DATCON

IPARI ELEKTRONIKAI KFT.

DT4220 E xx xx xx (PS)

Process Indicator

Operating Instructions

CE

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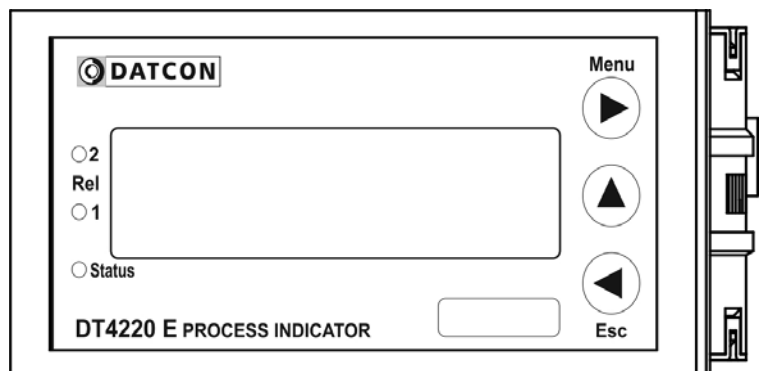
1. About this document

1.1. Function

This operating instructions manual has all the information you need for quick set-up and safe operation of
DT4220 E xx xx xx (PS).
Please read this manual before you start setup.

1.2. Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3. Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution, warning, danger
This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.

List
•   The dot set in front indicates a list with no implied sequence.

Sequence
1   Numbers set in front indicate successive steps in a procedure.

Parting
/   Parting set in between the elements of a list.
It's meaning: only one element can be chosen from the list.

2. For your safety

2.1. Authorized personnel

All operations described in this operating instructions manual must be carried out only by trained and authorized specialist personnel. For safety and warranty reasons, any internal work on the instruments must be carried out only by DATCON personnel.

2.2. Appropriate use

The DT4220 E Process Indicator enable process variable 0-20 mA, 4-20 mA, 0-10 V, 0-5 V, 2-10 V to be displayed in engineering units on the control panel.
Detailed information on the application range of the instrument is available in chapter "Product description".

2.3. Warning about misuse

Nem megfelelő vagy helytelen használat — alkalmazástól függően — zavart okozhat a készülékhez kapcsolódó egyéb készülékekben, rendszerekben.

2.4. General safety instructions

The DT4220 E Process Indicator is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standard as well as all prevailing safety regulations and accident prevention rules.

2.5. CE conformity

A DT4220 E is in conformity with the provisions of the following standards:
EN 61326-1:2012 (EMC)

2.6. Environmental instructions

Protection of the environment is one of our most important duties. Please take note of the instructions written in the following chapters:

- Chapter **3.6. Storage and transport**

- Chapter **9.2. Disposal**

3. Product description

3.1. Delivery configuration

Delivered items

The scope of delivery encompasses:

- DT4220 E
- 2 pc. mounting clamps (enclosed in a nylon bag)
- documentation:
  this operating instructions manual
  warranty

3.2. Type designation

3.3. Operating principle
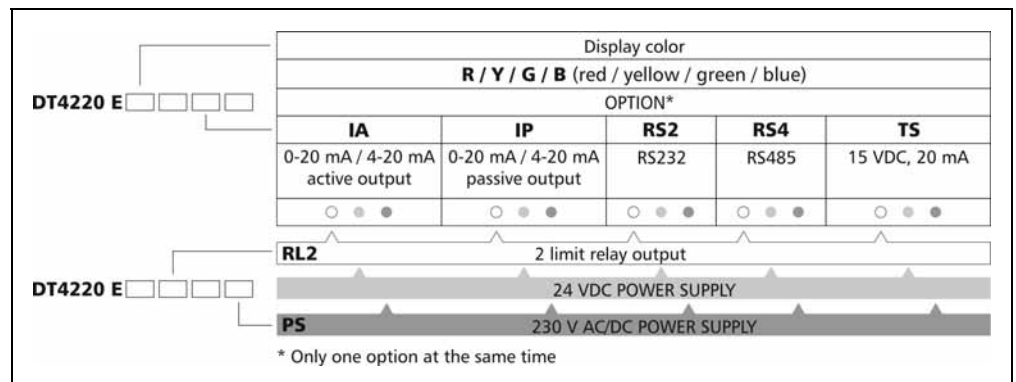
Area of application

The DT4220 xx xx xx (PS) Process Indicator enable process variable 0-20 mA, 4-20 mA, 0-10 V, 0-5 V, 2-10 V to be displayed in engineering units ont he control panel.
Any optional display range can be assigned to the input signal range. Large 5 digit, 14.2 mm height LED display make process value easily visible at a distance.

Options:

RL2

Two normally open relay contacts (SPST) for limit switching or for simple control tasks.

IA / IP

4-20 mA / 0-20 mA galvanic isolated scaleable analogue output. The output can be active (A) or passive (P).

TS

Galvanic isolated power supply output for 2, 3 or 4 wires transmitter.

RS2

RS232 galvanic isolated communication output with MODBUS RTU slave protocol. Only one instrument can be connected to the one RS232 connector of PLC or to the computer.

RS4

RS485 galvanic isolated communication output with MODBUS RTU slave protocol. 32 instruments can be connected to one RS485 connector of the PLC or to the computer.

Note: only one in five (IA, IP, TS, RS2, RS4) option can be implemented at the same time. The option RL2 always can be implemented independently another option.

Operating principle   The input current or voltage to be measured is led to the 23 bit A/D converter through a protection and signal condition circuit.
The digital output signal of the A/D converter is processed by a microcontroller.
The microcontroller drives the 5 digit LED display, processes the front panel membrane keypad, drives the limit relays, the analogue output and the communication output.
Easy on-site configuration through the front panel membrane keypad is a major advantage of the microcontroller-based technology. The configuration parameters: input signal selection, signal filtering, display scaling, decimal point position, display refresh rate, limit modes, limit values, etc. are stored in FRAM. The settings are protected by a two-level password against unauthorized manipulation.

Power supply   The instrument has two power supply version:
DT4220 E xx xx xx: 24 VDC ±10%, 3 W
DT4220 E xx xx xx **PS**:   230 V AC/DC ±10%, 3.5 VA / 3 W

3.4. Adjustment

The instrument can be adjusted through the
3 button front panel keypad. All configuration parameters are stored in the instrument FRAM for unlimited time, even when the supply voltage being switched off.
The instrument doesn't need any internal adjustment.

3.5. Display, indicators

The following figure shows the front panel of the instrument:
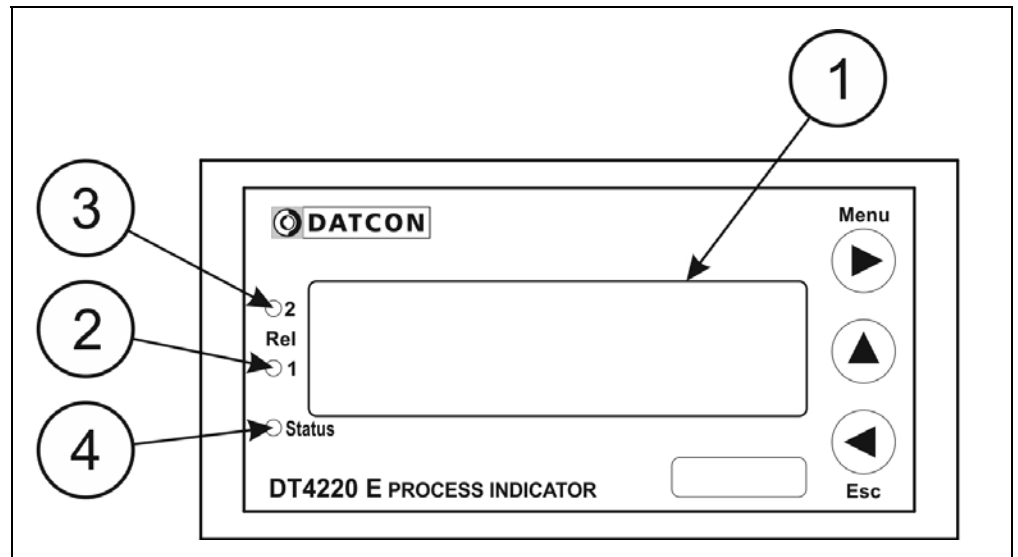
1. 5 digit 7 segment LED for displaying the measured value and the mnemonic messages.
2. "Rel1" yellow indicator for indicating that limit output 1 is in "on-state" (LIMIT1).
3. "Rel2" yellow indicator for indicating that limit output 2 is in "on-state" (LIMIT2).
4. "Status" yellow indicator for indicating that a successful data exchange has granted through the communication output.

3.6. Storage and transport

This instrument should be stored and transport in places whose climatic conditions are in accordance with Chapter **10.1. Technical specifications**, as described under the title: Environmental conditions.

The packaging of instrument consist of environment-friendly, recyclable cardboard is used to protect the instrument against the impacts of normal stresses occurring during transportation. The corrugated cardboard box is made from environment-friendly, recyclable paper. The inner protective material is nylon, which should be disposed of via specialized recycling companies.

4. Mounting

4.1. General instructions

Mounting position   Select a mounting position you can easily read the display reach for mounting and connecting the instrument and that minimizes the hazard of water, dust or dump getting into the instrument..

4.2. Main dimensions of the instrument

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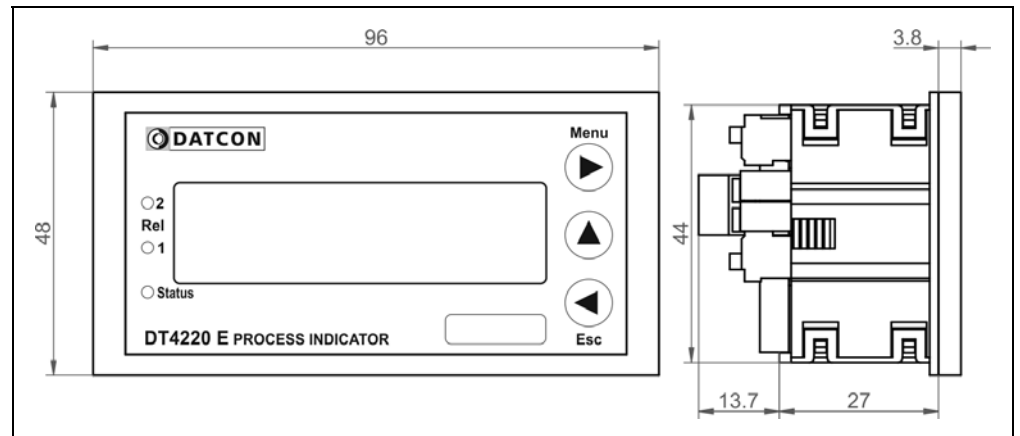
4.3. Mounting

Preparatory steps

The instrument is housed in a DIN standard ABS case. Fix it in the panel with the two enclosed mounting clamps.

Dimensions of panel cutout
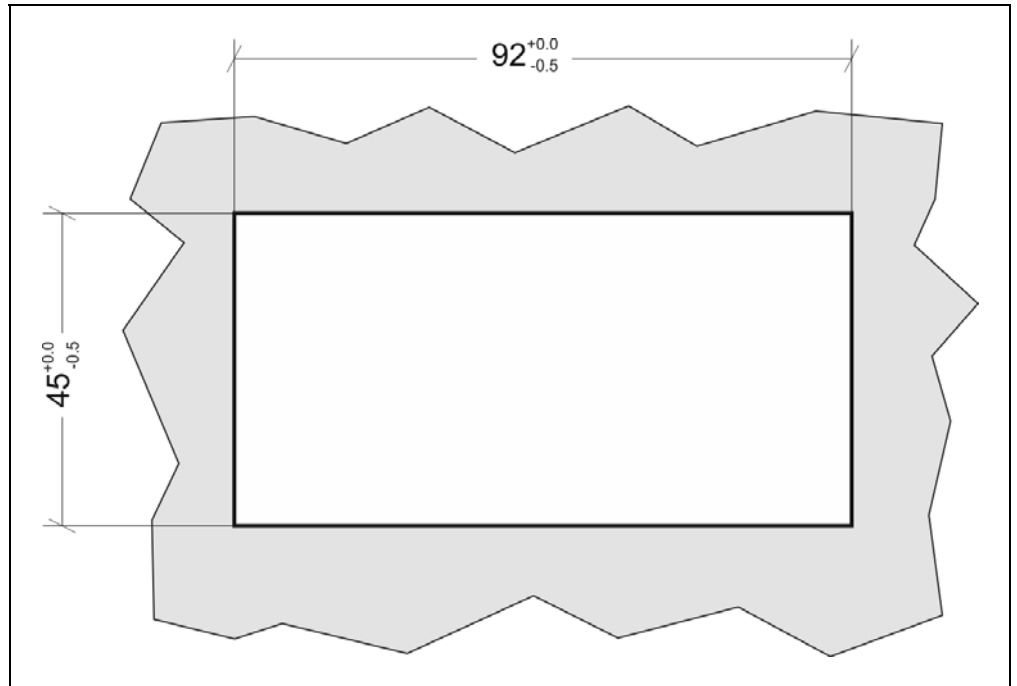
1. Cut-out the panel according to the figure shows above.

