

SENSORS & SYSTEMS



INSTRUCTION
MANUAL



Instruction Manual

DD241 PC

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1. Safety

1.1 Symbols Used

Knowledge of the operating instructions is a prerequisite for system operation. The following symbols are used in this instruction manual:



DANGER!

- **imminent danger**



IMPORTANT!

- **useful tips and information**



Something to do

1.2 Warnings

- Avoid **banging** and **knocking** the device
 - > Damage to or destruction of the display
- **The power supply** may not exceed the specified limits
 - > Damage to or destruction of the display
- **Power supply** and the **display/output** device must be connected in accordance with the safety regulations for electrical equipment
 - > Danger of injury
 - > Damage to or destruction of the display
- Protect the **cable** against damage
 - > Failure of the display

1.3 Notes on CE Identification

The following applies to the DD241PC: EMC regulation 2004/108/EC

Products which carry the CE mark satisfy the requirements of the EMC regulation 2004/108/EC

'Electromagnetic Compatibility' and the European standards (EN) listed therein.

The EC declaration of conformity is kept available according to EC regulation, article 10 by the authorities responsible at

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Germany

The display is designed for use in industry and to satisfy the requirements of the standards

- EN 61000-6-3 Spurious emission
- EN 61000-6-2 Resistance to disturbance

The display satisfies the requirements if they comply with the regulations described in the operating manual for installation and operation.

1.4 Proper Use

- The display is designed for use in industrial areas.
- It is used for controlling and monitoring industrial processes
- The system may only be operated within the limits specified in the technical data (chap. 2.4).
- The system should only be used in such a way that in case of malfunctions or failure personnel or machinery are not endangered.
- Additional precautions for safety and damage prevention must be taken for safety-related applications.
- The overvoltages to which the units are subjected at the connection terminals must be limited to the value of the overvoltage category II (see Technical Data)!
- The units may not be operated
 - in hazardous areas,
 - as medical units,
 - in applications expressly named in EN 61010!

1.5 Proper Environment

- Protection class: IP 65 (front side)
- Operating temperature: 0 to +50 °C (+32 to +122 °F)
- Storage temperature: -20 to +70 °C (-4 to +158 °F)
- Humidity: Max. relative humidity 80%, at 25 °C no condensation
- EMC:
 - acc. EN 61000-6-3 Spurious emission
 - EN 61000-6-2 Resistance to disturbance

2. System Description

The DD241PC is an electronic counting, controlling and monitoring unit. It consists of:

- 6-digits display
- Connection: Single-channel for analog sensor, 0 (4) ... 20 mA, 0 (2) ... 10 V
- Peak memory

Supplementary equipment model DD241PC(11)






- Interface RS232
- Two limit values as relay output

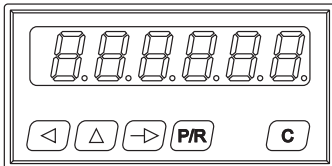
2.1 Description

The Controller is best suited for displaying measurements having process measuring signals of 0/4 - 20 mA. The 2-position scaling allows to allocate the process measuring signals to the desired display by simply setting the initial value to, for example, 0 and the final value to, for example, 2000 via the keyboard.

2.2 Components Control Panel LED Symbol Display

Control Panel

-  Shift key for display of functions, Confirmation key
-  Key to select decade towards the LEFT
-  Key to select decade UPWARDS
-  Key to shift between programming/operating level
-  Reset

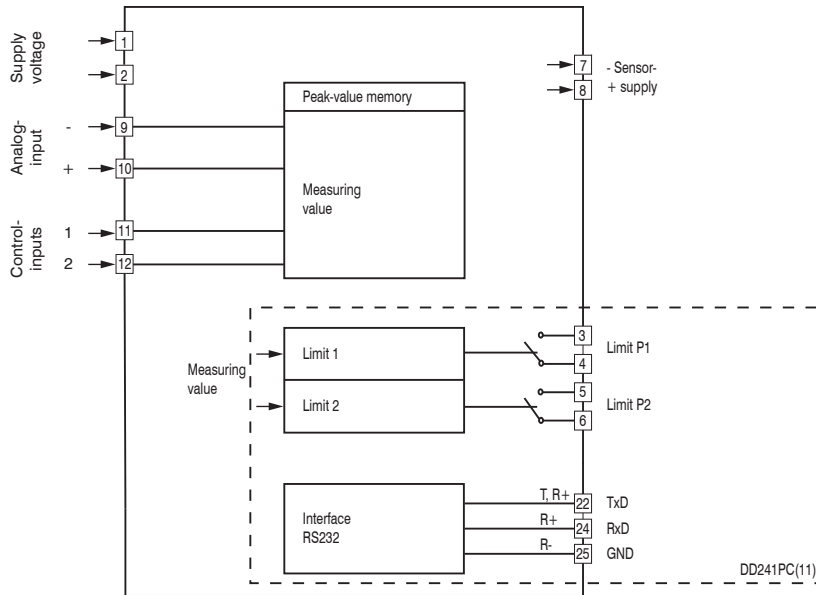


Display of operation parameters

- F** Current display status
- HIGH** Peak memory
- bFdn** Display adjustment Initial value
- bFuP** Display adjustment Final value
- P1** Limit 1
- P2** Limit 2

2.3 Block Diagram

The block diagram shows the components together with its contacts and connections.



