>	<input type="text" value="72"/>	Lower analog value of output 1
73	<input type="text" value="73 oA1"/>	<input type="text" value="73"/>	Upper analog value of output 1
75	<input type="text" value="75 dA1"/>	<input type="text" value="75"/>	Lower analog value of output 2
76	<input type="text" value="76 oA1"/>	<input type="text" value="76"/>	Upper analog value of output 2
78	<input type="text" value="78 dA1"/>	<input type="text" value="78"/>	Lower analog value of output 3
79	<input type="text" value="79 oA1"/>	<input type="text" value="79"/>	Upper analog value of output 3
80	<input type="text" value="-----"/>		Separating line

**6.5 Programming plan / Short outline**

<p>Line 21 Calculation function for F3                  0 *Ratio F3=F1:F2                  1 Sum F3=F1+F2                  2 Difference F3=F1-F2                  3 Stretching/Compression F3=(F2-F1):F1</p> <p>Line 24 Switching threshold for control inputs                  0 *Switching threshold 6V                  1 Switching threshold 3V</p> <p>Line 27 Factor for calculation function F3                  0.0001 Min.                  1.0000 *Default                  9999.66 Max.</p> <p>Line 28 Minimum update time for F1, F2 and F3                  0 0,02 seconds                  1 0,06 seconds                  2 0,1 seconds                  3 0,2 seconds                  4 *0,5 seconds                  5 1,0 seconds                  6 2,0 seconds                  7 3,0 seconds                  8 5,0 seconds</p> <p>Line 29 Mean value formation (display and limit values)                  0 *None                  1 4 x                  2 8 x                  3 16 x</p> <p>Line 32 Assignment of peak-value memory                  0 *F1                  1 F2                  2 F3</p> <p>Line 33 Assignment for limit value output 1                  0 *Upper limit value for display F1                  1 Lower limit value for display F1                  2 Upper limit value for display F2                  3 Lower limit value for display F2                  4 Upper limit value for calculation function F3                  5 Lower limit value for calculation function F3</p> <p>Line 34 Assignment for limit value output 2                  0 Upper limit value for display F1                  1 Lower limit value for display F1                  2 *Upper limit value for display F2                  3 Lower limit value for display F2                  4 Upper limit value for calculation function F3                  5 Lower limit value for calculation function F3</p> <p>Line 35 Output logic for limit value outputs                  0 *Both outputs as NO contact                  1 Output 1 NC contact, Output 2 NO contact                  2 Output 1 NO contact, Output 2 NC contact                  3 Both outputs as NC contacts</p>	<p>Line 36 Decimal point for display F1                  0 *No decimal point                  1 00000.0                  2 0000.00                  3 000.000</p> <p>Line 37 Decimal point for display F2                  0 *No decimal point                  1 00000.0                  2 0000.00                  3 000.000</p> <p>Line 38 Decimal point for display F3                  0 *No decimal point                  1 00000.0                  2 0000.00                  3 000.000</p> <p>Line 39 Selection of basic display                  0 *No switching to basic display                  1 F1                  2 F2                  3 F3                  4 SZ                  5 P1                  6 P2</p> <p>Line 40 Code                  0000 *Code not active                  :                  9999</p> <p>Line 41 Assignment of function key <b>F</b>                  0 *Function key not assigned                  :                  6 P2</p> <p>Line 42 Output behavior at lower limit value                  0 *With start-up blocking                  1 Without start-up blocking</p> <p>Line 43-45 Control inputs 1, 2, 3                  0 *Hold                  1 Reset peak-value memory                  2 *Delete start-up blocking                  3 Programming blocking                  4 *Keylock                  5 Print</p>
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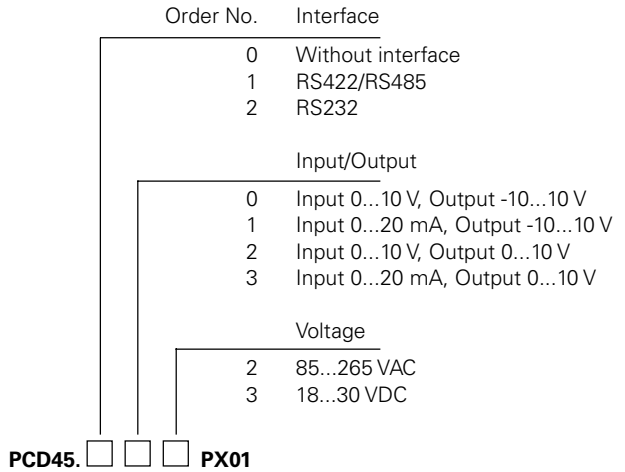
Options for interface versions (Line 51-54)

- 
- Line 51 Baud rate
    - 0 \*4800 baud
    - 1 2400 baud
    - 2 1200 baud
    - 3 600 baud
  
  - Line 52 Parity
    - 0 \*Even Parity
    - 1 Odd Parity
    - 2 No Parity
  
  - Line 53 Stop bits
    - 0 \*1 stop bit
    - 1 2 stop bits
  
  - Line 54 Device address
    - 00 \*minimum value
    - :
    - 99 maximum value
- 
- Line 60 Calibration of analog inputs
    - 0 \*Default (calibrated at factory)
    - 1 Two-point calibration with < key
    - 2 Two-point calibration with keys < and F
  
  - Line 61 Offset F1
    - 0 \*no offset
    - 1 Offset 2V/4mA with monitoring:  
Input < 2V/4mA
  
  - Line 62 Display calibr. for starting value of input F1
    - 99999 minimum value
    - 0 \* Default
    - 999999 maximum value
  
  - Line 63 Display calibration for final value of input F1
    - 99999 minimum value
    - 4095 \* Default
    - 999999 maximum value
  
  - Line 64 Offset F2
    - 0 \*no offset
    - 1 Offset 2V/4mA with monitoring:  
Input < 2V/4mA
  
  - Line 65 Display calibr. for starting value of input F2
    - 99999 minimum value
    - 0 \* Default
    - 999999 maximum value
  
  - Line 66 Display calibration for final value of input F2
    - 99999 minimum value
    - 8190 \* Default
    - 999999 maximum value

- Line 72 Lower analog value of output 1
  - 99999 minimum value
  - 0 \* Default
  - 999999 maximum value
  
- Line 73 Upper analog value of output 1
  - 99999 minimum value
  - 4095 \* Default
  - 999999 maximum value
  
- Line 75 Lower analog value of output 2
  - 99999 minimum value
  - 0 \* Default
  - 999999 maximum value
  
- Line 76 Upper analog value of output 2
  - 99999 minimum value
  - 8190 \* Default
  - 999999 maximum value
  
- Line 78 Lower analog value of output 3
  - 99999 minimum value
  - 0 \* Default
  - 999999 maximum value
  
- Line 79 Upper analog value of output 3
  - 99999 minimum value
  - 100 \* Default
  - 999999 maximum value



**7 Order Designation**









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