The cut-out needs special tools, it must be carried out by trained specialist personnel.

**Mounting with the
mounting clamps**
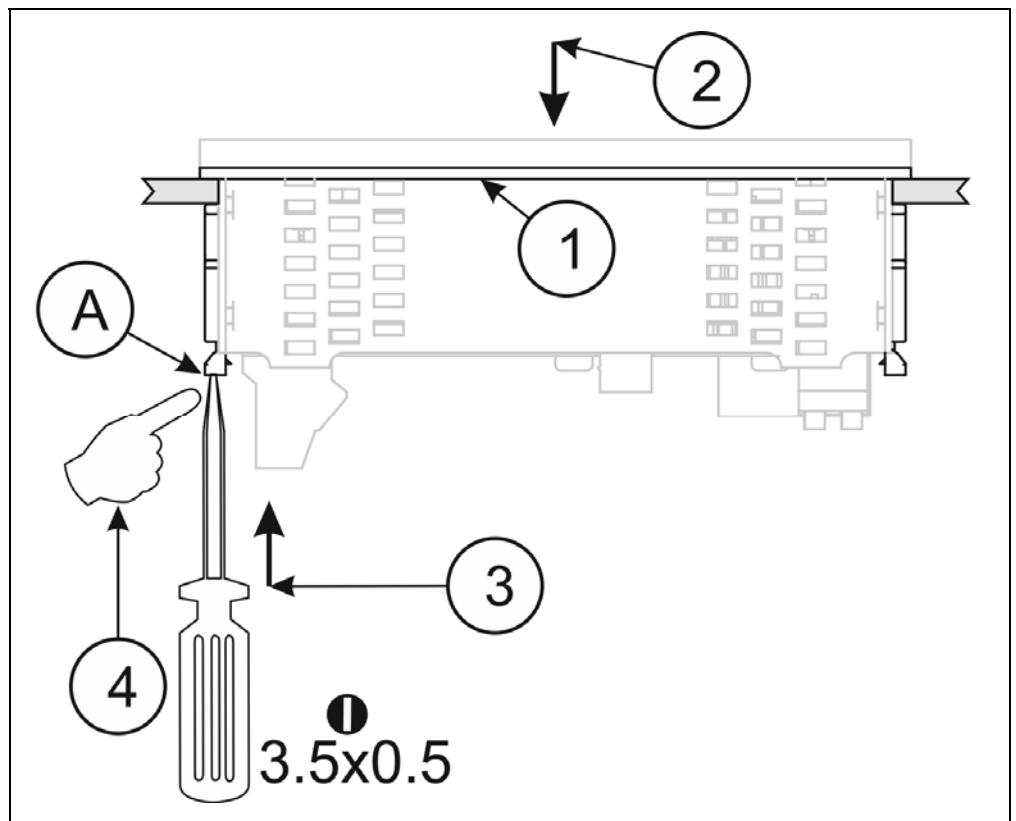
1. Put on the enclosed seal onto the instrument case from the rear side and fit it to the instrument holding frame (Figure step 1).
2. Put the instrument into the prepared cut-out until it possible and check the fitting of the seal between case and mounting surface.
3. Put one of the enclosed mounting clamp onto the tip of a screwdriver (A) and put the clamp with the help of the screwdriver into the hole on the side of the instrument.
4. Push the mounting clamp with your finger tip as far as you can while keeping the case in it's position.
Repeat the 4., 5. steps with the other clamp.
Please do not exercise forces higher than necessary, as it may cause damages to the clamp.

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5. Connecting

5.1. Preparing the connection

Always observe the following safety instructions:

- Connect or disconnect only in the complete absence of line voltage

- Take note the data concerning on the overcurrent protection in installation.

- Use only a screwdriver with appropriate head

Select connecting cable

Take note the suitability of the connecting cable
(wire cross-section, insulation, etc.).
You may use either solid conductor or flexible conductor.
In case of using flexible conductor use crimped wire end.
In case of mains connection the wire cross-section should be 1.0 mm2 (min.).
In case of connection communication cables take note the concerning prescriptions (www.modbus.org).
It's an important rule that the power cables and signal cables should lead on a separate way.

Preparing cables
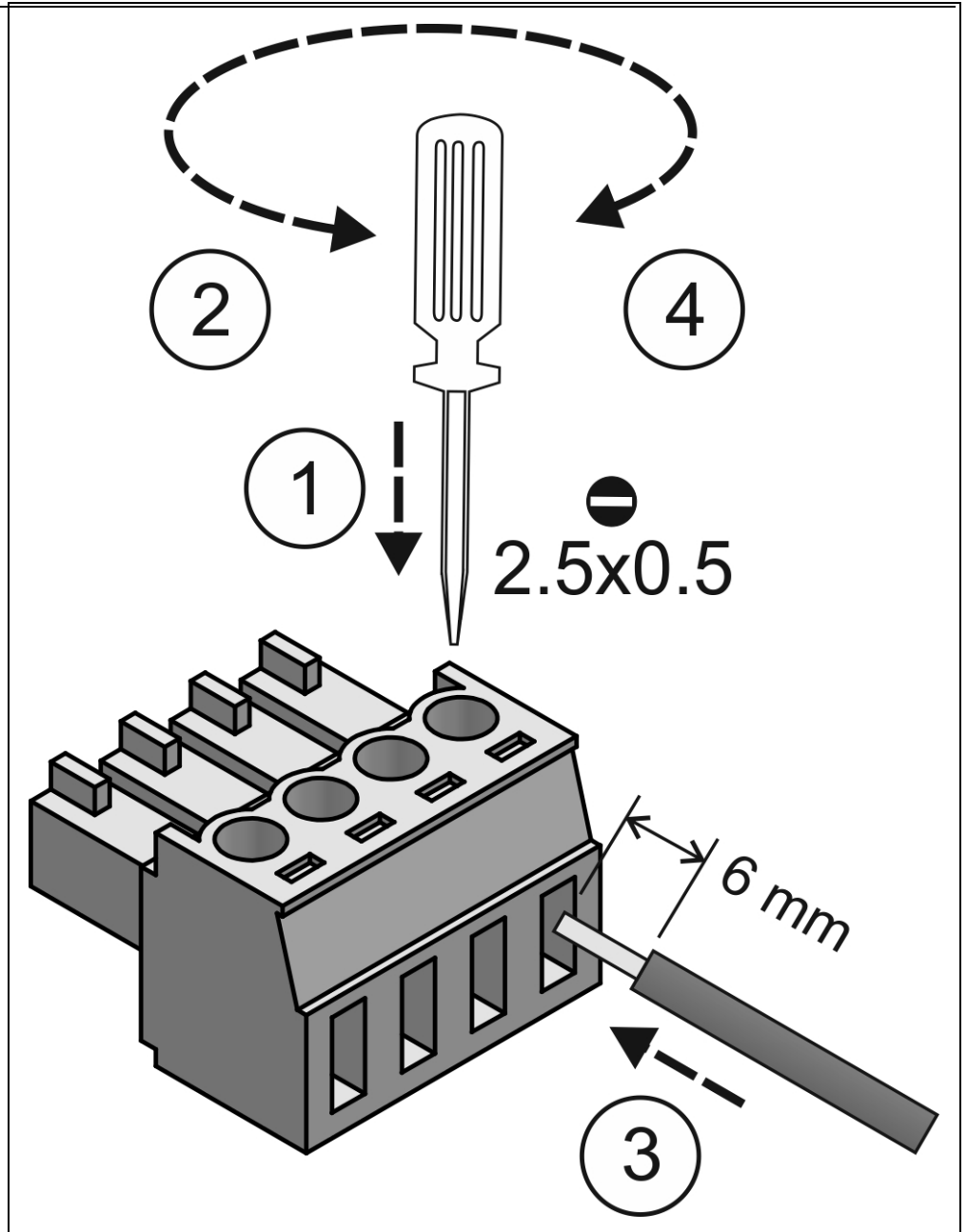
Prepare the cable for the connection.
Strip approx. 6 mm insulation.
In case of using flexible cable, use crimped wire end.

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5.2. Connecting the mains

The following figure shows the wiring plan, connecting the a DT4220 E xx xx **PS** type instrument to the mains:

Wiring plan, connecting the PS type instrument to the mains

In case of DC supply the polarity is indifferent.
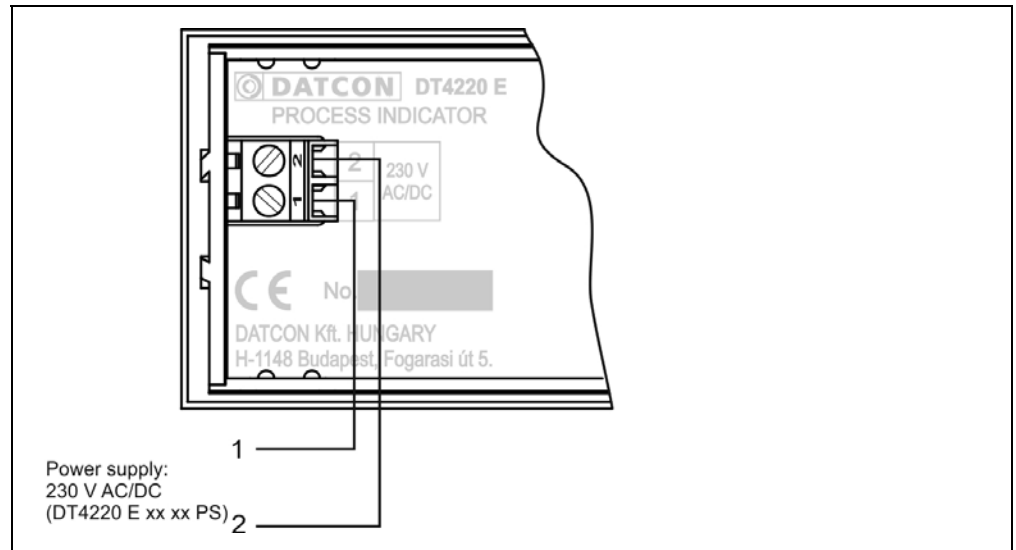
1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

The following figure shows the wiring plan, connecting the DT4220 E instrument to the low voltage power supply:

Wiring plan, connecting the 24 V type instrument to the the low voltage power supply

In case of DC supply the polarity is indifferent.

1. Loosen terminal screws.
2. Insert the wire ends into the open terminals according to the wiring plan.
3. Screw the terminal in.
4. Check the hold of the wires in terminals by pulling on them firmly.

5.3. Connecting to active current transmitter

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the input signal connecting are not compatible.

The following figure shows the wiring plan:

Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
6. Push in the terminal.

5.4. Connecting to passive current transmitter

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the input signal connecting are not compatible.

The following figure shows the wiring plan:

The instrument is connected to passive current transmitter via TS (transmitter supply) option.

Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
6. Push in the terminal.

Remark

If the instrument does not have the TS option, you need to use an external power supply for passive transmitter.

5.5. Connecting to voltage transmitter

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the input signal connecting are not compatible.

The following figure shows the wiring plan:

Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
6. Push in the terminal.

5.6. Connecting the limit relay outputs (option)

The following figure shows the wiring plan:

Wiring plan

The following figure shows the using of the push-in direct connectors.