2.4 Technical Data

Technical data- electrical	
Supply voltage	12...30 VDC
Power consumption	6 VA, 4 W
Sensor supply	12...26 VDC / max. 80 mA
Display	LED, 7-segment display, 6-digits
Digit height	14 mm
Function	Digital display of 1 measured value
Measurement principle	Analog, resolution 12 Bit
Signal inputs	Comparator inputs
Input logic	PNP
Control inputs	2 inputs
Control functions	Hold, Reset, TARA etc.
Data storage	> 10 Years in EEPROM
Analog input	0(2) ... 10 V, input resistance 20 kOhm
	0(4) ... 20 mA, input resistance 250 Ohm
	Resolution 12 Bit; Temperature coeffic. Typ. ± 20 ppm/ $^{\circ}$ C
Outputs relay	Normally open or closed, programmable (optional)
Interface	RS232 (optional)
General rating	Protection class II; Overvoltage category II; Pollution degree 2
Interference immunity	DIN EN 61000-6-3
Spurious immunity	DIN EN 61000-6-2
Programmable parameters	2 limits, analog input; Control inputs; Offset (maximum and minimum analog limit)
Approval	UL/cUL, CE-conform

System description, Delivery

Technical data - mechanical	
Temperature	Operating: -10... +50 °C; Storage -20... +70 °C
Relative humidity	80 % non-condensing
Core cross-section	1.5 mm ²
Protection DIN EN 60529	IP 65 face with seal
Operation / keypad	Membrane with softkeys
Housing type	Housing for control panel installation
Dimensions	W x H x L 96 x 48 x 124 mm
Cutout dimensions	92 x 45 mm (+0.6)
Installation depth	123.75 mm
Mounting	Front panel installation by clip frame
Weight	approx. 350 g (AC), 250 g (DC)
Housing material	Makrolon 6485 (PC)

3. Delivery

3.1 Unpacking

Check for completeness and shipping damage immediately after unpacking. In case of damage or missing parts, please contact the manufacturer or supplier.

- 1 DD241PC
- 1 Instruction manual

3.2 Storage

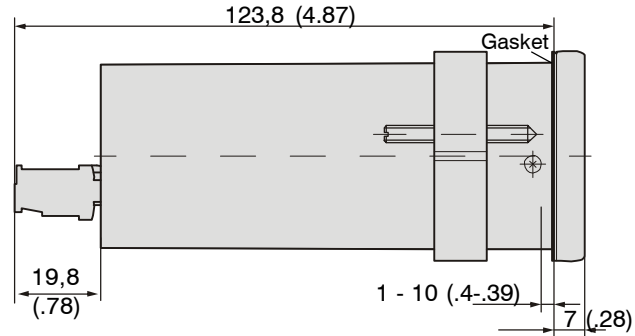
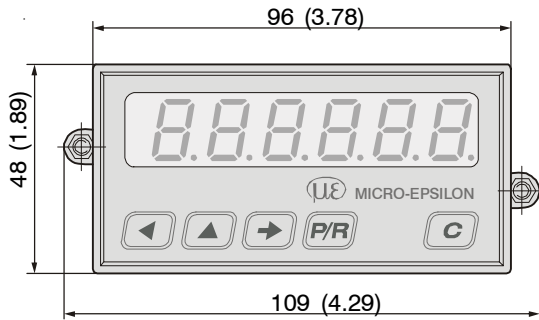
Storage temperature: -20 to +70°C (-4 to +158°F)
 Humidity: Max. relative humidity 80%, at 25°C no condensation

4. Installation

Make sure it is handled carefully when installing and operating.

In case of changes (including in the operating behavior) that impair safety, shut-down the units immediately. During installation work on the units, the power supply must always be disconnected. Installation work may only be carried out by appropriately trained experts. Following proper assembly and installation, the units are ready for operation.

4.1 Dimensional Drawing



Cut out
 $92^{+0,8} \times 45^{+0,6}$

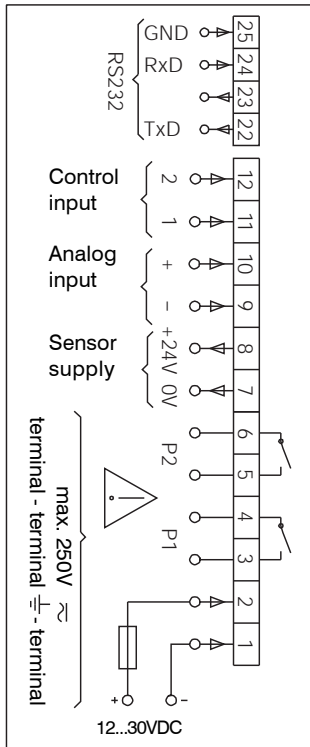
Dimensions
 mm
 (inches)

4.2 Connecting DD241PC

This chapter will explain how the contacts are assigned and give you some examples of connection. Under chapters 3.1 to 3.6, you will find actual tips and technical data for the various connections.



Litz contact only by means of connector sleeves with insulating enclosures for reasons of shock protection according to EN 1010. Do not otherwise assign contacts that have been left unassigned ex factory. We recommend to screen all sensor terminal leads and to ground the shield on one side. Shields on both sides are recommended in case of RF interference or in case of quipotential bonding over long distances. The sensor leads should not be in the same phasing as the MAINS supply and the output contact leads.



Pin	Function
1	Supply voltage 0 V
2	Supply voltage 12 ... 30 VDC
3	Relay output P1
4	Relay output P1
5	Relay output P2
6	Relay output P2
7	Sensor supply 0V
8	Sensor supply +10...26VDC
9	Analog input -
10	Analog input +
11	Control input 1
12	Control input 2
22	TXD
24	RXD
25	GND

4.2.1 Supply Voltage

Direct voltage connection

Connect interference-free supply voltage, i.e. do not use the supply voltage for the supply in parallel of drives, contactors, electrovalves, etc.

→ Connect DC voltage according to terminal diagram.

Voltage range 12...30VDC $\pm 10\%$, max. 5% residual ripple.

Recommended external protection M 400mA.



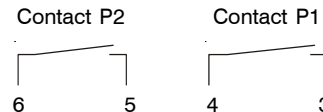
Fire protection:
Operate instrument on the MAINS with external fuse recommended on the rating plate. In case of disturbance, make sure that 8A /150VA (W) are never exceeded - as defined per EN 61010.

4.2.2 Relay Contacts

The signal outputs (contacts 3, 4 and 5, 6) are floating relay contacts. The signal outputs can be assigned as per the adjacent terminal diagram.

The response time depends on the prepared Update time in programm line 28.

Max. rating 150VA / 30W	Max. voltage 250VAC / 110VDC	Max. current 1A
----------------------------	---------------------------------	--------------------



→ Connect contacts 3, 4 and 5, 6 adequate.



The user must take care that, in case of disturbance, the contact rating of 8A / 150VA (W) is not exceeded. The output relay of the instrument (1 relay or more) may, in total, **switch max. 5 x per minute. Admissible clicks** as per interference suppression standards EN 61000-6-4 for the industrial sector. In case of higher switching rate, the user is responsible for and in charge of providing interference protection on site in consideration of the load to be switched.

4.2.3 Connect Sensors

→ Connect sensor supply to contacts 7 and 8.

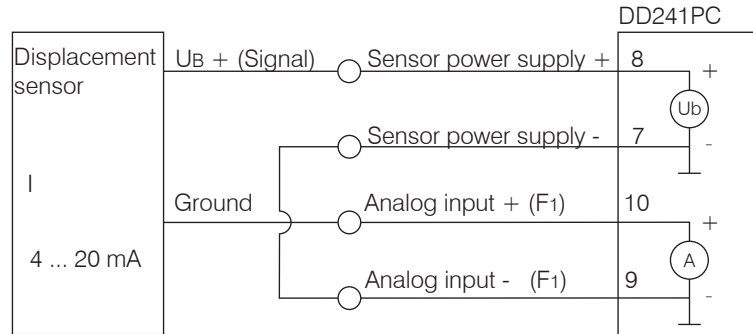
The sensor supply is not short-circuit proof

Pin	Voltage	Max. admissi. current
7	0V	/
8	10 ... 26VDC	85mA

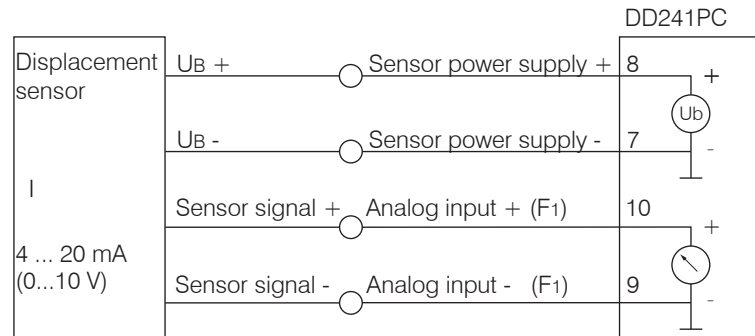


However, do not use sensor supply for unearthed inductors or capacitive loads.

2 Wire - current electronics



4 Wire - current electronics 4 Wire - voltage electronics

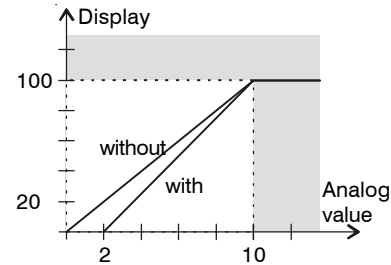


i **IMPORTANT!**
Grounds of power supply and the analog input F₁ are connected internally.

4.2.4 Assignment of Analog Inputs

→ Assign the analog input to contacts 9 (-) and 10(+).

The display adjustment (scaling) is effected at the front via the keyboard. The setting with or without offset (2 V, 4 mA) is effected on programming line 26.



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

4.2.5 Assignment of Control Input

Contacts 11 and 12 are two control inputs - input logic PNP, rising edge. It is possible to choose the function of these control inputs on the programming lines 31 and 32. The functions are: Hold, Reset – Peak memory, Programming disable, Keylock, Print and TARA.

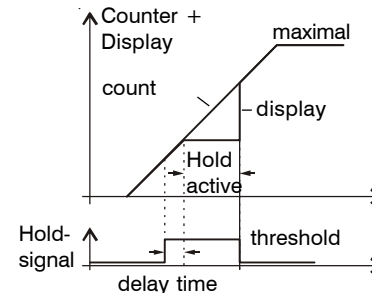
Hold-Input

The function Hold activates the display upon actuation of the input, with a delay of 0 to 9 seconds, as programmed in line 39. After deactivation of the input, the next display of Update will again show the current value.