The button can be pushed down easily. Please do not exercise forces higher than necessary, as it may cause damages to the terminal assembly.

Using of the push-in direct connectors
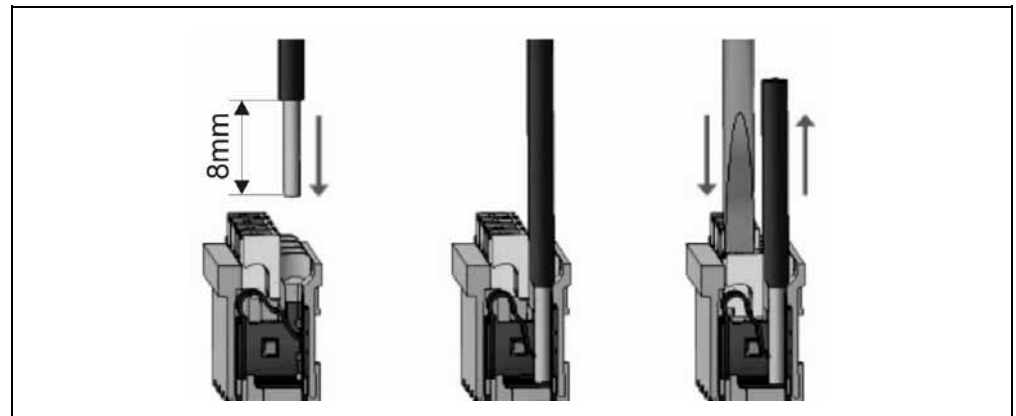
1. Push the stripped cable-end until it possible into the terminal assembly. In the case of flexible cable-ends, you can facilitate opening the connection part by pushing down the white button.

2. By pushing the wire in, the self-closing connection is being established. Check it by pulling it outwards firmly.

(3. When you are going to disassemble the cable, push down the white button by a screwdriver, and pull the cable-end out.)

5.7. Connecting the analogue output (option)

The following figure shows the wiring plan:
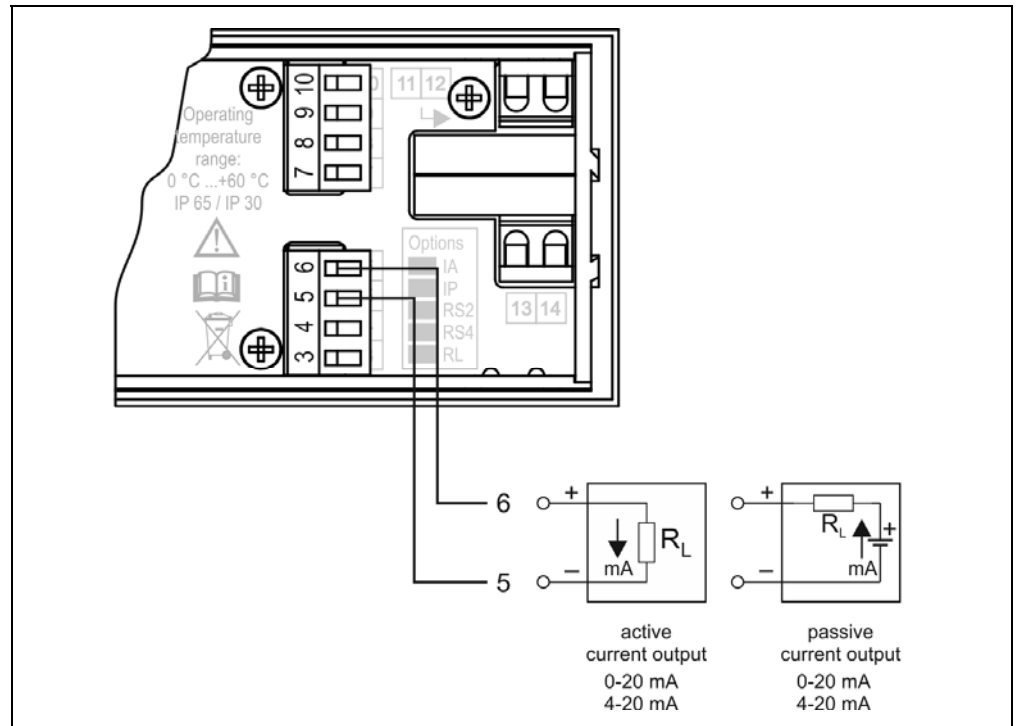
Wiring plan

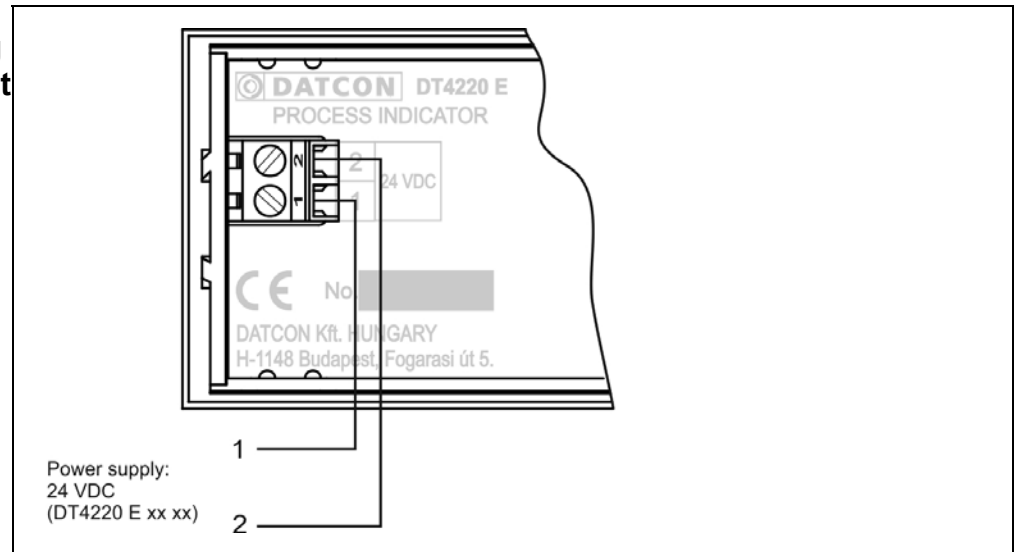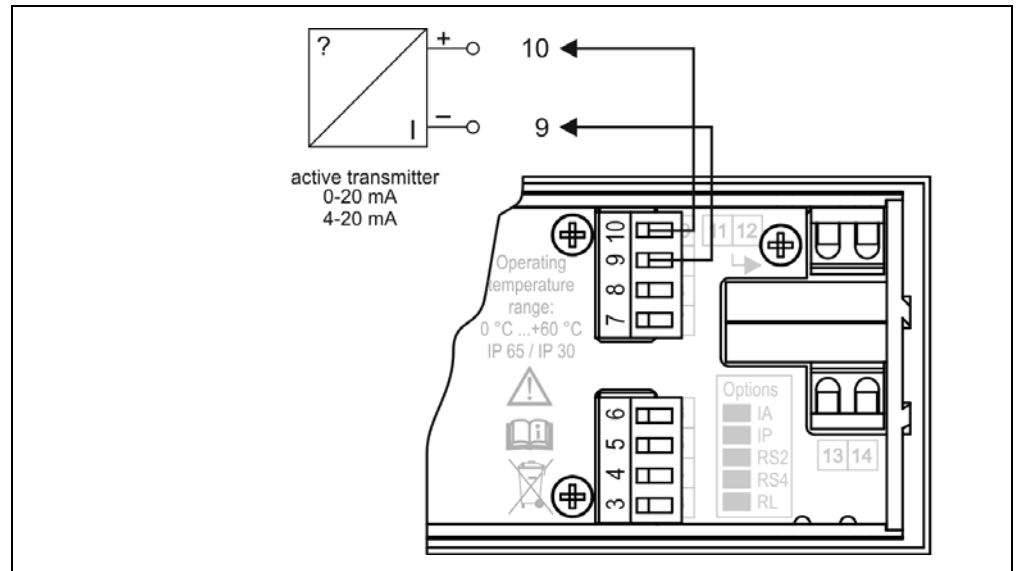1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
6. Push in the terminal.

5.8. Connecting the RS-232 MODBUS communication output (option)

The following figure shows the wiring plan:
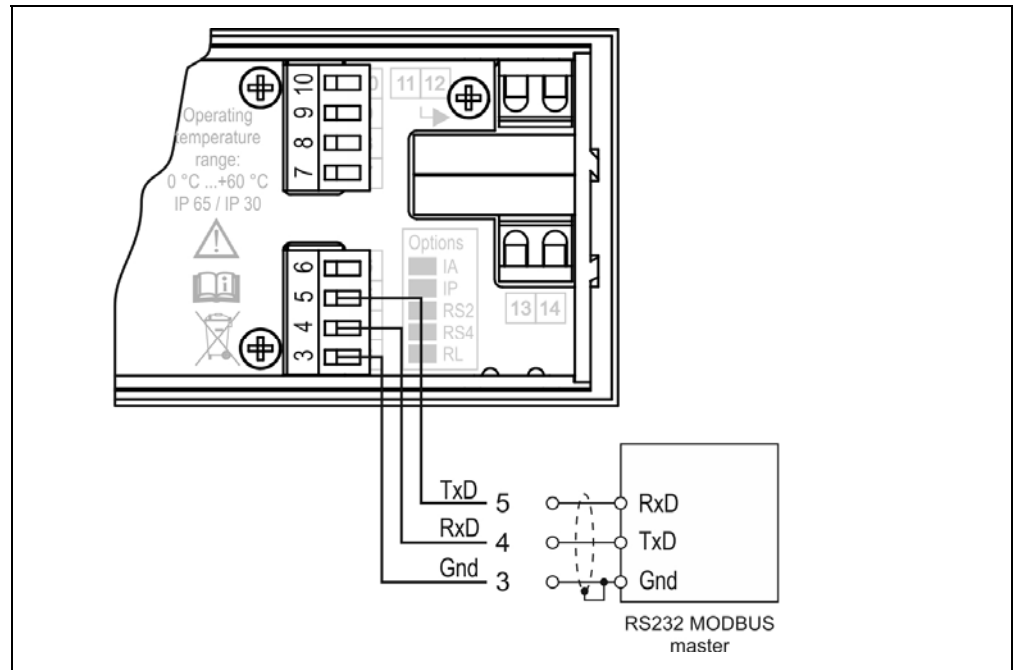
Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
6. Push in the terminal.

The RS-232 MODBUS communication output should be used for short distance communication. The maximum distance is < 10-15 m, it depends on the communication speed.
You can find useful information about the MODBUS communication at www.modbus.org.

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5.9. Connecting the RS-485 MODBUS communication output (option)

The following figure shows the wiring plan:
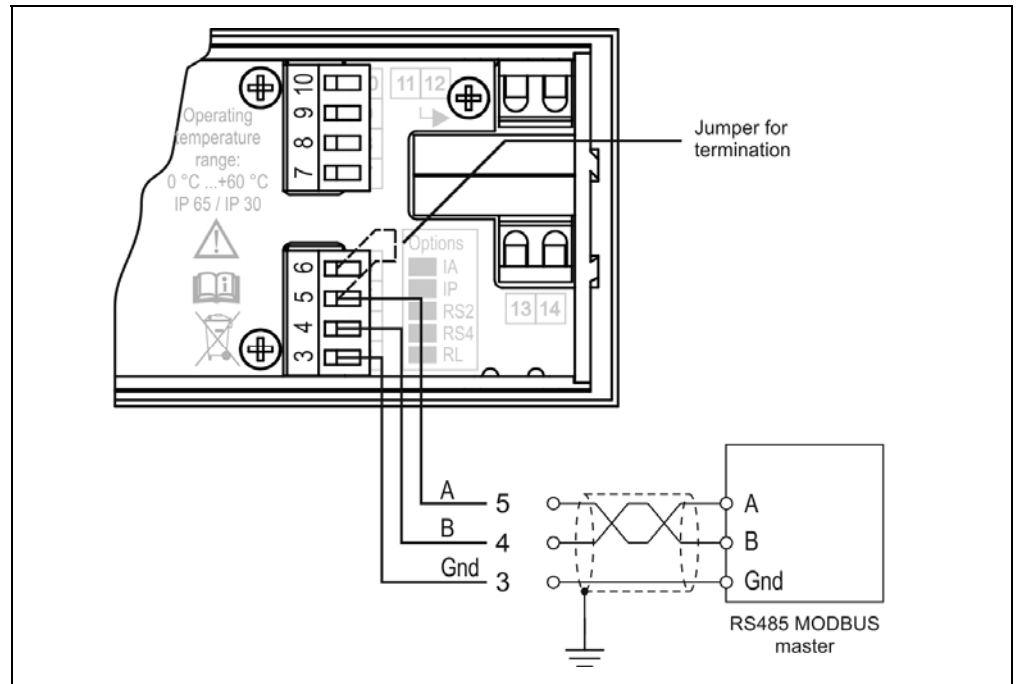
Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
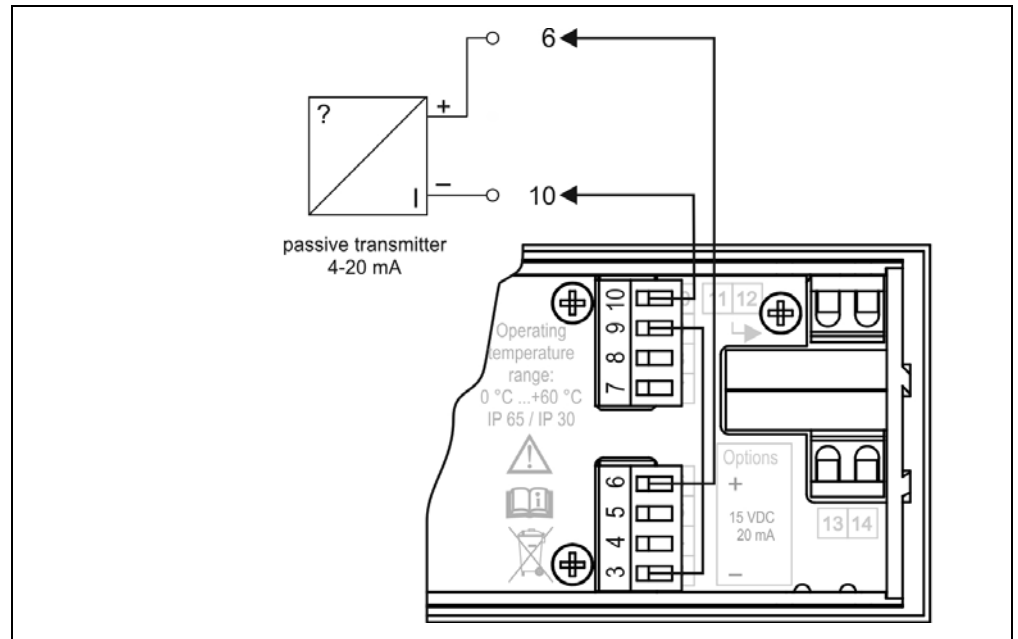6. Push in the terminal.

The RS-485 MODBUS communication output should be used for long distance communication. 32 instruments can be connected to the PLC or to the computer.
You can find useful information about the MODBUS communication at www.modbus.org.

5.10. Connecting the transmitter supply (TS) output (option)

The following figure shows the wiring plan:
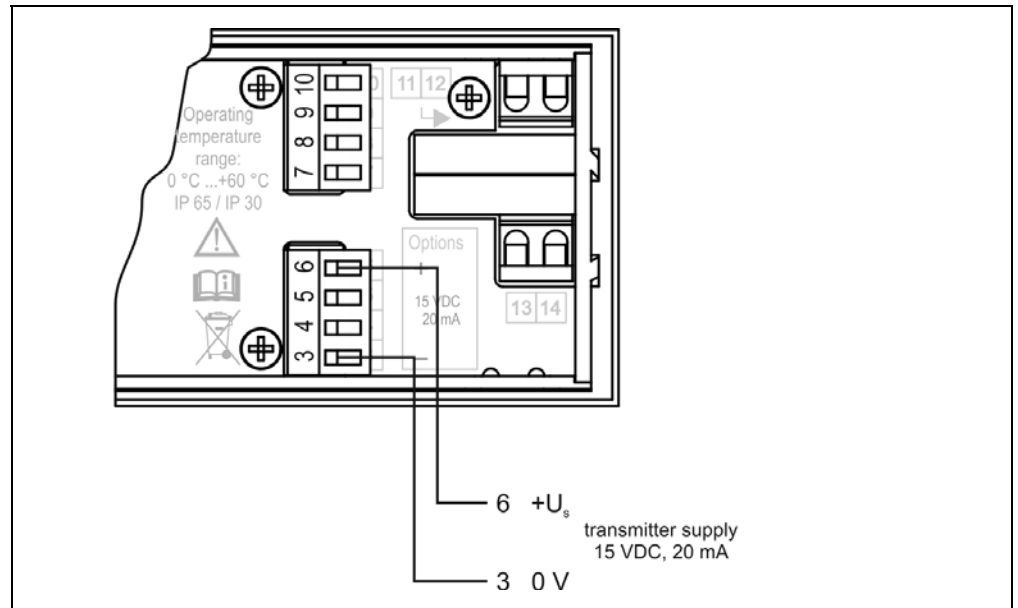
Wiring plan

1. Pull out the terminal so you can make connection easier.
2. Loosen terminal screws.
3. Insert the wire ends into the open terminals according to the wiring plan.
4. Screw the terminal in.
5. Check the hold of the wires in terminals by pulling on them firmly.
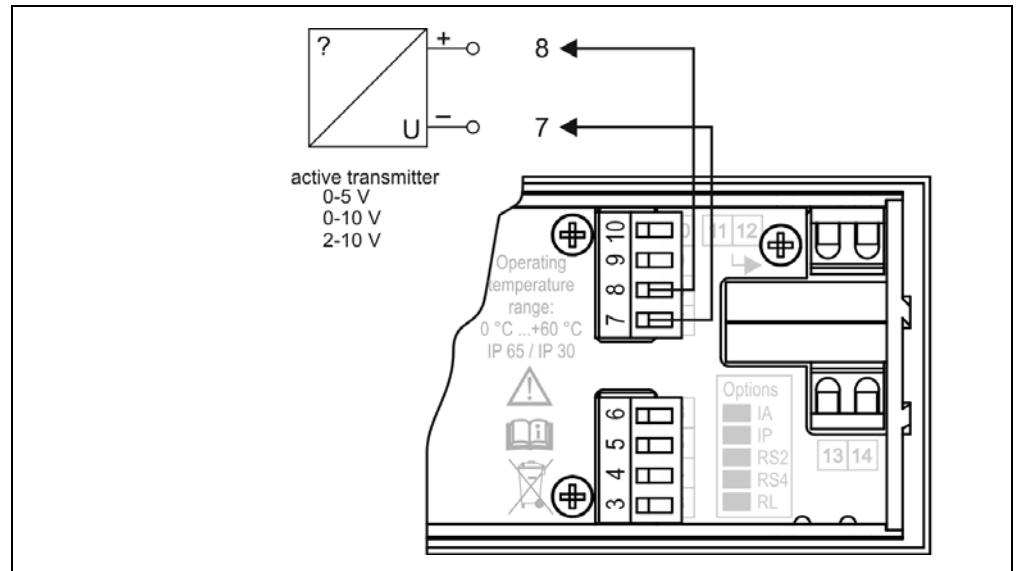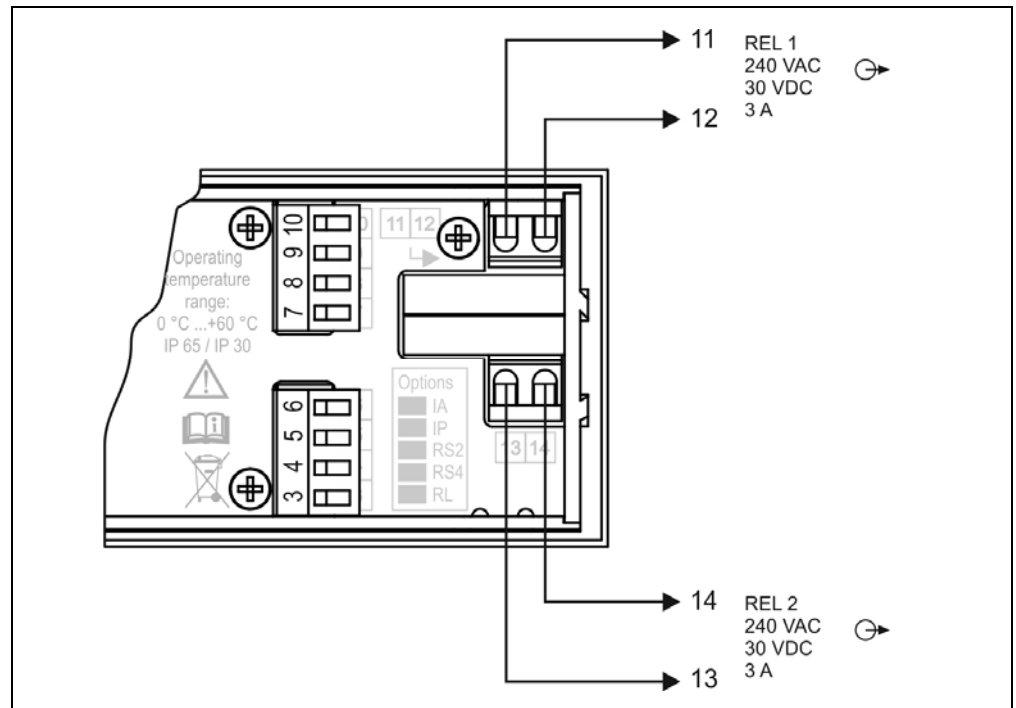6. Push in the terminal.

5.11. Final steps

Checking the connections

Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

Put the instrument under supply voltage

After you have completed the connections, put the instrument under supply voltage. If the supply connection is correct the display gives light.

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6. Display and manual controls

6.1. The first start-up

The factory default setting is:
Selected input signal: 4-20 mA
Scaling: 4 mA ÷   0%
        20 mA ÷ 100%
When the input current is 0 mA, you can see ⁻25.00.
on the display.

In the case of an error message

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the function of buttons at menu not compatible.

If anything else appears on the display instead of the scaled input signal (e.g. a message with blinking letters), then it is an error message of the instrument.

The four most frequented error messages are the following:

1. The displayed value is correct, but the numbers are blinking:
The input signal is correct. The analogue output signal (option IA or IP) is less or more than the specified levels of Namur standard.
Solution: scale the analogue output corresponding the measured signal level.

2. There is only a flashing _l_   at the left side of display:
The input signal is more than the specified input range. The instrument can not measure it.
Solution: check the input signal with a digital multimeter.

3. There is only a flashing ⁻ _l_   at the left side of display:
The input signal is less than the specified input range. The instrument can not measure it.
Solution: check the input signal with a digital multimeter.

4. There is a flashing ⁻9999 or 99999 on the display:
The input signal is less or more than the displayable value. The instrument can not display it.
Solution: modify the low value of scale or the high value of scale, change the decimal point position if necessary.

In order to define the error more accurately, please go to Chapter 6.2.

6.2. Characters and mnemonics appearing on the display

DT4220 E has a 7-segment type display. It means that maximum 7 bars are used to form each characters. The numbers can be read easily, some of the letters, marks however, looks unusual:

I = 1, 2 = 2, 3 = 3, 4 = 4, 5 = 5,
6 = 6, 7 = 7, 8 = 8, 9 = 9, 0 = 0

A = A, b = B, c = C, d = D, E = E, F = F, 9 = G,
h = H, i = I, J = J, H = K, L = L, $\overline{ii}$ = M, n = N,
o = O, P = P, q = Q, r = R, 5 = S, t = T, U = U,
u = V, $'\!'$ = W, H = X, Y = Y, 2 = Z

All mnemonics (code words, 5 digit length max.) presented on the display comes from English expressions in abbreviated form.

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Login text

dt	DT - Datcon instrument.
4220E	Type of the instrument.
n0.0Pt	No option is installed. (No Option)
AnALO	Analogue output option is installed.
COᴍᴍ	Communication option (RS-485 or RS-232) is installed.
tS	Transmitter Supply output option is installed.