For the models with relay, the limits P1 and P2 react to the value actually displayed. For the models with interface, the value actually displayed is transmitted.

Input resistance	Selectable operating threshold
ca. 3kOhm	≤3V and ≤6V

Programming of the threshold in line 23.



i IMPORTANT!
Level of the threshold ≤40 V.

4.2.6 Assignment of RS232 Interface (Option)

The serial interface can perform the following functions:

- Retrieve data
- Program and retrieve parameters.

Interface parameters are:

- Transmission speed (Baud rate),
- Parity bit,
- Number of stop bits,
- address by which the master approaches the control instrument.

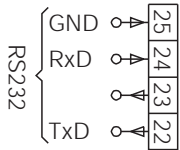
The interface parameters can be set on the programming level (Line 51 to 56)

Characteristics of the interfaces

RS232 Full-duplex transmission:

- asymmetric
- 3 lines
- Point-to-Point connection – 1 emitter and 1 receiver
- Distance of data transfer: max. 30m

→ Assign contacts 22, 24 and 25 with the interface.



5. Operator Level

The following chapter will inform you on the operation. The controller is automatically on the operator level after the supply voltage has been turned on.


On the operator level it is possible to

- read and, if necessary, to clear the current display status;
- read and, if necessary, to clear the peak;
- adjust the display for the initial and final values;
- to read and modify the limit values P1 and P2.


It is possible to disable all operation parameters on the programming level. (Line 11-16)

Key functions




Parameter reading

It is possible to switch to the next operation parameter with the  key.

Peak value reset

1. Have the peak value displayed.
2. Push  key.

Parameter setting


1. Have parameters displayed.
 2. Push  key and select desired decade; the chosen decade position flashes.
 3. Push  key and enter value desired.
- To set further decades, repeat steps 2 and 3.
4. Confirm the parameters entered via  key.

Should no confirmation occur within 15 s, the previous setting will remain valid.

IMPORTANT!



Only the measuring value display F1 is displayed by the factory setting. According to the settings in the programming field 2 (see Chap. 6.2) this can be adjusted for the further parameters.

Reading of operation parameter

Push  key. An Infotext will appear for approx. 1 s regarding the displayed operation parameter (e.g.: F for the current measurement).


Measuring value display F1


After having turned on the instrument or upon selection via the  key,  appears for 1 second, afterwards the current measurement.

Reset → Push  key (TARA function has to be activated, see Chap. 6.5).


HIGH - Peak memory

Read → Push  key. HIGH appears for 1 second in the display, afterwards the peak value

Reset → Push  key.

bFdn-Display adjustment Initial value

Read → Push  key.


bFdn appears for 1 second on the display, afterwards the initial value.

Example : When measuring rotational speed, 0...10 V correspond to a speed of 0...1000 rpm.
The setting of the initial value remains at 0.

bFuP

4095

bFuP - Display adjustment Final value

Read → Push  key.

Example:

bFuP appears for 1 second on the display, afterwards the final value.
When measuring rotational speed, 0...10 V correspond to a speed of 0...1000 rpm.

The final value is set from 4095 to 1000.


Modify

→ Endwert über Taste  und  eingeben Taste  zur Quittierung drücken.

P1

1000

Limit value P1

Read → Push  key.

Modify


P1 appears for 1 second on the display, afterwards the limit P1.

→ Enter limit P1 via keys  and  . Push  for confirmation.

P2



2000

Limit value P2


Read → Push  key.

Modify

P2 appears for 1 second on the display, afterwards the limit P2.

→ Enter limit P2 via keys  and  . Push  for confirmation.



If you push the  key once more, the current measurement will again be displayed.

6. Programming Level

This chapter will inform you on how to program your controller.

Operation parameters are set on the programming level. The programming level consists of 3 programming fields. Access is protected via a 4-character code.

1. programming field

Here it is possible to select and modify all operation parameters. The operation parameters that are disabled for the operator are also displayed.


2. programming field


The individual operation parameters for operator access on the operator level are disabled or enabled here.

3. programming field

All functions and values conditioned by the machinery as well as interface parameters are programmed here.


Key functions

→ Push  key.

The display shows 

Start programming




No code is entered when instrument is delivered ex-works; thus you may skip the code request by pushing the  key. The code is set in programming line 40. Upon installation of a code, it will only be possible to switch to the programming level by using the correct code.

Programming level

Enter code via the keys  and  . Push key  for confirmation. The device will now switch from the operator to the programming level.



Enter Code

If a wrong code has been entered, „**Error**“ will keep on being displayed as long as the  key remains pushed. After 15 seconds, the instrument switches automatically to the operator level.

Wrong Code

If the correct code is unknown, please send counter back to the supplier or perform a reset of the factory setting.




Correct code unknown

Select the programming line needed via the  key. The corresponding line number will then be displayed. Please keep the  key pressed for quick sweep.

Select programming lines

By keeping the  key pressed and pushing the  key, it is possible to jump back within the programming lines.



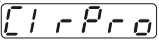
Switch back within programming lines

Select decade to be modified via  key. The selected decade flashes. Enter value by pushing the  key. Push  key for confirmation.

Betriebsparameter ändern

It is possible to leave programming at any time by pushing  .

Modify operation parameters


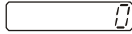
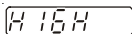

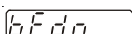

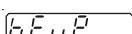


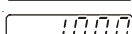

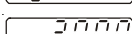
Turn on instrument and push keys  and  simultaneously. All values already programmed are set back to factory setting.  is displayed.

Leave programming

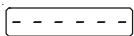

6.1 Programming Field 1

Here it is possible to select and modify all operation parameters. The operation parameters that are disabled for the operator are also displayed. The denomination of the selected line, e.g. F, is displayed for one second, afterwards its corresponding digit value.

→ Continue to next programming line via the  key.

	Measuring value display F1	1. Line
		
	High - Peak memory	2. Line
		
	bFdn - Display adjustment Initial value	3. Line
		
	bFuP - Display adjustment Final value	4. Line
		
	P1 - Limit value P1	5. Line
		
	P2 - Limit value P2	6. Line
		




DD241PC(11) only


 The dash line signalsizes the end of the first programming field.
 → Continue to programming field 2 with help of the key .

6.2 Programming Field 2


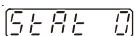
Here it is possible to disable or enable the individual operation parameters. **StAt** is displayed.
 The denomination of the selected line, e.g. “F”, “HIGH”, “bFdn”, “bFuP” appears for one second; afterwards the display jumps to StAt and the current status value.

Meaning of the status digits

- 0 Free access Operation parameter can be selected, read and modified, and/or cleared on the operator level.
 - 1 Display only Operation parameter can be selected and read on the operator level.
 - 2 Disabled Operating Parameter cannot be selected on the operator level.
 The relevant functions remains valid.
- Modify status Enter relevant status digits with the keys  and  . Modified status digit is automatically saved when the next programming line is selected via the key .

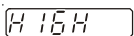
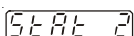
 Factory setting is always marked with a *.

Measuring value display F1

-  0 * Free access
-  1 Display only
- 2 Disabled

11. Line

HIGH - Peak memory

-  0 Free access
-  1 Display only
- 2 * Disabled

12. Line

bFdn - Display adjustment Initial value

<input type="text" value="bFdn"/>	0	Free access
<input type="text" value="START 2"/>	1	Display only
	2	* Disabled

13. Line

bFuP - Display adjustment Final value

<input type="text" value="bFuP"/>	0	Free access
<input type="text" value="START 2"/>	1	Display only
	2	* Disabled

14. Line

P1 - Limit value P1

<input type="text" value="P1"/>	0	* Free access
<input type="text" value="START 0"/>	1	Display only
	2	Disabled

15. Line

P2 - Limit value P2

<input type="text" value="P2"/>	0	* Free access
<input type="text" value="2000"/>	1	Display only
	2	Disabled

16. Line

DD241PC(11) only

The dash line signals the end of the second programming field.
 → Continue to programming field 3 with help of the key

6.3 Programming Field 3

All functions and values conditioned by the machinery as well as interface parameters are programmed here. The programming field 3 starts with programming line 23. The selected line number appears on the left display field. The programmed value appears in the right display field.

→ Switch to the next programming line using the key .



Factory setting is always marked with a *.

Operating threshold of control inputs (PNP, rising edge)

23	0	* Operating threshold ≤ 6 V	23. Line
	1	Operating threshold ≤ 3 V	

Decimal point

24	0	* no Decimal point	24. Line
	1	00000.0	
	2	0000.00	
	3	000.000	

Offset

26	0	* no Offset	26. Line
	1	Offset 4 mA, without monitoring < 4 mA	
	2	Offset 4 mA, with monitoring < 4 mA (display flashes)	

Update time (Repeated display and relay response time)

28 2	0	0,1 sec	5	5 sec	28. Line
	1	0,5 sec	6	10 sec	
	2	* 1 sec	7	20 sec	
	3	2 sec	8	30 sec	
	4	3 sec	9	60 sec	

Function of control input 1 (Contact 11)

31 0	0	* Hold	31. Line
	1	Reset Peak memory	
	2	Programming disabled	
	3	Keylock	
	4	Print (only for interface option)	
	5	TARA-function	

Function of control input 2 (Contact 12)

32 1	0	Hold	32. Line
	1	* Reset Peak memory	
	2	Programming disabled	
	3	Keylock	
	4	Print (only for interface option)	
	5	TARA-function	

Assignment Limit P1

33 0	0	* Upper Limit	33. Line
	1	Lower Limit	

Assignment Limit P2

34 0	0	* Upper Limit	34. Line
	1	Lower Limit	

DD241PC(11) only

Output logic for relay outputs

- | | | |
|------|---|-----------------------------------|
| 35 0 | 0 | * Both outputs make contacts |
| | 1 | P1 break contact, P2 make contact |
| | 2 | P1 make contact, P2 break contact |
| | 3 | Both outputs break contacts |

DD241PC(11) only

35. Line

Hold Delay time

- | | | |
|------|---|-------------------------------|
| 39 0 | 0 | * No delay |
| | 1 | Delay 1 s (selection 1...9 s) |
| | 2 | Delay 9 s |

39. Line

Code Settings

- | | | |
|--------|---|-------------------------------|
| 40 Cod | 0 | * Code not activ
max. 9999 |
|--------|---|-------------------------------|