Error messages

For example: *107.50*
The displayed number is blinking.

The input signal is correct. The analogue output signal (option IA or IP) is less or more than the specified levels of Namur standard.
In this case the analogue output value indicates the error: it is 3.2 mA or 22 mA, according the actual settings.

1

The input signal is more than the specified input range. The instrument can not measure it.
In this case the analogue output value indicates the error: it is 3.2 mA or 22 mA, according the actual settings.

- 1

The input signal is less than the specified input range. The instrument can not measure it.
In this case the analogue output value indicates the error: it is 3.2 mA or 22 mA, according the actual settings.

-9999
99999

The input signal is less or more than the displayable value. The instrument can not display it.

Critical error messages

In case of a critical error call manufacturer sertvice department!

S. Adc	A/D converter error. (Service: ADC)
S.FrAᴍ	FRAM error. (Service: FRAM)
S.cAL.ı	Calibration error. (Service: Calibration Input) Factory calibration is damaged.
S.cAL.o	Calibration error. (Service: Calibration Output) Factory calibration is damaged.

During code writing

codE   Code? (Code) - type in the code!

bAd.co   Bad code (Bad Code)

USEr   A User login took place (User)

SUPEr   A Supervisor login took place (Supervisor)

During setting

Lo''   The typed number is lower than allowed (Low Limit)

high   The typed number is higher than allowed (High Limit)

rEtYP   Re-type it please (Re-type)

EScAP   Automatic escaping (Auto Escape)-over 5 minutes

EHit   Exit from the setting (Exit)

rEAdY   The requested operation has been completed (Ready)

Error   Error (Error)

no   No, I don't want this menu item (No)

YES   Yes, the menu can be started (Yes)

Limit display

L____   Both limit outputs are switched off

L1___   The limit output No.1 is switched on (Limit 1)

L_2__   The limit output No.2 is switched on (Limit 2)

L12__   Both limit outputs are switched on

6.3. Functions of the push-buttons during measurement

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the function of buttons at menu not compatible.

The following figure shows the push buttons:
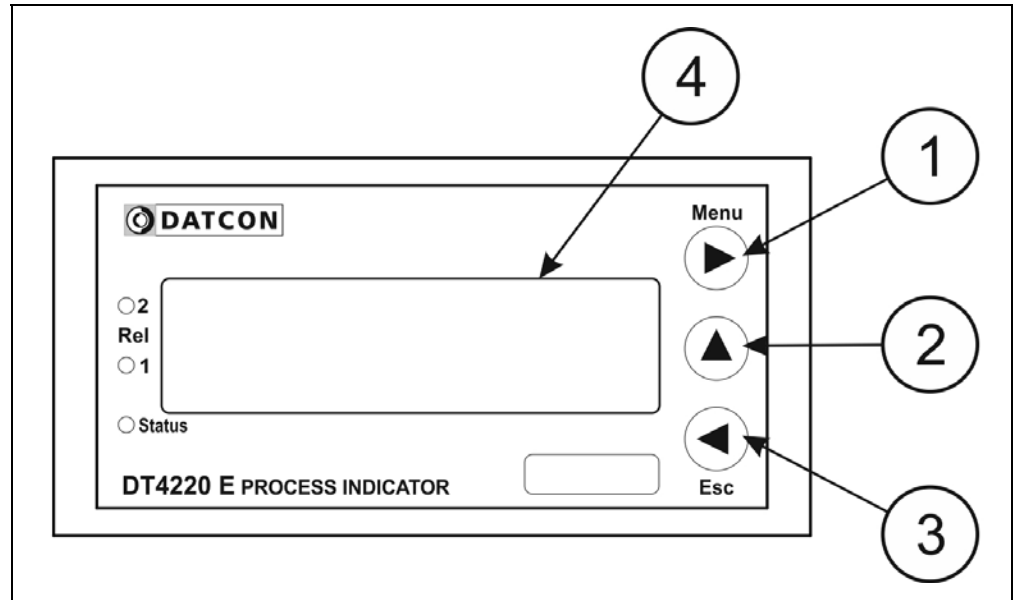
(1) ► **Menu** button: Entering the menu.
When you push this button, the instrument will ask for a password (code) in accordance with Chapter **7.1. Functions of the push-buttons during navigation in the menu**, when the right code has been given, it enters into the menu. During this time the instrument works continually and the outputs are refreshed. If no keys are pressed for a period of 5 minutes, the instrument exits from menu.

(2) ▲ button: displaying firmware version.
The firmware version remains on the display as long as the button is being pressed.
Format: YY.M.DD: YY = year, M = month, DD = day.

(3) ◄ **Esc** button: displaying the status of the limit output and clearing the alarm (alarm acknowledgement).
It's functionality depends on the operating mode of displaying the limits. In default factory setting this function is 'dynamic', therefore It displays the limit output state as far as this button is pressed.

6.4. indicators
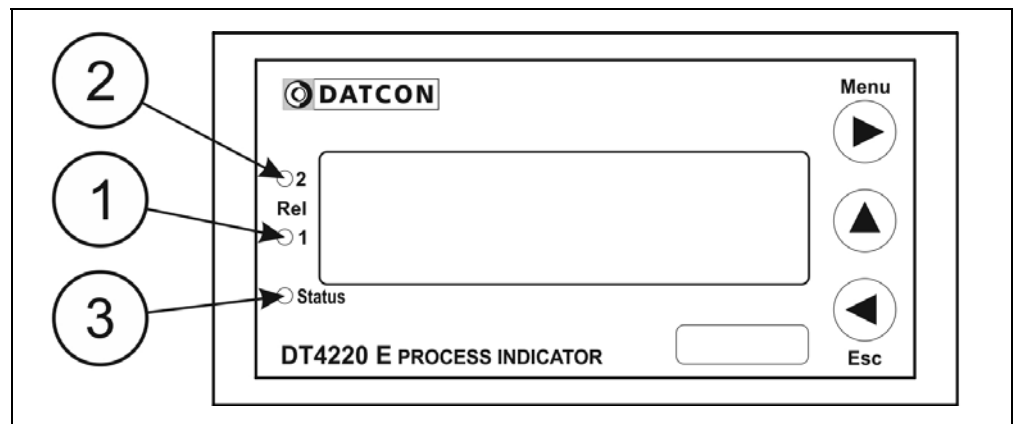
(1) Rel 1: limit output indicator (yellow)
indicates that the limit output 1 is in "on-state" (LIMIT1).

(2) Rel 2: limit output indicator (yellow)
indicates that the limit output 1 is in "on-state" (LIMIT2).

(3) Status: Communication status indicator (yellow)
The indicator gives light for 0.1 sec when a succesfull data exchange
has granted through the communication output.

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7. Setting-up

7.1. Functions of the push-buttons during navigation in the menu

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the function of buttons at menu not compatible.

► **Menu** button:
You can enter the actual menu item or the actual submenu item by pressing this button.

During typing/editing a number:
You can select the next digit. If this button is held on over 1 sec, the left digit of display is selected.

▲ button:
You can select the next menu item by pressing this button.
If this button is held on over 1 sec, the first menu item is selected.

During selecting a parameter item from a list:
You can select the next parameter item by pressing this button.
If this button is held on over 1 sec, the default parameter item is selected.

During typing/editing a number:
You can increment the selected digit of number by pressing this button.
If this button is held on over 1 sec, the selected digit of number is 0.

◄ **Esc** button:
You can leave the actual menu item or the actual submenu item by pressing this button.
The changed parameter is saved before the exit had occurred.
If no keys are pressed for a period of 5 minutes, the instrument also exits from menu.

7.2. Typing the code (password) in

The importance of the code

You may enter the menu only after you have typed your code in. The code is made from 4 numeric characters. This solution prevents unauthorised persons from changing the settings of the instrument.

Levels of authorisation

User level: allows the modification of the most necessary parameters only. The rest of the menu is not even shown for users. The user code default factory setting is: **0000.**
Supervisor level: allows the modification of all parameters for the authorised person. The supervisor code default factory setting is: **1000.**

Typing the code in

The DT4220 E is a modern type of process indicator family. The old type (DT4220) and this new type have same functions and same options but the function of buttons at menu not compatible.

1. Press the ► **Menu** button. The blinking *codE* mnemonic shows that the device is asking for the code.
2. Four zeros appear: *0000*. The zero at the left side is blinking.
3. Use the ▲ and the ► buttons, type in either the user code or the supervisor code.
4. Press the ◄ **Esc** button. If a correct code has been type in, the mnemonic *USEr* (login as a user) or the mnemonic *SUPEr* (login as a supervisor) is displayed and stays there for 2.5 seconds; then the first menu item is shown on the display: *0 l.br i*.
5. If an incorrect code has been typing in, the mnemonic *bAd.co* (BAD Code) is shown on the display and stays there for 2.5 seconds; then the instrument exits from the menu.
Start typing the code in again from Point 1.

Automatic exit from the menu

If no buttons are pressed, the instrument displays the mnemonic *EScAP* (Auto Escape) after 5 minutes has passed from the last pressing of a button, and goes back to the measuring mode. This solution is due to security: unauthorised persons, after 5 minute, will not be able to change the settings of the instrument, should it be left alone for some reason.

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7.3. The menu structure

The following figure shows the menu structure.
The detailed description is on next pages.
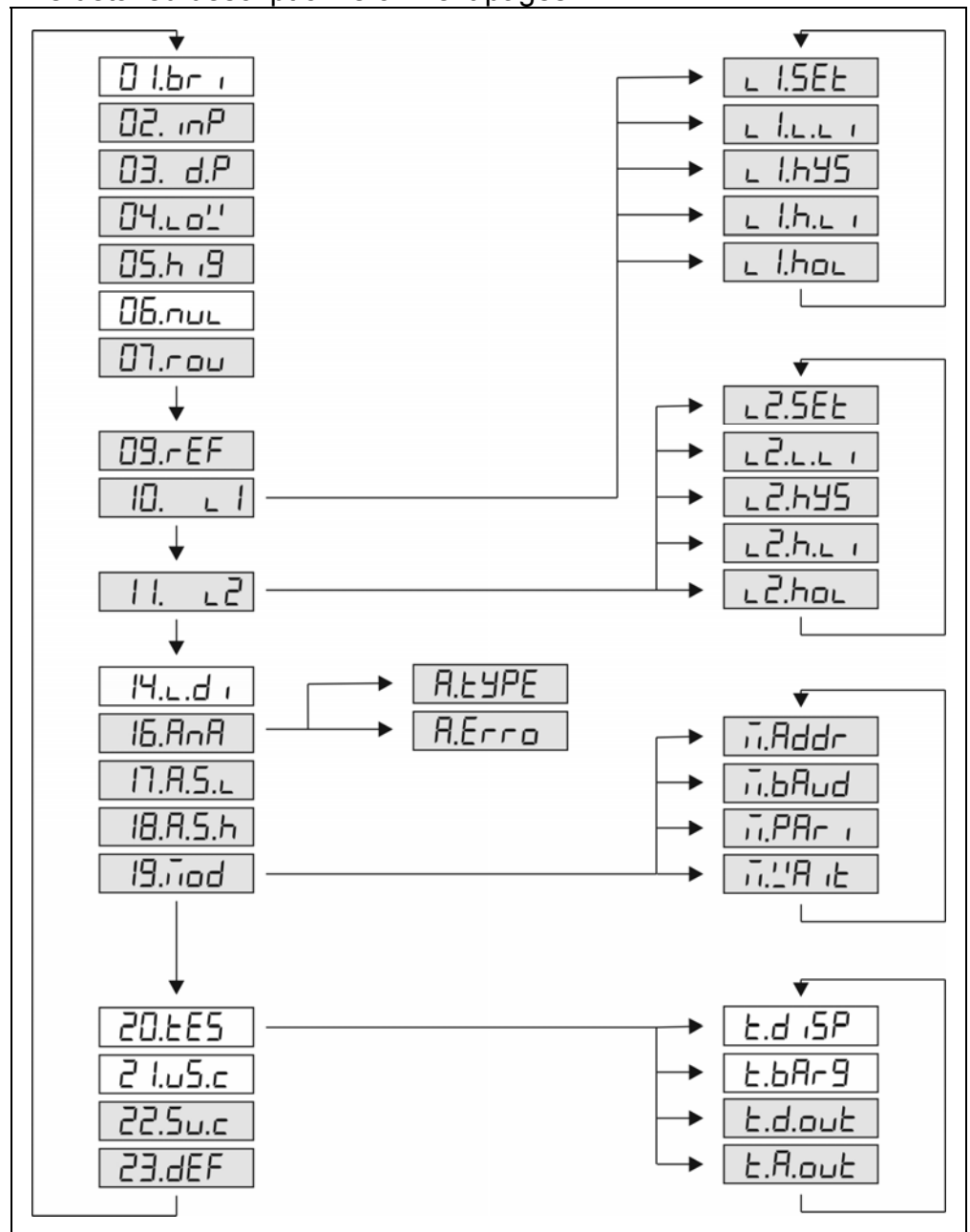
Comment:
The menu items shown in grey appear only in the case of a supervisor-level login.