40. Line

Balancing Analog input

- | | | |
|------|---|---|
| 41 0 | 0 | * Standard |
| | 1 | Two-state balancing via key C |
| | 2 | Two-state balancing via key △ and P/R |

41. Line

TARA function via keys

- | | | |
|------|---|-------------------------|
| 46 0 | 0 | * Without TARA function |
| | 1 | With TARA function |

46. Line

Programming level

Baud rate

51 0	0	* 4800 Baud
	1	2400 Baud
	2	1200 Baud
	3	600 Baud

Parity

52 0	0	* Even
	1	Odd
	2	No

Stop bits

53 0	0	*1
	1	2

Adress

54 0	0	* from
	99	to

Assignment output value via interface (Line 31 or 32=4)

55 0	0	*F
	1	HIGH

DD241PC(11) only

51. Line

52. Line

53. Line

54. Line

55. Line

----- The dash line signalizes the end of the third programming field.

It is possible to terminate programming at any time by pushing P/R key. The instrument switches then back to the operator level.

Turn off programming

Simultaneously press the keys ◀ and ▶ and turn on the instrument. All values already programmed are set back to factory setting. C I R P r 0 is then displayed.

Reset to factory settings

6.4 Two-state Balancing (teach-IN)

The two-state balancing allows flexible calibration of display to the analog signal of the sensor. The balancing state 1 and state 2 can be placed anywhere in the positive measuring range for the two-state balancing.

Please refer to figures 1 and 2, see Fig. 6.1 and 6.2.

6.4.1 Programming

- Factory setting of factory needs to be modified as follows:
- Line 13 = 0 Free access for bFdn - Display balancing Initial value
 - Line 14 = 0 Free access for bFdn - Display balancing Final value
 - Line 41 = 1 Two-state balancing via key

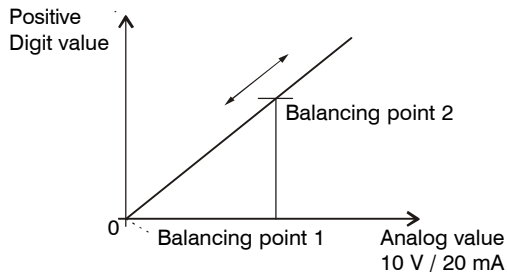


Abb. 6.1: Positive Digit value

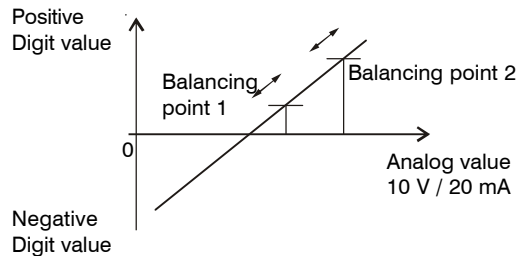



Abb. 6.2: Positive and Negative Digit value

6.4.2 Operation Two-state Balancing

Please perform the two-state balancing as follows

Measuring value display F1

After turning on the device or when selecting via the key , F will appear for 1 second, then the current measurement.

Set connected signal encoder to first „teach“ position

→ Select state 1:

Tip key 

APdn - Display balancing state 1

Display shows APdn for 1 second, then 0

→ Initiate balancing:

Tip key 



dn (down) shows the value computed for state 1

→ confirm:

Tip key 

dn Pro, State 1 is programmed

Set signal encoder to second „teach“ position

→ Select state 2:

Tip key 

APuP - Display balancing state 2

Display shows APuP for 1 second, then 4095

→ Start input:

Tip key 

→ Set default value to zero:

Tip key 

Programming level

000000

→ Select 3rd decade:

Tip key  2 x

→ Enter digit 3:

Tip key  3 x

→ Confirm value 300:

Tip key 

Ready to enter the 2nd learn position, for example 300

300

Initiate balancing: Tip key 

uPXXXX

→ Confirm:


uP - shows the value computed for state 2

Tip key 

uP Pro

300

uP Pro, State 2 is programmed

Tip key  till F is displayed

F

300

End of balancing, ready for operation

6.5 TARA Function

The TARA function allows a balancing of the displayed value F to the value 0, comparable with a balance, which can be set to 0 constantly.

Activating:

The TARA function is deactivated according to standard. The activation follows in line 46.

Performing the TARA function via keyboard:

- 1) Select measuring value display F
- 2) Push Key → display value is set to 0

Note: If you want to execute the TARA function once only, for example for setting of a plant, a further zero setting can be avoided by setting to status 1, see line 11.

Return to absolute display values:

- 1) Set line 46 to 0 (without TARA function) in programming mode
- 2) Change in RUN mode again. During switching to RUN mode the internal offset value is deleted, so that the absolute value is shown again at analog output.

Performing the TARA function via the external control input:

The TARA function can be activated for the adequate control input via the selection 5 of the control inputs 1 or 2:

Line 31/32	Function of control input 1 (contact 11)
0	*Hold
1	Reset Peak Memory
2	Programming disabled
3	Keylock
4	Print
5	TARA function

7. Errors

 and  must be rectified at the factory.

8. RS232 (Option)

The serial interface can do the same job as DD241PC display and keyboard. The interface is for polling data and alteration of programmed parameters. In general the DD241PC is operated by PC or PLC when applying the serial interface, however another device with similar characteristics will do as well.