7.4. The menu structure (detailed description)

The menu items

0 1.br ı 01. brightness - Display brightness

*02. ınP 02. input - Input selection

*03. dP 03. decimal point - Decimal point position

*04.Lo� 04. low - Low value of scale

*05.h ı9 05. high - High value of scale

06.nÜL 06. null - Leading zeroes enable / disable

*07.roU 07. rounding - Display value rounding

*09.rEF 09. refresh - Display refresh time

* 10. L ı 10. limit1 - #1 Limit output

* 11. L2 10. limit2 - #2 Limit output

14.L.d ı 14. limit displaying - Limit display mode

* 16.AnA 16. analog - Analogue output select

* 17.A.5.L 17. analog scale low - Assign 4 mA to low value

* 18.A.5.h 18. analog scale high - Assign 20 mA to high value

* 19.ᵐod 19. MODBUS - MODBUS communication settings

20.tE5 20. test - Tests

2 1.U5.c 21. user code – Change user code

*22.5U.c 22. supervisor code - Change supervisor code

*23.dEF 23. default - Factory default setting

Comment:
The menu items marked with '*' appear only in the case of a supervisor-level login.

7.5. Menu item 01: Display brightness

Function   The brightness can be set between 10%-100%, in 10% steps.
                      [factory default: 100%]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: 100, 90, 80, 70, 60, 50, 40, 30, 20, 10.

7.6. Menu item 02: Input selection

Function   The instrument has current and voltage inputs. Here you can select the input and the signal level.
                      [Factory default: 4-20 mA current input]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: I 4-20, I 0-20, U 0-10, U 0-5, U 2-10.

7.7. Menu item 03: Decimal point position

Function

Setting the position of the decimal point on the display, or switching the decimal point off.
[Default factory setting: 2 decimals]

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: 2, 1, 0, 4, 3.

7.8. Menu item 04: Low value of scale

Function

Any optional display range can be assigned to the input signal range (scaling). Here you can set the low value of the desired display range.
[Factory default: 000.00.]

Note! For scaling the DISPLAYED value you should set the high value also. (Next menu item.)

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

Notice

For scaling must be assign the high (end) value also. (Next menu item)

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7.9. Menu item 05: High value of scale

Function   Any optional display range can be assigned to the input signal range (scaling). Here you can set the high value of the desired display range.
[Factory default: 100.00]

Note! For scaling the displayed value you should set the low value also. (Previous menu item.)

Sequence of operations   Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

Notice   For scaling must be assign the low (start) value also. (Previous menu item)

7.10. Menu item 06: Enable / disable displaying the leader zeros

Function   Leader zero: the zeros that stand in front of an integer of no value.
E.g. the instrument displays the value 5.2 together with the leader zeros:
005.20 (default factory setting), or without the leader zeros: 5.20.
In this menu item you can either disable displaying of the leader zeros or you can enable this function again.

Sequence of operations   Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: NULL (enabled) or SPACE (disabled).

7.11. Menu item 07: Rounding displayed value

Function   In some case it can be useful to round the displayed value. E.g. the measured physical quantity is noisy.
In this menu item you can select a rounding value.
[Factory default: 1]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: 1, 2, 5, 10, 20, 50, 100.

7.12. Menu item 09: Display refresh time

Function   Here you can define the time periods by which the instrument displays the new measurement values.
[Factory default: 0.5 second]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: 0.5 sec, 1.0 sec, 1.5 sec, 2.0 sec, 0.01 sec, 0.1 sec, 0.3 sec.

7.13. Menu item 10 and 11: Setting limit outputs

Function The instrument has two optional limit outputs. They are identical with each other, and work independently.
Operation: the instrument keeps comparing the displayed physical value with the (adjustable) limit value. It switches the output ON or output OFF depending whether the displayed value is higher or lower than the limit value.

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired sub-menu item.
5. You can enter to sub-menu by pressing the Menu button and you can exit from sub-menu item by pressing the Esc button.
(6. Press Esc button again if you want to leave the menu.)

The selectable sub-menus:
∟ _l.SEt_ limit 1: Setting the operating mode
∟ _l.L.Li_ limit 1: Low limit value
∟ _l.hY5_ limit 1: Hysteresis of the limit output
∟ _l.h.Li_ limit 1: High limit value
∟ _l.hold_ limit 1: Limit output hold mode

7.13.1. Setting the operating mode

Function Here you can define the operating mode of limit output.
[Factory default: OFF]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values:

OFF off:
The output is always in switched off condition.

$h igh$ high:
The output gets switched on, when the displayed physical value is higher than or equal with the low limit value.

LoU low:
The output gets switched on, when the displayed physical value is lower than the low limit value.

$in5 id$ inside:
The output gets switched on, when the displayed physical value is between the low limit value and the high limit value.

$oUt5 i$ outside:
The output gets switched on, when the displayed physical value isn't between the low limit value and the high limit value.

$hERt i$ heating:
The output gets switched on, when the displayed physical value is lower than the low limit value. The output gets switched off, when the displayed physical value is higher than the high limit value.

$cooL i$ cooling:
The output gets switched on, when the displayed physical value is higher than the high limit value. The output gets switched off, when the displayed physical value is lower than the low limit value.

On on:
The output is switched on independently from the measured value.

7.13.2. Low limit value

Function   The instrument compares the displayed value with this low limit value. Here you can define the numerical value by which the device will compare the measured physical values.
[Factory default: 050.00]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

7.13.3. Hysteresis of the limit output

Function

Here you can define a numerical value which provides the hysteresis of the limit output.

If the operating mode is OFF or HEATING or COOLING or ON then the hysteresis value will be indifferent because the instrument does not use hysteresis.

[Factory default: 0 (There is not hysteresis.)]
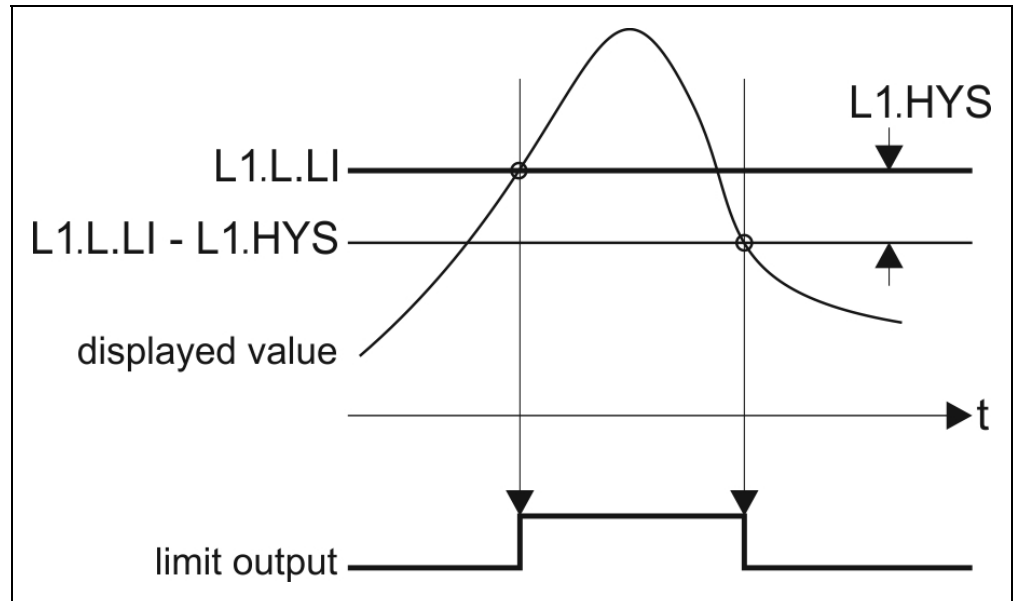
The figure shows the limit output change vs. input signal, where the value of hysteresis is > 0.

Remark: this operation is working in the mode: HIGH.

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

7.13.4. High limit value

Function

Here you can define a second numerical value with which the instrument will compare the displayed value when the selected operating mode is INSIDE, OUTSIDE, HEATING, COOLING. In other operating modes this value has no effect on the operation.
[Factory default: 090.00]

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

If the high limit value is less than the low limit value then the instrument will exchange these values when exits from the menu.

7.13.5. Limit output hold mode

Function

In case of basic operating mode the limit output is switching on or switching off when the conditions are exist. In limit output hold mode the output is kept in switched state and only by pressing Esc button can be reset (limit signaling acknowledge).
[Factory default: OFF]

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values: OFF or HOLD.

7.14. Menu item 14: Limit output state display mode

Function The state of limit outputs may present on the display. Here you can set the condition of presenting the states.
[Factory default: dynamic]

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired value.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

The selectable values:

dYnAṁ dynamic:
It displays the limit output state as far as the Esc button is pressed.

t ṁEd timed:
It displays the limit output state as far as the Esc button is pressed and 5 sec. long after releasing button.

5tAt ι static:
Pressing Esc button the limit output display can be switch on or switch off.

chAn9 changing:
Changing the state any of the limit outputs (switch on or switch off) it displays the state automatically for 5 sec. long.
Keeping the Esc button pressed it displays the measuring value.

PEr ιo periodical:
It changes between the limit display and measuring display mode in 5 sec. period.
Keeping the ENTER button pressed it displays the measuring value.

on on:
It displays the limit output state continuously.
Keeping the ENTER button pressed it displays the measuring value.

oFF off:
There is no limit output display.

7.15. Menu item 16: Analog output signal setting

Function
In this menu item you can choose between 4-20 mA and 0-20 mA output current.
[Factory default: 4-20 mA]

The analog output can indicate the error state too. When the error occurs the analog signal changes to 3.2 mA or 22 mA. (selectable)

Sequence of operations
1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired sub-menu item.
5. You can enter to sub-menu by pressing the Menu button and you can exit from sub-menu item by pressing the Esc button.
(6. Press Esc button again if you want to leave the menu.)

The selectable sub-menus:

$A.type$ analog output type
4-20 or 0-20 mA.

$A.Erro$ analog output error
3.2 or 22 mA.

7.16. Menu item 17: Assignment analog output low (start) value to display value (scaling)

Function

Here you can assign analog output start value (0 mA or 4 mA) to the measured physical value. This way you can assign any phisical range to any output range.
[Factory default: 000.00 so in case of a measured value is 000.00 the output value will be 4 mA (or 0 mA).]

Notice! For scaling the analog output must be assign the analog output high (end) value also. (Next menu item)

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

7.17. Menu item 18: Assignment analog output high (end) value to display value (scaling)

Function

Here you can assign analog output high value (20 mA) to the measured physical value. This way you can assign any phisical range to any output range.
[Factory default: 100.00 so in case of a measured value is 100.00 the output value will be 20 mA.]

Notice! For scaling the analog output must be assign the analog output low (start) value also. (Previous menu item)

Sequence of operations Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

7.18. Menu item 19: MODBUS communication settings

Function
The instrument can be connected to a PLC or to a computer for MODBUS RTU slave protocol communication.
Here you can find how to set communication parameters.
Note 1:
When no communication option is installed than these parameters are indifferent.
Note 2:
You have to set at the PLC or at the computer the same communication parameters as here.

Sequence of operations
1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired sub-menu item.
5. You can enter to sub-menu by pressing the Menu button and you can exit from sub-menu item by pressing the Esc button.
(6. Press Esc button again if you want to leave the menu.)