8.1 Transmission Protocol

Transmission is effected sign by sign in ASCII code. Every sign consists of 8 bits. Bit number 8 is the parity bit, i.e. in case of „no parity“ bit number 8 is always broadcasted as zero. Please consider the following when setting the data bits at the PC end:

Parity	Data bits
Even	7
Odd	7
No	8

Upon each PC query the DD241PC is replying by serial interface, provided the data transfer was finalized correctly. The sign transmission is initiated by a start sign <STX> (= 2Hex) and finalized by a stop sign <ETX> (= 3Hex). In addition, the DD241PC transmits a <CR> (carriage return = 0DHex) after <ETX>. This enables the reading of complete data blocks by one command (with standard languages). <STX> is followed by the designated DD241PC device address. Thus, the DD241PC can be addressed directly in a serial network. The address is followed by the line number (position) for optional readout or programming respectively by the sign “P” for a programming command and the corresponding data or parameters.

The protocol is split into 3 groups as under:

a) Read memory (READ instruction):

<STX> address line <ETX> [<CR>]

b) Write memory (WRITE instruction):

<STX> address line P data <ETX> [<CR>]

c) Special commands:

<STX> address parameter <ETX> [<CR>]

<STX>	start of text (02Hex)
address	00 ... 99 (device address)
line	01 ... XX (see operating plan)
P	programming command
data	programming data
parameter	special commands
<ETX>	end of text (03Hex)
<CR>	0DHex (control signs "carriage return") "CR" is optional but will always be returned by DD241PC.

General example:

General <STX> address line <ETX> (address = 00; line = 02)

ASCII <STX>0002<ETX>

Hex 02H,30H,30H,30H,32H,03H



The blanks between the individual signs of a command are only for better understanding. The PC input has to be without blanks. Control signs (inferior to 20Hex) are in brackets. In case the PC is transmitting a wrong protocol the DD241PC will reply an error message, provided the device is still able to communicate. For further details please refer to Chap. 8.5 "Error messages".

8.2 Memory Reading

All memory cells provided with a line number in the programming plan can be read (except for the separating lines marked by dashes). The protocol: <STX> address line <ETX> [<CR>] can be applied to each line. The DD241PC reply however may vary in length of the protocol from line to line. This depends on the data length of the respective memory. The DD241PC enables readout both in RUN and in PGM mode. The only difference in reply affects the mode parameter: a “R” or “P” as described below is transmitted.

Reply to a read command (general):

<STX> address line mode [VZ] data <ETX> <CR>

Mode P = DD241PC is in programming mode

R = DD241PC is in RUN mode

VZ pre-sign. Only transferred if negative value

Data max. digit number, with leading zeros without decimal point
(exception: line 6 – with decimal point)

Exmples for memory reading

The following protocol applies to the examples:

Device address = 35; DD241PC mode = R (RUN)

Measured value readout (line = 01, displayed value = 1500)

Query: <STX>3501<ETX>

Reply: <STX>3501R001500<ETX><CR>

Read out of display adjustment bFuP (line = 04, setting = 1000)

Query: <STX>3504<ETX>

Reply: <STX>3504R001000<ETX><CR>

Update time readout (line = 28, setting = 2)

query: <STX>3528<ETX>

reply: <STX>3528R2<ETX><CR> (2 corresponds to 1 second)

Read out of device address (line = 54, setting = 35)

Query: <STX>3554<ETX>

Reply: <STX>3554R35<ETX><CR>

8.3 Memory Programming

All memory cells provided with a line number in the programming plan enable programming, except for the separating lines (marked by dashes) and the lines 1 – 6. The protocol: <STX> address line P [VZ] data <ETX> [<CR>] is applicable to each line. The DD241PC reply after each individual programming procedure is the same as for line reading.

All memory cells enable programming both in RUN and programming mode.

Programming in RUN mode

The data in the lines 23, 26, 28, 39, 51 - 54 and 56 are only internally memorized after switching from PGM mode into RUN mode. Switching to PGM mode see chapter 8.4.2. The remaining lines are active immediately after programming.

All data programmed in RUN mode are only taken into the non-volatile memory after switching from PGM mode to RU mode. If there is no PGM/RUN switchover the former data are active again after mains failure.

Write command (general):

<STX> address line P [VZ] data <ETX> [<CR>]

Examples

The following protocol applies to the examples:

device address = 35; DD241PC mode = R (RUN)

Programming the display adjustment bFuP (line = 04, setting = 1000)

Command: <STX>3504P001000<ETX>

Reply : <STX>3504R001000<ETX> <CR>

Programming the update time (line = 28, setting = 3)

Command: <STX>3528P3<ETX>

Reply: <STX>3528R3<ETX> <CR>

Programming the code (line = 40, setting = 1234)

Command: <STX>3540P1234<ETX>

Reply: <STX>3540R1234<ETX> <CR>

Programming the device address (line = 54, new device address = 27)

Command: <STX>3554P27<ETX>

Reply: <STX>3554R27<ETX> <CR>

8.4 Special Commands

Special commands (except for the command „delete measured and maximum value“) are instructions that do not relate to a certain line number (memory cell in the operating plan).

8.4.1 Delete Measured and Maximum Value

The measured value (line 1) or the maximum value (line 2), can be cleared by following special command. These lines do not allow programming. All remaining lines in the programming plan (except the separating lines) are deleted by entering 0 (see above). The delete command is equal with a reset by the C-key. The DD241PC reply to deletion is the same as the read command for the respective line.

General: <STX> address line <ETX>

Example: Delete maximum value memory HIGH (line 2)

Address = 35, line = 02, status = RUN mode

Command: <STX>3502<ETX> = 7FHex

Reply : <STX>3502R000000<ETX><CR>

8.4.2 Switching DD241PC to PGM or RUN Mode

This command is for switching between PGM and RUN mode by each query. Replied are the current line number and the active status after command accomplishment.

General: <STX> address <DC1> <ETX>

Example:

Address = 35, status = RUN mode, current line = 1

Query: <STX>35<DC1><ETX> <DC1> = 11Hex

Reply: <STX>35P<ETX><CR>

Repeating the command means switching to RUN mode again

Query: <STX>35<DC1><ETX>

Reply: <STX>35R<ETX><CR>

8.4.3 Switching to Next Line

This instruction allows to switch the display to its corresponding next line. The function is available in the RUN mode as well as in the PGM mode. The contents of the current line (after switching) is returned as answer.

Example: address = 35, status = RUN mode, switch from line 1 to line 2

Command: <STX>35<LF><ETX> <LF> = 10Hex

Answer: <STX>3502R000100<ETX><CR>

8.4.4 Identification Reading

Identification data are read only. The address is followed by two parameters: command parameter “I” (for identification) and selection parameter “T” (device type and software version) or “D” (date and hardware version) or “V” (version number) for the several identification data.

Read device type and program number:

Address = 35, type = DD241PC, program number = 01

Query: <STX>35IT<ETX>

Reply: <STX>35PCD41 01<ETX><CR>

Read date and version number:

Address = 35, date = 09.09.06, version = 1

Query: <STX>35ID<ETX>

Reply: <STX>35090906 1<ETX><CR>

8.5 Error Messages

If the DD241PC is receiving a wrong data protocol by the PC (for example not existing line or letters instead of numbers) the DD241PC will reply by a corresponding error message, provided the device is still able to communicate. To enable an error message at least the control sign <STX> as well as the address have to be correct. Otherwise the DD241PC is not addressed and therefore unable to return an error message to the PC.

If there is no reply upon a PC query, neither an error message, this means a fatal error. The reason may be missing of a control sign <STX> or address or the interface parameters of PC and DD241PC do not coincide.

General structure

<STX> address line status <CAN> error number <ETX> <CR>

Example:

Address = 35, line = 09 (void line), error number = 2

<STX>3509R<CAN>2<ETX><CR>

Both positions „line“ and „status“ are being omitted in the case of an error reply.

Error description

Error 1: format error (<ETX> at incorrect place), for example if the data format is not kept during programming (i.e. during programming of the limit value only 5 data digits instead of 6 are being transferred).

Error 2: line (position) not existing or separating line

Error 3: parameter error (void values in the protocol). For example, the limit value contains characters or other void signs or the stated value is beyond the permitted range.

8.6 Used Control Signs

Control sign	Hex	Decimal
<STX>	02	02
<ETX>	03	03
<LF>	0A	10
<CR>	0D	13
<DC1>	11	17
<CAN>	18	24
	7F	127

9. Warranty

All components of the device have been checked and tested for perfect function in the factory. In the unlikely event that errors should occur despite our thorough quality control, this should be reported immediately to Micro-Epsilon.

The warranty period lasts 12 months following the day of shipment. Defective parts, except wear parts, will be repaired or replaced free of charge within this period if you return the device free of cost to Micro-Epsilon.

This warranty does not apply to damage resulting from abuse of the equipment and devices, from forceful handling or installation of the devices or from repair or modifications performed by third parties.

No other claims, except as warranted, are accepted. The terms of the purchasing contract apply in full.

Micro-Epsilon will specifically not be responsible for eventual consequential damages.

Micro-Epsilon always strives to supply the customers with the finest and most advanced equipment.

Development and refinement is therefore performed continuously and the right to design changes without prior notice is accordingly reserved.

For translations in other languages, the data and statements in the German language operation manual are to be taken as authoritative.

10. Decommissioning, Disposal

- Disconnect all cables between sensor and consecutively control and processing units.

- The DD241 PC is produced according to the directive 2002/95/EC („RoHS“). The disposal is done according to the legal regulations (see directive 2002/96/EC).

11. Service, Repair

In the event of a defect in the sensor, sensor cable or controller the whole measuring system must be sent back for repair or replacement.

In the case of faults the cause of which is not clearly identifiable, the whole measuring system must be sent back to the manufacturer

12. Factory Setting

The following parameters are programmed in the DD241PC at the factory:

F Actual measuring value	free access
High peak memory	disabled
bFd _n , bFuP Display adjustment initial value	disabled
Operating threshold of control inputs	6 V
Decimal point	no
Offset	no
Update time repeated display	1 s
Control input 1	Function Hold
Control input 2	Function Reset peak value memory
Hold delay time	no
Balancing analog input	Standard
TARA Function	off

Additional parameters for DD241PC(11)

Baudrate	4800
Parity	even
Stopp bit	no
P1 Upper limit 1	1000, free access
P2 Upper limit 2	2000, free access
Relais outputs logic	NOC



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