The selectable sub-menus:

ñ.ñodE MODBUS mode: RTU or ASCII
ñ.Addr MODBUS address: the slave address
ñ.bAUd MODBUS baud rate: 2400 or 4800 or 9600
ñ.PAr ı MODBUS parity: even or odd or none
ñ.UA ıt MODBUS wait: delay time before answer [ms]

7.19. Menu item 20: Tests

Function
Testing the display and the digital outputs.

Sequence of operations
1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the desired sub-menu item.
5. You can enter to sub-menu by pressing the Menu button and you can exit from sub-menu item by pressing the Esc button.
(6. Press Esc button again if you want to leave the menu.)

The selectable sub-menus:

t.d ıSP display test
t.d.oUt digital outputs test

7.20. Menu item 21: Changing the user code

Function

You can define new codes instead of the factory-defined user code. The code is an optional number within the range between 0000 and 9999.
[Default factory setting: 0000]

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons. Press the Esc button. You have to type the new code in twice. This prevents an error in defining the new code due to typing mistakes. This is indicated by the mnemonic ⌐ᴇᴛ⥾ᴾ (re-type). Type the code value again by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

Warning!

Do not forget the user code you have defined.
If you forget it, defining another one is possible only by using a supervisor code for entering into the menu.

7.21. Menu item 22: Changing the supervisor code

Function

You can define new codes instead of the factory-defined supervisor code. The code is an optional number within the range between 0000-9999.
[Default factory setting: **1000**]

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Type the desired value by using the ▲ and the ► buttons. Press the Esc button. You have to type the new code in twice. This prevents an error in defining the new code due to typing mistakes. This is indicated by the mnemonic ⌐ᴇᴛ⥾ᴾ (re-type). Type the code value again by using the ▲ and the ► buttons.
5. Exit from menu item by pressing the Esc button. The change is saved to FRAM.
(6. Press Esc button again if you want to leave the menu.)

Warning!

Do not forget the supervisor code you have defined. If you forget it, defining another one is possible in the service only.

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7.22. Menu item 23: Resetting the default settings

Function

In this case **all** the settings are deleted, and the default factory setting is restored.
Using this function makes sense in that case, when the settings of the instrument have changed so much, that it is easier to start the setting-up process from the default factory setting.

It is not possible to cancel this operation once the command has been issued.

Sequence of operations

Read the chapter **7.1. Functions of the push-buttons during navigation in the menu** for learning the buttons handle.

1. Enter the menu by typing the supervisor code.
2. Keep stepping by pressing the ▲ button as long as you see this menu item.
3. Enter the menu item by pressing the Menu button.
4. Pressing the ▲ button, select the ⅃Е5 (Yes) text.
5. Press the Menu button you see this ⌐ЕЯd⅃ (Ready) on the display.
All of the parameters have been set to factory default settings.
After then the instrument restarts.

8. Fault rectification

8.1. Fault finding

The instrument has a sophisticated self-test function. It is able to detect and display the majority of the errors.

In the case of an error that causes total inability of the instrument to function, nothing appears on the display.

8.2. Repairing

In accordance with **Point 2.1.**: For safety and warranty reasons, any internal work on the instrument must be carried out by DATCON personnel.
In the case of errors, it is recommended to notice of the displayed error message, as well as of the phenomenon seen.
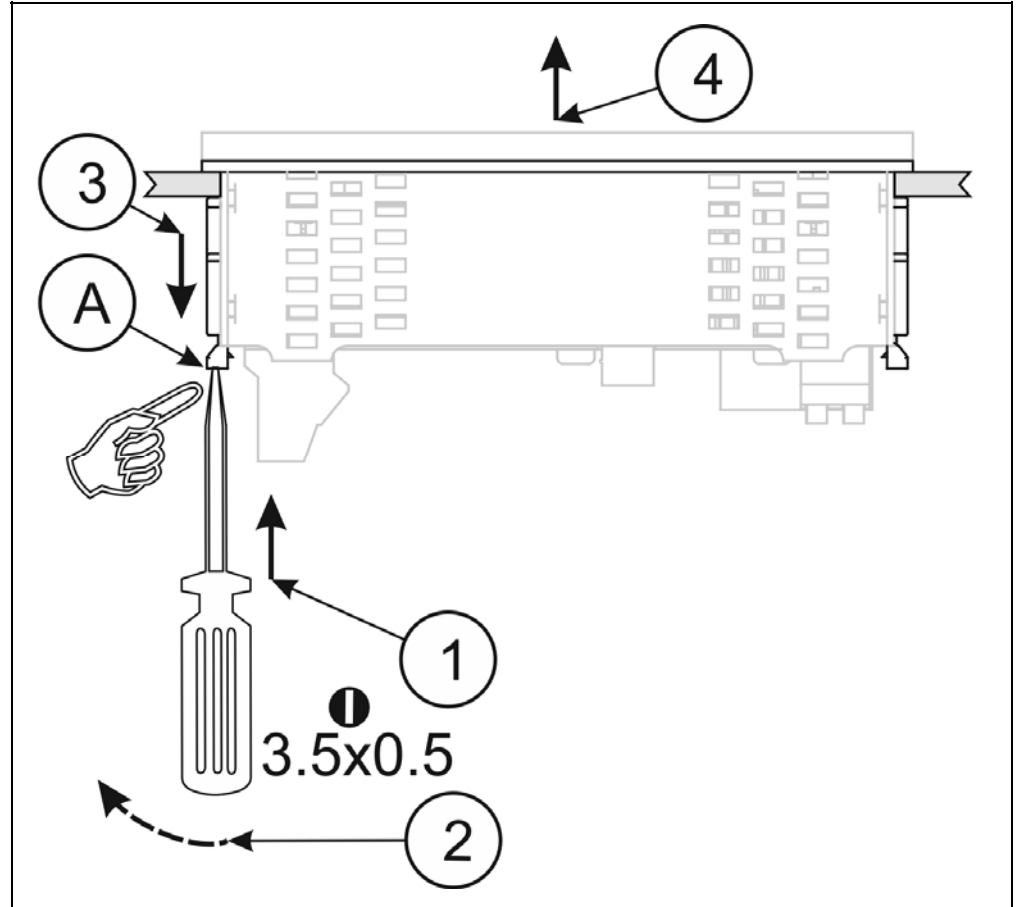These informations please communicate to the Datcon service personnel.

9. Dismounting

9.1. Dismounting procedure

The following figure shows the dismounting procedures:

Dismounting

Before put off power supply and disconnect all wires.
1. Slip the tip of the screwdriver into the hole of the mounting clamp (A) (Figure step 1).
2. Move the screwdriver handle to make free the clamp (Figure step 2).
3. Keeping the screwdriver in this position draw back the mounting clamp (Figure step 3).
Please do not exercise forces higher than necessary, as it may cause damages to the clamp.
4. Repeat the 1., 2., 3. steps with the other clamp.
5. You can take out the instrument from the panel cutout (Figure step 4).

9.2. Disposal

According with the concerning EU directive, the Manufacturer undertakes the disposal of the instrument that are manufactured by it and intended to be destroyed. Please deliver it in contamination-free condition to the site of the Manufacturer or to a specialised recycling company.

10. Appendix

10.1. Technical specifications

* = default settings

Input parameters	
Input signal:	DC current / DC voltage
Measuring range:	0-20 mA / *4-20 mA
	0-10 V / 2-10 V / 0-5 V
Input resistance:	10 Ω (current input)
	100 kΩ (voltage input)
Overrange:	±50 mA (current input)
	±200 V (voltage input)

Display	
Display unit:	LED, 5 digit (+ values) / 4 digit (- values),
	7 segment, negative sign, setable decimal point
Character height:	14.2 mm
Display color:	*red / orange / yellow / green / blue
Display brightness:	Adjustable from10% to *100% in 10% steps.
Display range:	-9 999–99 999
Relation between the display	Any values to be displayed could be selected
and the input signal:	(within the display range) to be assigned to the
	input values.
Display refresh time:	0.01 / 0.1 / 0.3 / *0.5 / 1.0 / 2.0 sec (adjustable)
Indicator LEDs:	2 limit values (yellow)
	1 status (MODBUS communication) (yellow)
Manual controls:	3 membrane push-buttons on the front cover

Measuring parameters	
Characteristic:	Linear
Display accuracy at 23 °C ±2 °C, after 10 min warm up time:	0.02%
Display accuracy at whole operating temperature range:	0.2%
Temperature-dependency:	25 ppm / °C
ADC sample rate:	122 SPS
Number of averaged samples:	Display refresh time / ADC sample rate. (*61)

Limit outputs (optional)	
Output type:	2 x relay contact (NO: normally open)
Contact rating:	AC: 240 V, 3 A
	DC: 30 V, 3 A
Refreshing time:	Same as the display refresh time

Active analog output (optional)

Output type:	galvanic isolated DC current
Output ranges:	*4-20 mA / 0-20 mA (scalable)
Characteristic:	Linear
Accuracy at 23 °C ±2 °C, after 10 min warm up time:	0.03%
Accuracy at whole operating temperature range:	0.4 %
Temperature-dependency:	75 ppm / ˚C
Load resistance	0-500 ohm
Overcurrent protection:	22 mA
Overvoltage protection:	75 V (normal polarity)
	Reverse polarity: protected by 63 mA fuse
Isolation voltage:	0.5 kV

Passive analog output (optional)

Output type:	galvanic isolated DC current
Output ranges:	*4-20 mA / 0-20 mA (scalable)
Characteristic:	Linear
Accuracy at 23 °C ±2 °C, after 10 min warm up time:	0.03%
Accuracy at whole operating temperature range:	0.4 %
Temperature-dependency:	75 ppm / ˚C
External supply voltage range:	4-30 V
Overcurrent protection:	22 mA
Overvoltage protection:	Up to 75 V
Maximum loop resistance:	$R_{max} = (U - 4\ V) / 0.02\ A$ [ohm]
Minimum loop resistance:	If U < 20 V: not required
	If U > 20 V: $R_{min} = (U - 20\ V) / 0.02\ A$ [ohm]
Isolation voltage:	0.5 kV

Transmitter supply output (optional)

Output voltage:	15 VDC ± 10% @ 30 mA
	16 VDC ± 10% @ 4 mA
Output current:	30 mA max.
Isolation voltage:	0.5 kV

Communication interface (optional)

Type:	RS232 or RS485, (isolated)
Isolation voltage:	0.5 kV
RS-485 termination resistance:	135 ohm, you can switch on by using a short on the terminals
Baud rate:	300 / 600 / 1200 / 2400 / 4800 / *9600 Baud
Parity:	*even / odd / none
Protocol:	MODBUS RTU slave
Address:	1-247 (factory setting: 0)
Possible commands:	read of registers (3)

Power supply

DT4220 E xx xx xx:	24 VDC ±10%, 3 W
DT4220 E xx xx xx **PS**:	230 V AC/DC ±10%, 3.5 VA / 3 W

Ambient conditions

Operating temperature range:	0-60 °C *
Storage temperature range:	-25 - +70 °C
Climatic conditions:	EN 60654-1, class B2
Relative humidity:	90% (max., non-condensing)
Place of installation:	Cabinet

You can order instrument for -20 - +60 °C operating temperature range.

Electromagnetic compatibility (EMC): In accordance with the standard IEC 61326-1:2005
Emission:

Conducted:	EN 55011:2010 Limits for Class A equipments
Radiated:	EN 55011:2010 Limits for Class A equipments

Immunity:

ESD:	4 kV/8 kV contact / air	-B- criteria
BURST:	2 kV/1 kV power / signal	-B- criteria
SURGE:	1 kV	-B- criteria
Conducted RF:	3 Veff	-A- criteria

General data

Housing:	panel instrument
Dimensions [mm]:	96 x 48 x 45 (width x height x depth)
Panel cut off:	91 x 44 (width x height)
Weight:	0.15 kg
Protection:	IP 65 (front) IP 30 (rear)
Connection cable:	
Power supply:	max. 2 mm2
Signal, option:	0.25-1.5 mm2
Limit output:	0.25-1.5 mm2
Connection:	
Power supply:	2 pole screw terminal
Signal, option:	4 pole plug-in screw terminal
Limit output:	2x 2 pole push-in direct connection

The Manufacturer maintain the right to change the technical data!

10.2. MODBUS registers

These registers are read only.
MODBUS address:

| 1000	I32	Displayed value: 32 bit, signed, integer. This value is without reference to the place of decimal point.
1002	U16	Number of decimal character (0-4).
1003	U16	Error (0 = no error, 1 = repearing must be carried out in service, 4 = the input signal is out of the specified ranges).
1004	I16	Not used.
1005	U16	Limit1 output: 1 = ON, 0 = OFF
1006	U16	Limit2 output: 1 = ON, 0 = OFF

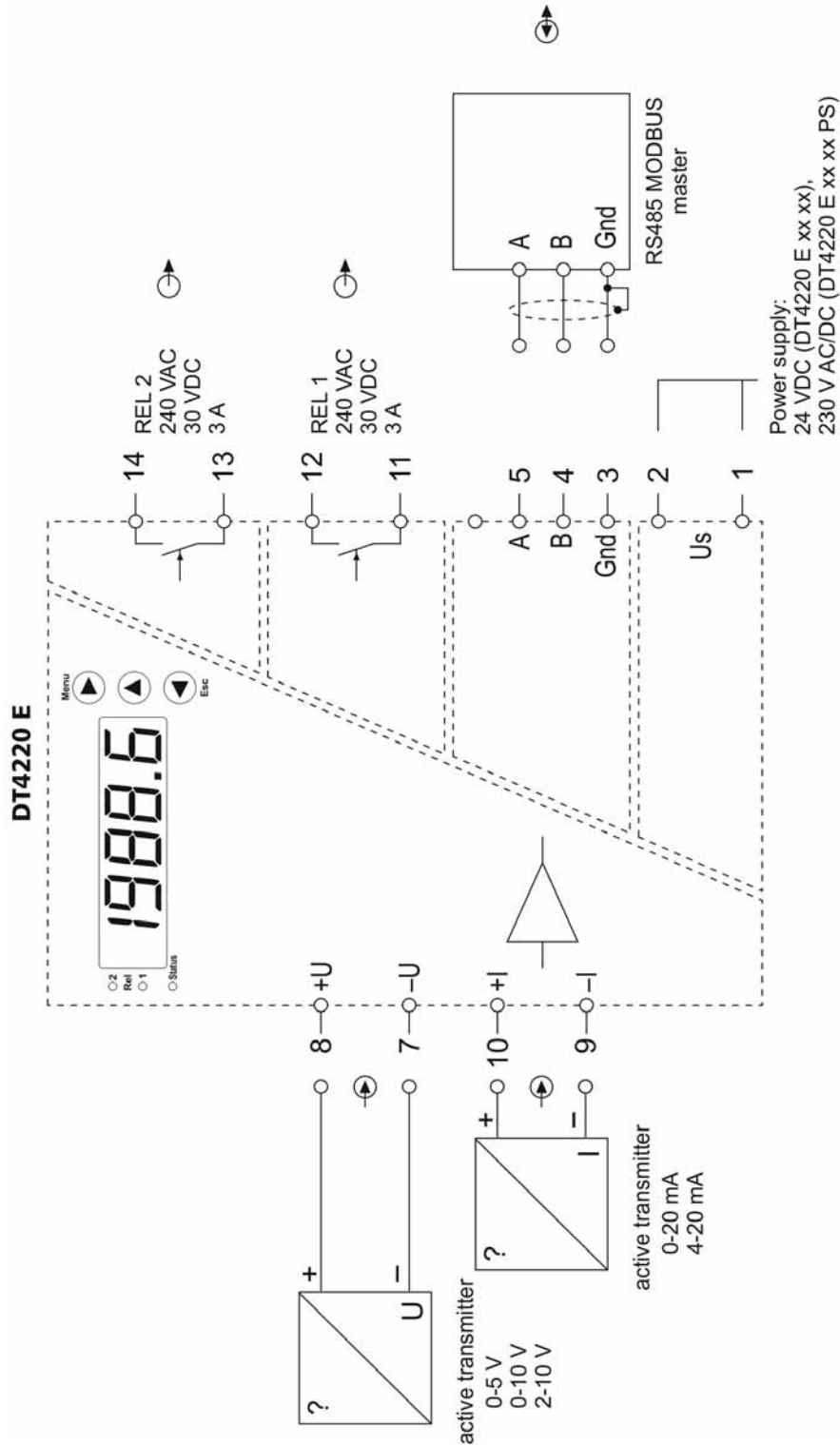## 10.3. Application example

Analog output option:
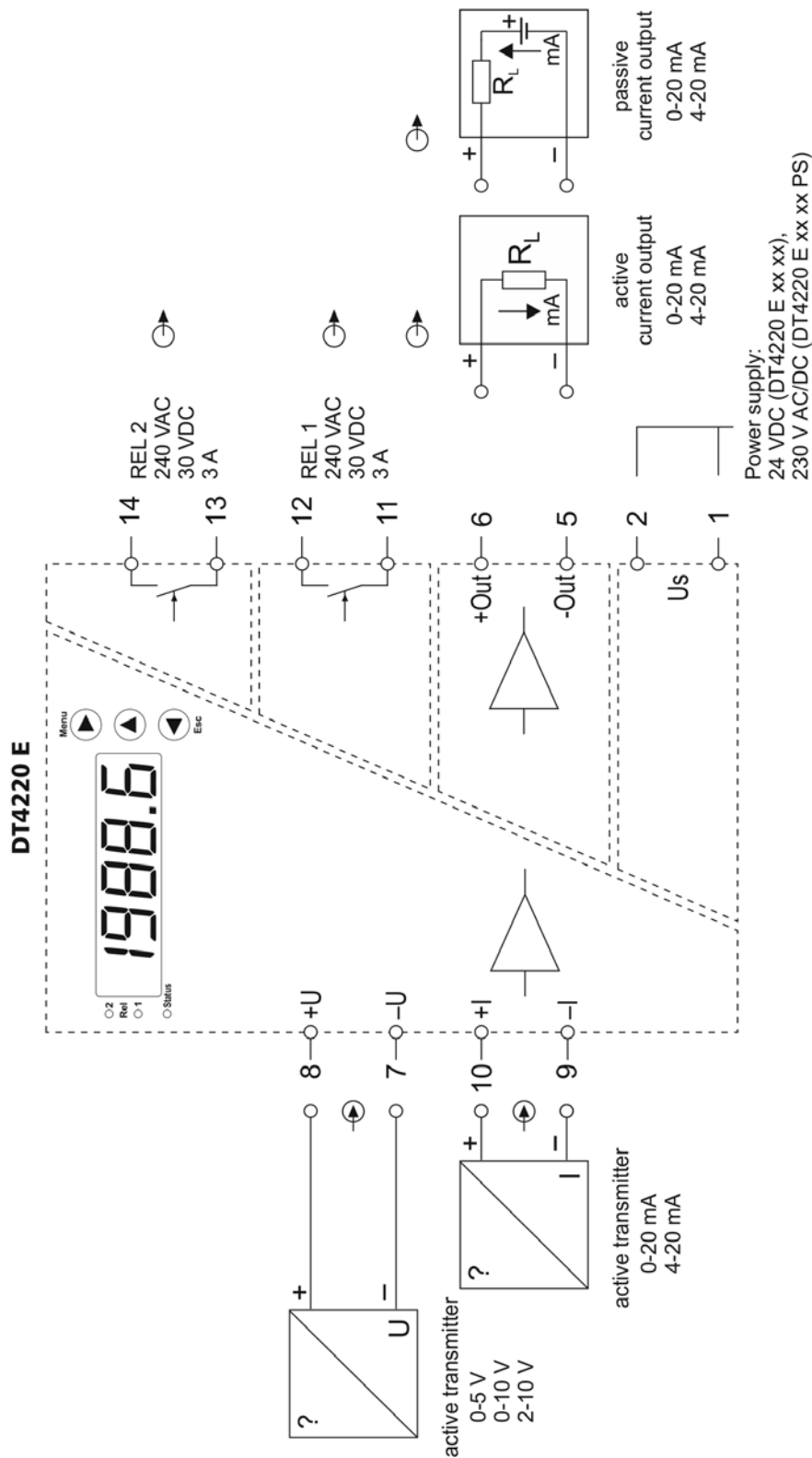
Use the current input or the voltage input only. Do not use (do not wire) both at the same time!

RS232 communication interface option:
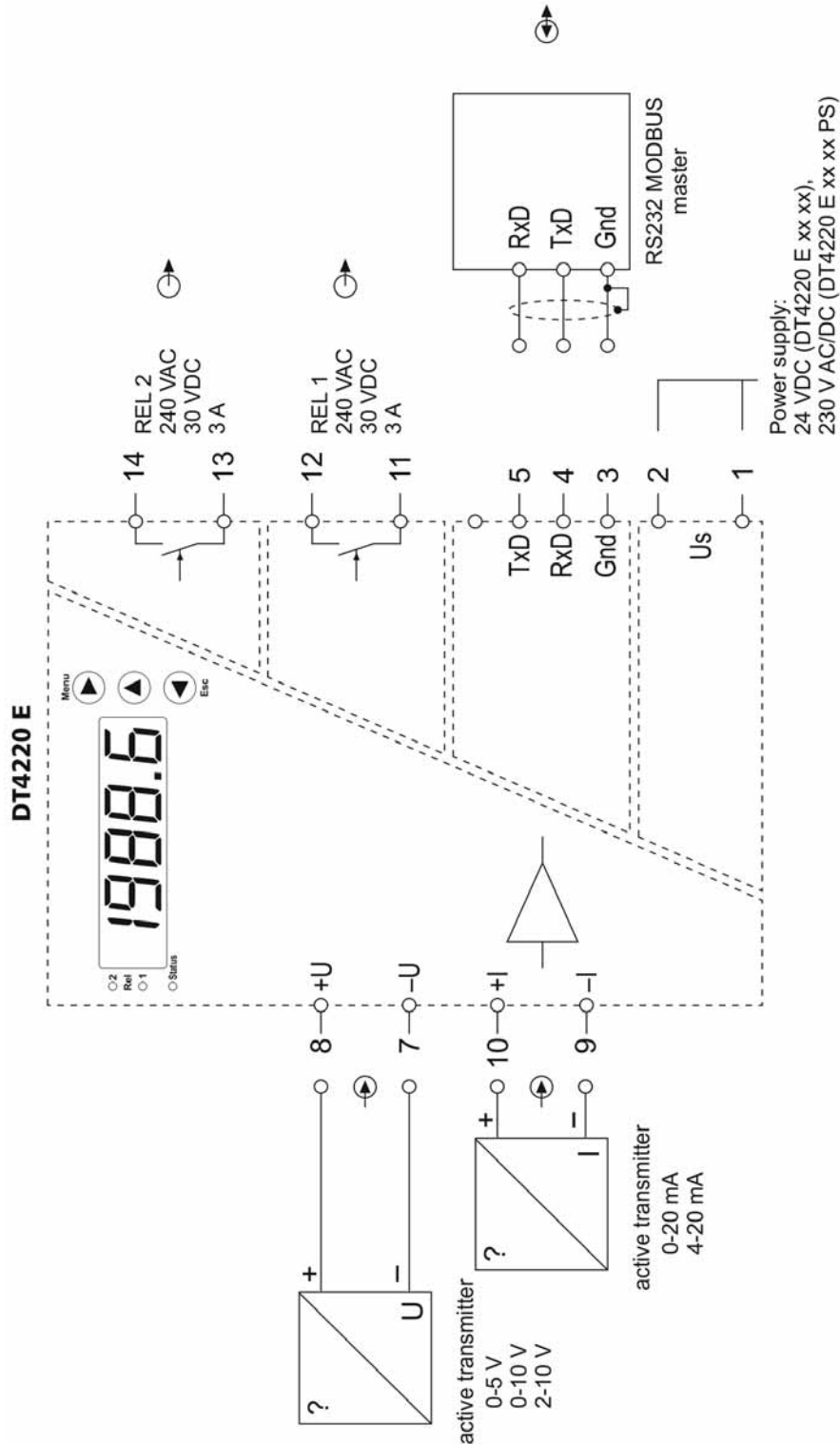
Use the current input or the voltage input only. Do not use (do not wire) both at the same time!

RS485 communication interface option:

Use the current input or the voltage input only. Do not use (do not wire) both at the same time!

Shematic for units of RS-485 communication: