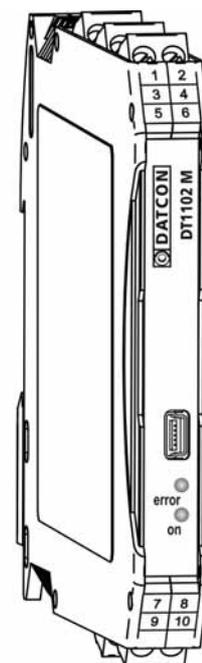


DT1102 M (PS)

MODBUS Output Galvanic Isolator

Operating Instructions



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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 DT1102 M (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 or its environ.

List

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

Action

- This arrow indicates a single action.

Sequence

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

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 DT1102 M (PS) is a MODBUS Output Galvanic Isolator for industrial use. Detailed information on the application range is available in chapter **3. Product description**.

2.3. Warning about misuse



Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, or damage to system components through incorrect installing or adjustment.

2.4. General safety instructions

Using the DT1102 M (PS) MODBUS Output Galvanic Isolator 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 standards as well as all prevailing safety regulations and accident prevention rules.

2.5. CE conformity

The DT1102 M (PS) is in conformity with the provisions of the following standards:

- EN 61326-1:2013 (EMC)
- EN 61010-1:2011 (Safety)

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

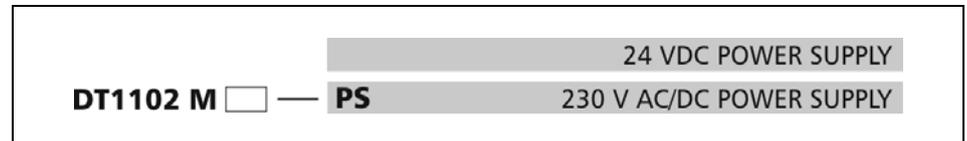
3.1. Delivery configuration

Delivered items

The scope of delivery encompasses:

- DT1102 M (PS)
- documentation:
 - this operating instructions manual
 - certification
 - warranty
 - mini USB (5 pin) - USB A cable
 - setup software on CD

3.2. Type designation



Area of application

3.3. Operating principle

The DT1102 M (PS) MODBUS Output Galvanic Isolator provide signal transmission and conversion between DC current or DC voltage signal source and signal processing units.

The instruments feature complete 3-way isolation: the input, the output and the power supply are isolated from each other.

The instruments has three bipolar symmetrical inputs:

1. -25 mA - +25 mA DC current,*
2. -2.5 - +2.5 V DC voltage,*
3. -125 - +125 V DC voltage.*

The instruments has one output:

RS485 MODBUS RTU/ASCII slave

* You must use one input at a time.

The PC configurator software is accessory or free downloadable from homepage: www.datcon.hu

The input type and range and the MODBUS communication parameters are configurable (current or voltage). See chapter

10.1. Technical specification.

The configuration parameters can be download from the PC to the DT1102 M via USB port.

The front panel LED indicators provide information about the operating status of the device.

Principle of operation



The input current flows through the measuring resistor or the input voltage is divided by the attenuator. This voltage is measured by a 24-bit A/D converter. The digital output signal of the A/D converter is processed by a microcontroller. The measured values are reading from instruments via galvanically isolated RS485 interface using MODBUS RUT/ASCII protocol.

The instrument's power supply produces two galvanically isolated supply voltages, one of for input side and one of for output side.



Connecting the instrument to the PC through the USB interface the instrument's communication circuitry come into active state and it is ready for communication with the configuration software. The USB port is galvanic isolated therefore the USB cable can plugged into a grounded PC too.

Power supply

The DT1102 M (PS) is available two different power supply:

DT1102 M: 24 VDC $\pm 10\%$
 <1.2 W / 1.8 VA

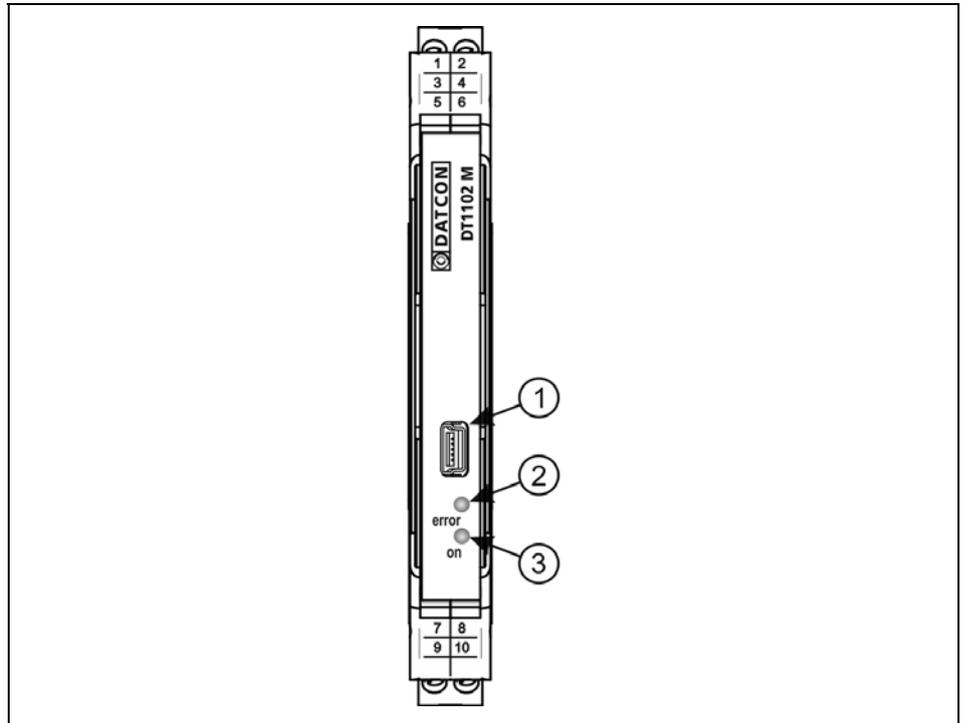
DT1102 M PS: 230 V AC/DC $\pm 10\%$
 <1.9 VA / 1.3 W

3.4. Adjustment

After connecting the DT1102 M is ready to work with the factory default parameters are written in chapter **6.1. The first start-up**. For working with the default parameters there is no need any adjustment. The detailed description of the setup can be found in chapter **7. Setting-up**.

3.5. Indicators, USB connector

The following figure shows the indicators and USB connector on the DT1102 M front panel.



1. USB-B mini, 5 pole connector for connecting to the PC at configuration.
2. The „error” red indicator blinking light indicates different error states.
3. The „on” green indicator continuous light indicates that the instrument is working.

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 specification, as described under the title: Ambient conditions.



The packaging of DT1102 M 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 polyfoam and nylon, which should be disposed of via specialized recycling companies.

4. Mounting

4.1. General instructions



Mounting position

The instrument should be installed in a cabinet with sufficient IP protection, where the operating conditions are in accordance with chapter **10.1. Technical specification**, as described under the title: Ambient conditions.

The instruments are designed in a housing for mounting on TS-35 rail.

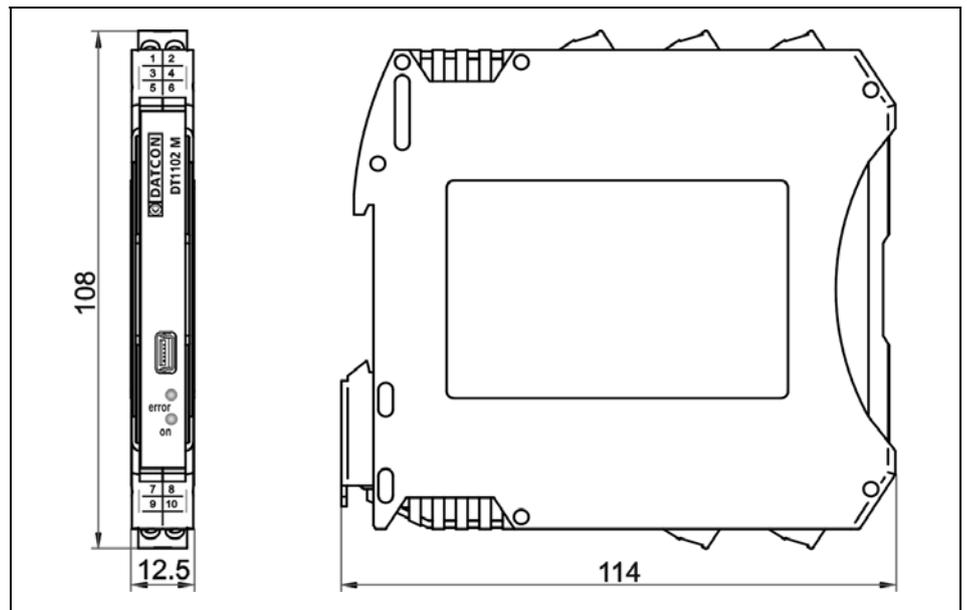
The instruments should be mounted in vertical position (horizontal rail position).



Horizontal mounting may cause overheating and damage of the instrument.

4.2. Main dimensions of the instrument

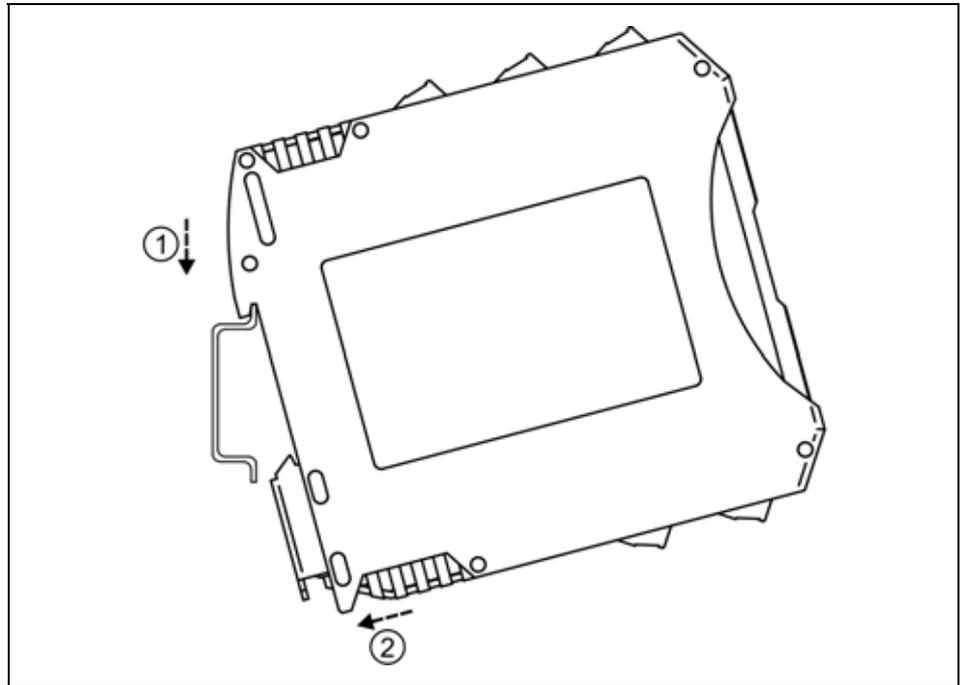
The following figure shows the main dimensions of the instrument.



4.3. Mounting procedure

The following figure shows the mounting procedures (fixing on the rail):

Mounting on the rail



The mounting doesn't need any tool.

1. Tilt the instrument according to the figure; put the instrument's mounting hole onto the upper edge of the rail (figure step 1.).
2. Push the instrument's bottom onto the bottom edge of the rail (figure step 2.), you will hear the fixing assembly closing.
3. Check the hold of the fixing by moving the instrument firmly.

5. Connecting

5.1. Preparing the connection



Always observe the following safety instructions:

- The connection must be carried out by trained and authorized personnel only!
- Connect or disconnect only in the complete absence of supply voltage
- You should take note the data concerning on the overcurrent protection in installation
- Use only a screwdriver with appropriate head.

Select connection cable

Take note the suitability of the connecting cable (wire cross-section, insulation, etc.).

The wire cross-section should be 0.25-1.5 mm².

You may use either solid conductor or flexible conductor.

In case of using flexible conductor use crimped wire end.



Preparing cables

For the input connection we recommended to use screened cable. It's an important rule that the power cables and signal cables should lead on a separate way.

Prepare the cable for the connection.

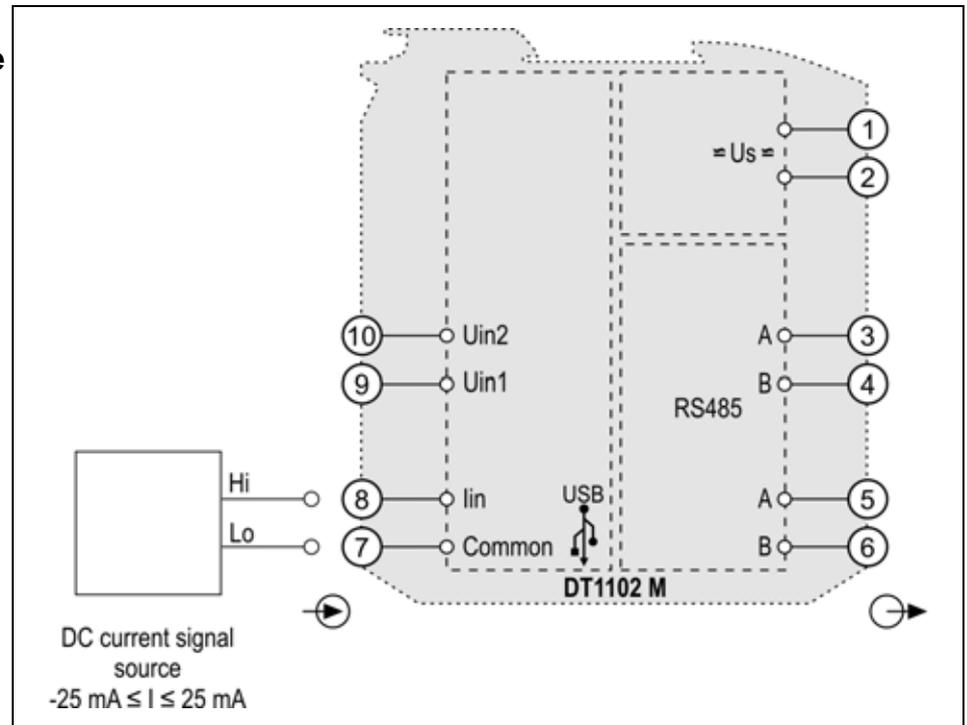
Strip approx. 8 mm insulation.

5.2. Connecting the DC current signal source

The following figure shows the wiring plan, connecting the DC current signal source:

Wiring plan, connecting the DC current signal source
(see also “Application example”)

Be careful the polarity of the cables



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.

Checking the Connections

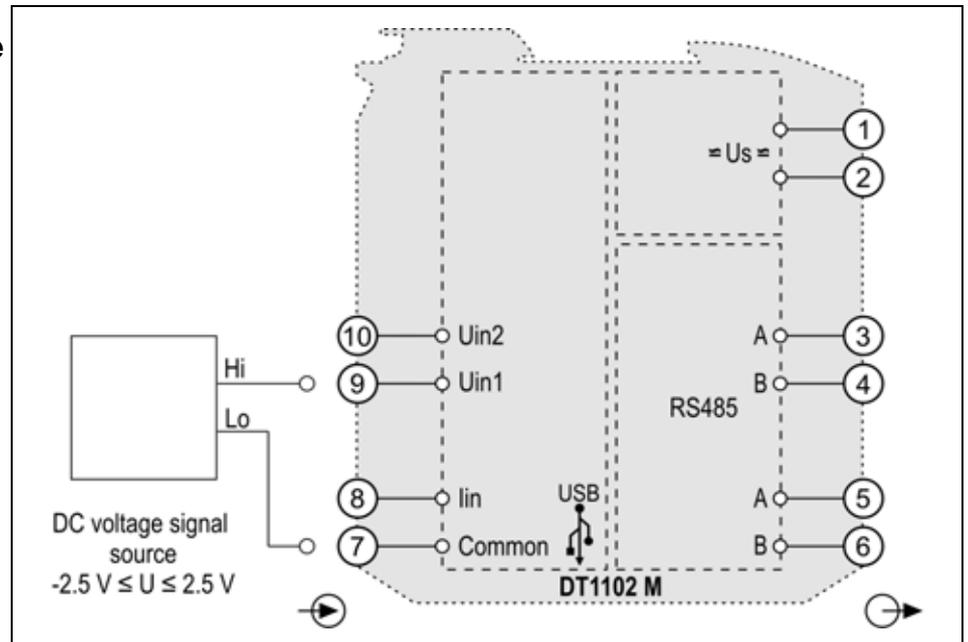
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.3. Connecting a -2.5 - +2.5 VDC voltage signal source

The following figure shows the wiring plan, connecting the DC voltage signal source:

Wiring plan, connecting the DC voltage signal source
(see also “Application example”)

Be careful the polarity of the cables



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.

Checking the Connections

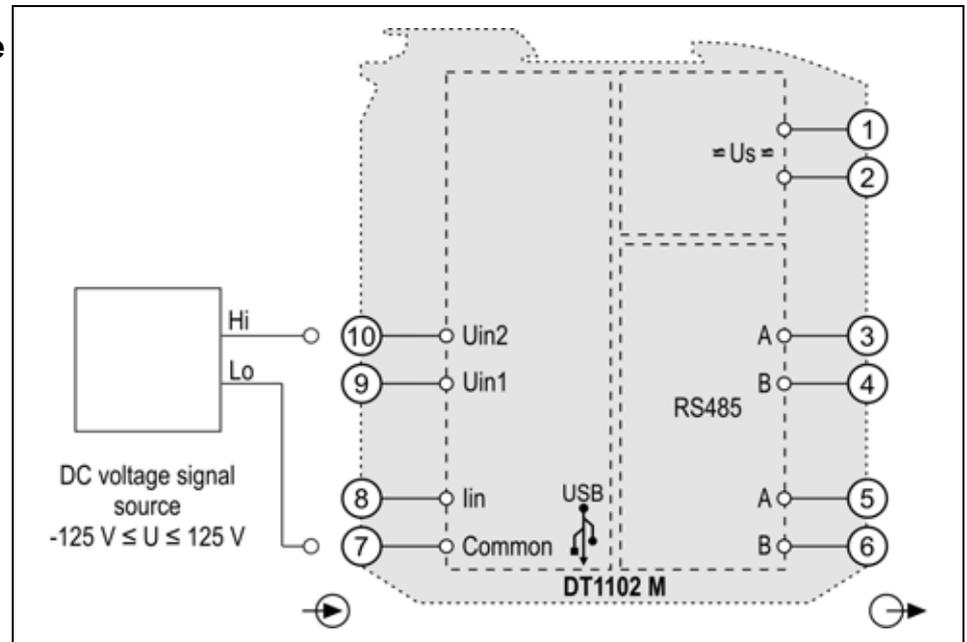
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

5.4. Connecting a -125 - +125 VDC voltage signal source

The following figure shows the wiring plan, connecting the DC voltage signal source:

Wiring plan, connecting the DC voltage signal source
(see also “Application example”)

Be careful the polarity of the cables



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.

Checking the Connections

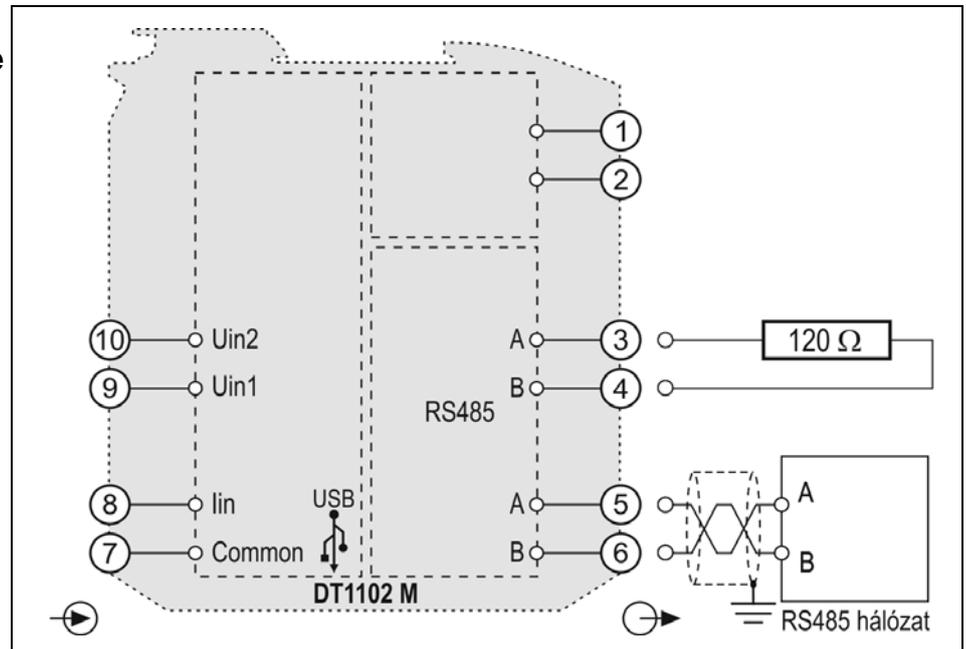
Check if the cables are connected properly (have you connected all the cables, have you connected to the right place, do not the cable-ends touch each other).

The following figure shows the wiring plan, connecting the signal processing unit and the power supply, where the DT1102 M is the last device on the RS485 bus:

Wiring plan, connecting the signal processing unit and the power supply
(see also “Application example”)

Be careful the polarity of the cables

DC supply voltage polarity 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.

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).

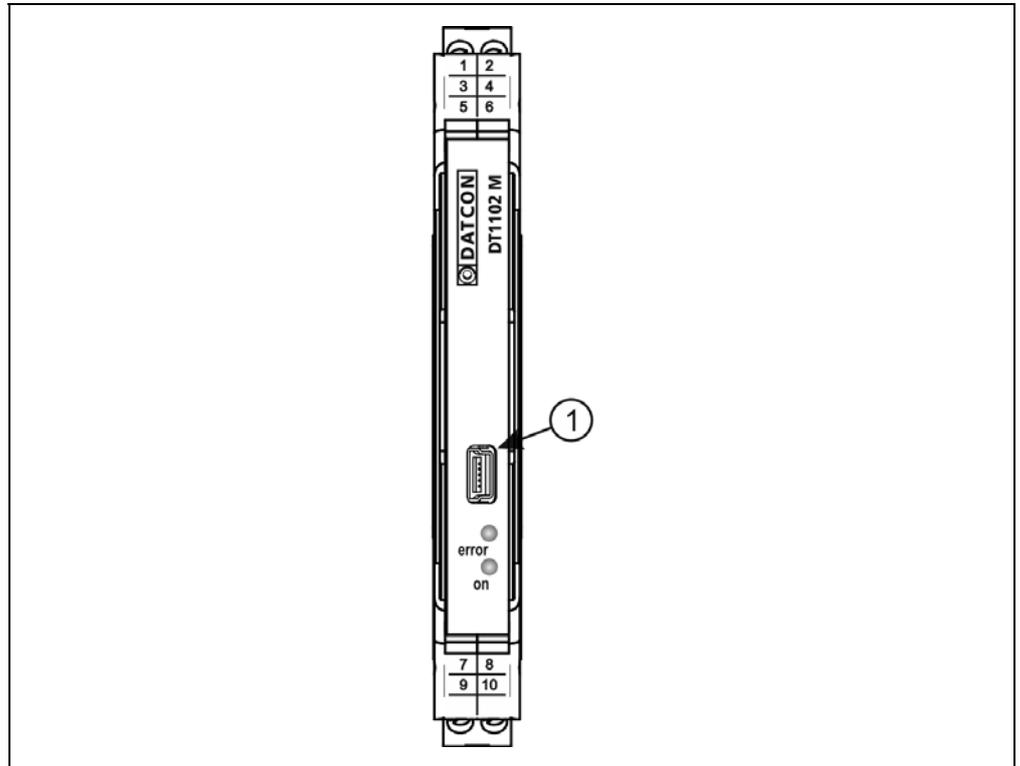
Put the instrument under supply voltage

5.6. Put the instrument under supply voltage.

After you have completed the connections, put the instrument under supply voltage. If the connection is correct the green indicator gives light and you can measure an output signal according to the measured value on the input.

5.7. Connecting to PC via USB cable

The following figure shows the USB connector on front of the instruments.



1. For the communication between PC and instruments plug the accessory USB cable (USB-B mini, 5 pins) to USB connector (1) and another cable end to PC. The cable ends are not interchangeable, because the plugs at cable ends are different.
2. See the chapter **7. Setting-up** for settings. If you only want to install USB driver to PC, just connect the instrument to PC (not necessary supply voltage to instrument). But if you want to setting-up to instrument, you have to connect the supply voltage to instrument. The USB driver is in \DT1102 M\USB Driver folder of the included CD, or downloadable from www.datcon.hu website.
3. After the settings unplug the USB cable from instruments. (Please don't move to USB plug laterally.)



The USB port is galvanic isolated therefore the USB cable can plugged into a grounded PC too. When USB cable connected or unplugged to instrument need not switch off the power supply.



6. The first start-up, indicators

6.1. The first start-up

After connecting the DT1102 M is ready to work with the factory default parameters.

Factory default settings:

- Input signal: Current
 - Input initial value: 0 mA
 - Input end value: 22 mA
- Used input terminals are Common (7) and lin (8).

- MODBUS protocol: RTU
 - Device address: 1
 - Communication speed: 9600 Baud
 - Parity: Even
- Used output terminals are +A (5) and -B (6).

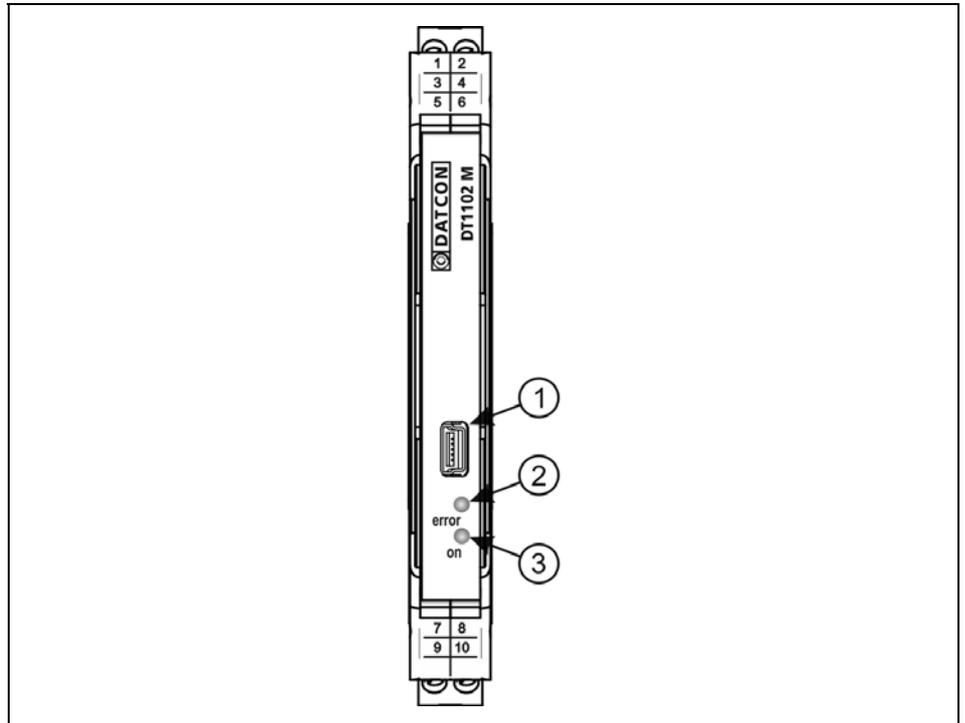
When the factory default settings are appropriate, not necessary any other setting. When you are going to use other parameters you should set-up the instrument according to chapter 7. **Setting-up**.



The inappropriate settings or the different between settings type and used terminals type makes measurement error happen.

6.2. Indicator LED-s

The following figure shows the indicators and USB connector on the DT1102 M front panel.



(2) The blinking light of „**error**” red indicator indicates different error states.

(3) The continuous light of „**on**” green indicator indicates that the instrument is working.

Error state signaling:

“on” indicator: light, “error” indicator: blinking.

The number of blinks gives the error information:

- **1 blink:** fatal error.

The repair can be carried out only by the manufacturer.

- **4 blinks:** input range error.

The measured value out of input range. Please check the input parameter settings and the value of the input signal.

- **5 blinks:** MODBUS communication error.

The MODBUS communication settings are inappropriate or RS485 bus error. Please check that the MODBUS communication settings are consistent with MODBUS MASTER communication parameters. Please check the noise level on RS485 bus in standby state (no communication). The noise voltage must be lower than 200 mV_{pp}.

7. Setting-up

7.1. First steps

Necessary tools

For setting-up you need:

- mini USB (5 pin) - USB A cable (accessory)
- DT1102 M.exe configuration software (accessory)
- PC with Windows operation system and one free USB connector

Software

1. Install the USB driver for making the virtual serial port:

→ Connect the instrument with the USB cable to the PC USB port.

If the windows runs the device installer application then browse and select the file "**DT1102 MUSB Driver\MCP2200_v1.2.inf**" and install it.

Another method (if the first method failed): run the application "**DT1102 MUSB Driver\Driver Installation Tool\xxx\MCP2200DriverInstallationTool.exe**".

2. Install the configuration software:

→ Just copy the **DT1002 M.exe** file to a folder on PC, where you run it.

Setting-up

1. Connect the instrument with the USB cable to the PC USB port and put it under supply voltage.

2. Start the **DT1102 M.exe** configuration program.

3. Select the appropriate serial port. (Baud rate must be 115200.)

4. Click on the „Open” button.

5. Use the configuration software as is written on the following pages.

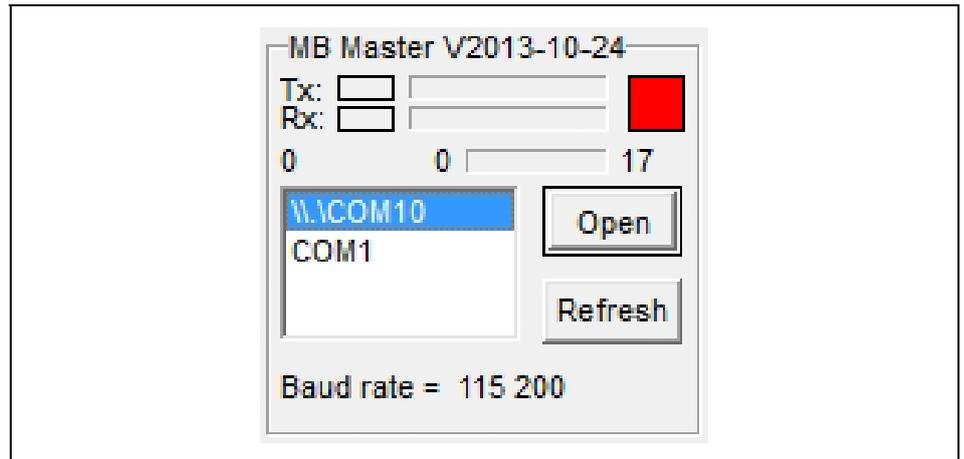
6. At the end of the settings click on the "**Write settings to instrument**" button, the new settings are written into the instrument.

7. Click on the „**Close**” button for finishing the configuration procedure and disconnect the USB cable.

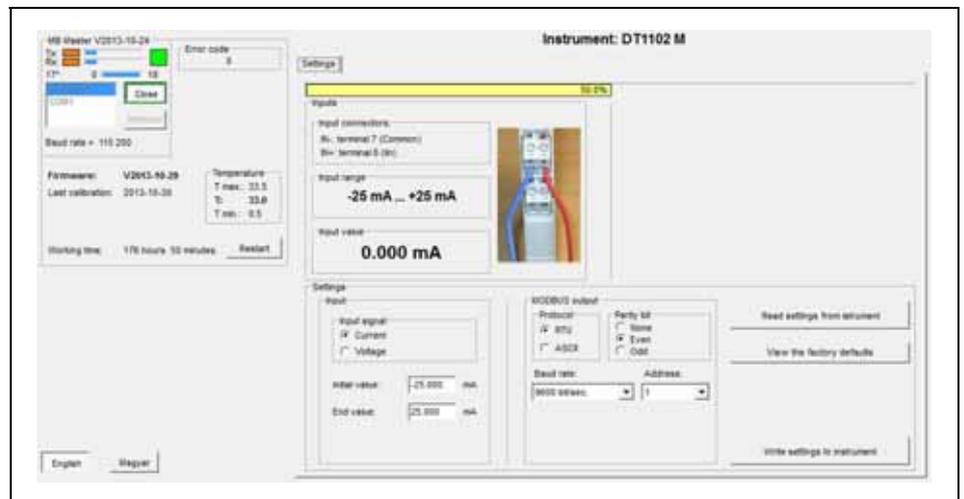
8 Close the DT1102 M.exe configuration program.

The setting finished.

The virtual serial port setting panel (for USB communication):



The all perspective of configuration program:



7.2. Analogue input type setting

Function

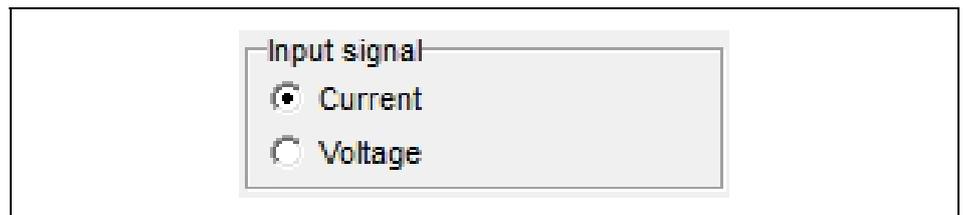
The instrument has two different inputs. The selectable input signal can be current or voltage.

[Factory default: Current input]

Sequence of operations

1. Select the appropriate input mode by clicking the button.
2. At the end of the settings click on the “Write settings to instrument” button, the new settings are written into the instrument.

The figure shows the factory default setting.



7.3. Analogue input range setting

Function

Selectable input ranges:

-25 - +25 mA @ current input
Terminals: Common (7) and lin (8).

-2.5 - +2.5 V @ voltage 1 input
Terminals: Common (7) and Uin1 (9).

-125 - +125 V @ voltage 2 input
Terminals Common (7) and Uin2 (10).

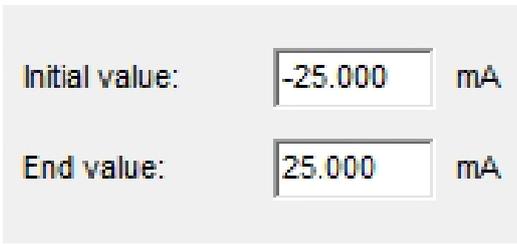
The initial value and the end value can be set arbitrary within this range. (Please note recommendation Chapter **10.1. Technical specification.**)

[Factory default: -25 - +25 mA]

Sequence of operations

1. Type the appropriate values into fields.
2. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

The figure shows the factory default setting.



The figure shows a screenshot of the factory default setting for the analogue input range. It consists of two rows of input fields. The first row is labeled "Initial value:" and contains a text box with the value "-25.000" and a unit selector set to "mA". The second row is labeled "End value:" and contains a text box with the value "25.000" and a unit selector set to "mA".

7.4. MODBUS communication parameters setting

Function

The instrument has RS485 interface. The measured values, selected input type and error messages readable via this interface with MODBUS RTU/ASCII protocol.

Parameters:

Protocol: RTU/ASCII

Parity: None/Even/Odd

Communication speed: 2400/4800/9600/14400/19200/38400

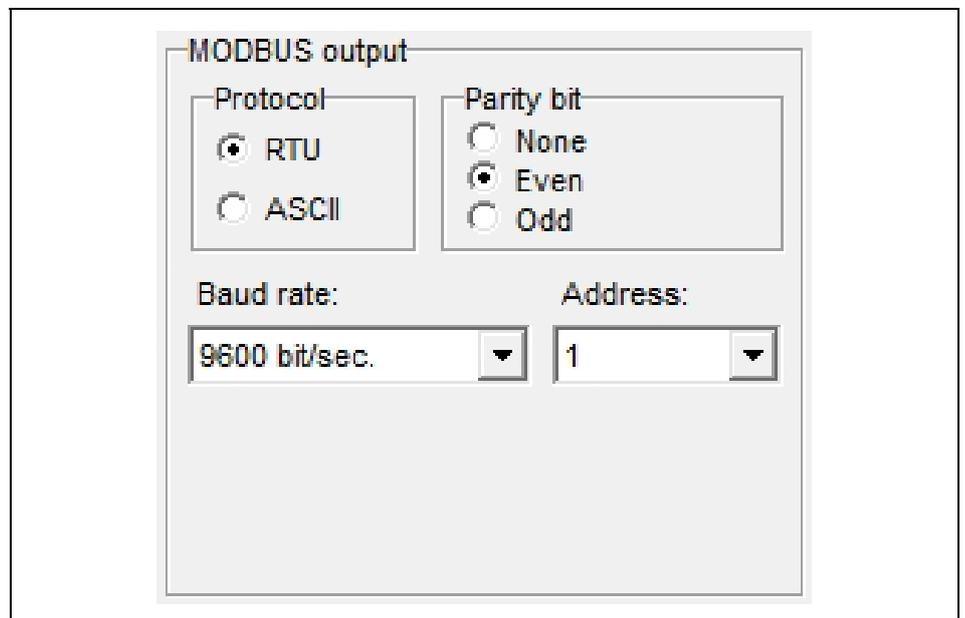
Device address: 0-247 ().

[Factory default: RTU protocol, Even parity, 9600 Baud, 1. address]

Sequence of operations

1. Select the protocol by clicking the radio button.
2. Select the parity by clicking the radio button.
3. Select the communication speed by choose one from dropdown list.
4. Select the device address by choose one from dropdown list. If you choose 0, then device won't answer any MASTER question, as the device is unconnected.
5. At the end of the settings click on the "Write settings to instrument" button, the new settings are written into the instrument.

The figure shows the factory default setting.



7.5. MODBUS registers

The table shows the MODBUS registers.

Register address	Content
1000	Input type (UINT16): 100 - current input, 101 - voltage input
1001	Error register (UINT16): 0 - no error 1 - fatal error 4 - input overload 5 - MODBUS error
1002	Measured value HI (IEEE754 Single, HI word)
1003	Measured value LO (LO word)
1004	Scale percent HI (IEEE754 Single, HI word)
1005	Scale percent LO (LO word)
1006	Measured value (INT16)
1007	Scale percent (UINT16)

7.6. Resetting default setting

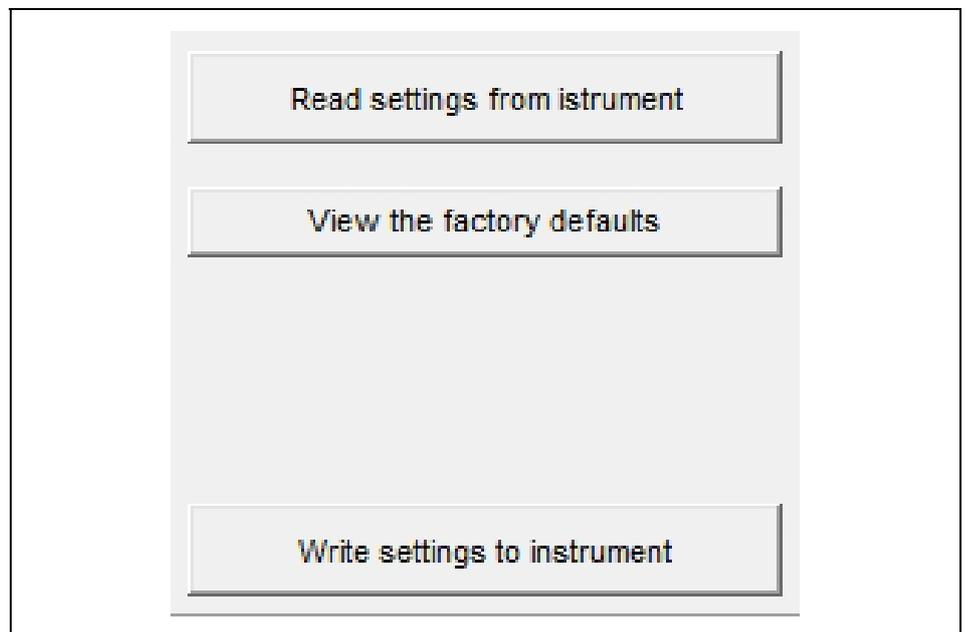
Function

In this case all the settings are deleted, and the default settings are 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.

Sequence of operations

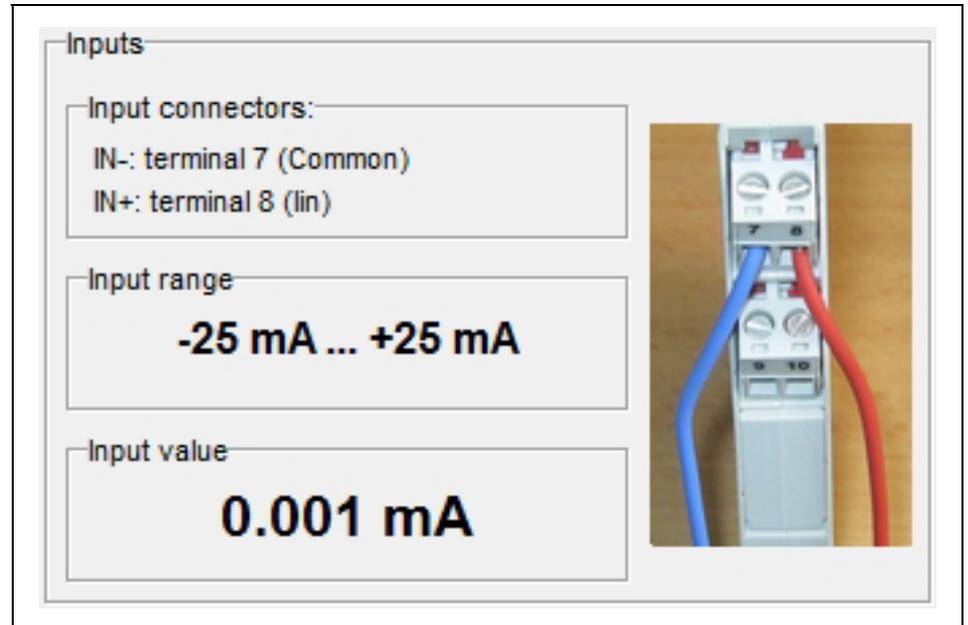
1. Click on the „View the factory defaults” button. The default settings are appeared on fields.
2. If necessary change the settings.
3. At the end of the settings click on the “Write settings to instrument” button, the new settings are written into the instrument.



7.7. Display measured data

Function

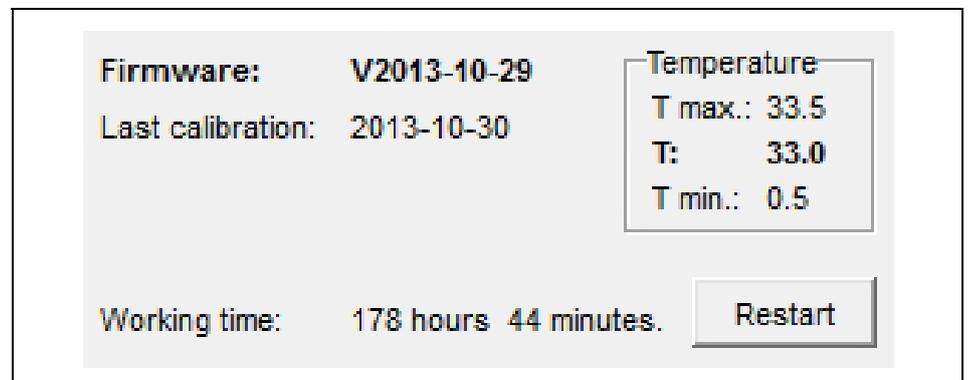
The program can read out and display the measured input value when the PC and instrument are connected. This value helps to check instruments wiring and settings.



7.8. Display system information

Function

The program can read out and display the system information when the serial port is open.

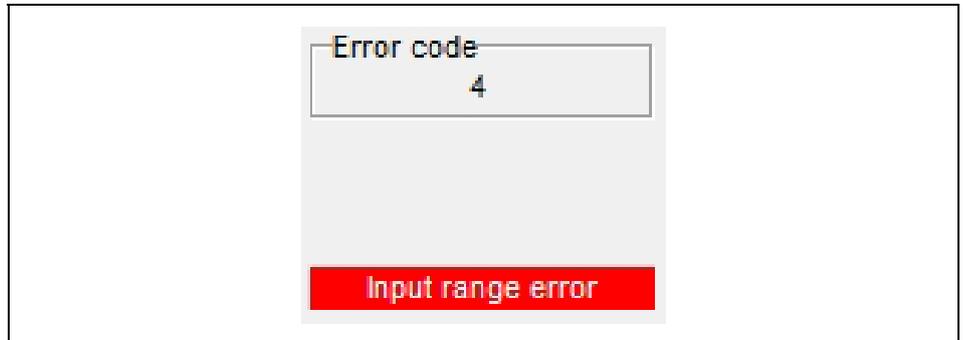


7.9. Display errors

Function

The program can read out and display the error messages when the serial port is open. When the error occurs, the error message and the error code are visible.

The figure shows how visible the “Output range error” status.



When the critical errors occur (Error code = 1), must call the manufacturer.

When the next errors occur:

- Input Range Error (Error code = 4): The input signal is too high (input current / voltage). Please check the transmitter which connects to the input and the input ranges, see Chapter 10.1.

Technical specification.

Please read out the settings from the instruments, and check them. If you find bad setting, please fix it, and download new settings to the instrument.

- MODBUS communication error (Error code = 5):

The MODBUS communication settings are inappropriate or RS485 bus error. Please check that the MODBUS communication settings are consistent with MODBUS MASTER communication parameters. Please check the noise level on RS485 bus in standby state (no communication). The noise voltage must be lower than 200 mV_{pp}.

8. Fault rectification

8.1. Fault finding



The fault finding must be carried out by trained and authorized personnel only!



- The green indicator is dark → check the power supply. If the supply voltage is OK: the instrument is defective.
- There is error signal → check the power supply, input signal and see the error code (which is displayed by Error LED) in Chapter 7.9. **Display errors**.

When the result of fault finding is that the DT1102 M is defective call the manufacturer service department.

8.2. Repairing



There is no user repairable part inside the instrument. In accordance with Point 2.1.: **For safety and warranty reasons, any internal work on the instrument must be carried out only by DATCON personnel.**

9. Dismounting

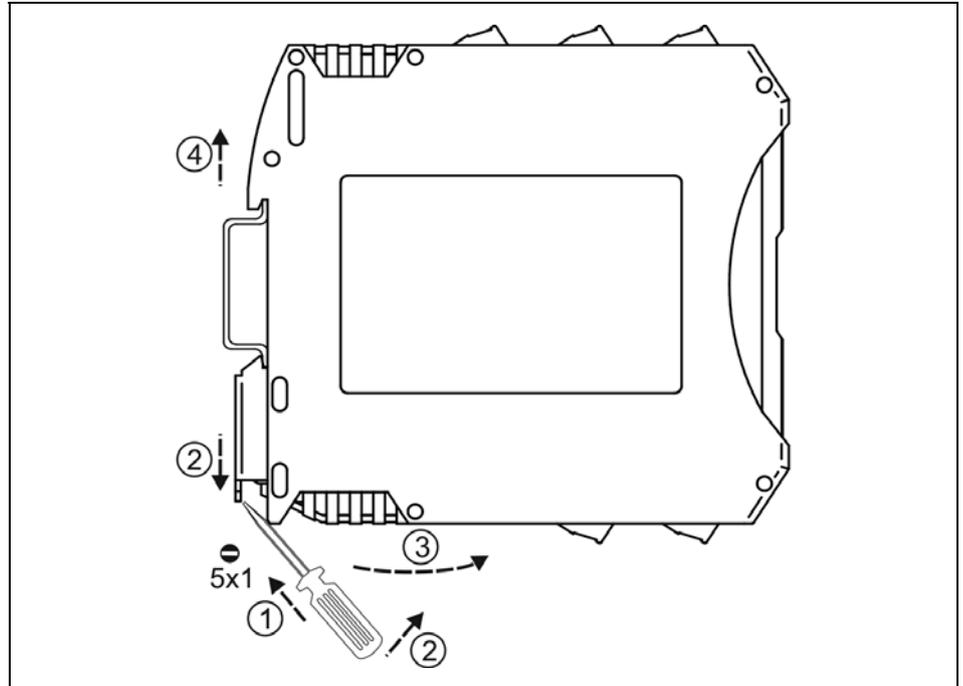
9.1. Dismounting procedure

Before dismounting take note the warnings written in chapter 5.1.

Preparing the connection.

The following figure shows the dismounting procedures.

Dismounting from the rail



The dismounting procedure needs a screwdriver for slotted screws.

1. Before dismounting switch off the power then disconnect all wires.
2. Put the screwdriver end into the fixing assembly's hole (figure step 1.).
3. Lift the screwdriver handle until it possible to open the fixing assembly (figure step 2.).
4. Keeping the screwdriver in this position lift the instrument bottom from the bottom edge of the rail (figure step 3.). Lift the whole instrument (you may put out the screwdriver) (figure step 4), the instrument will be free.

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 specialized recycling company.

10. Appendix

10.1. Technical specification

Input parameters

Input signal:	DC current / DC voltage
Maximum of input ranges:	-125 - +125 V (Uin2 voltage input: 7-10) -2.5 - +2.5 V (Uin1 voltage input: 7-9) -25 - +25 mA (lin current input: 7-8)
Overload:	150 V @ Uin2 (7, 10) 50 V @ Uin1 (7, 9) ±200 mA @ lin (7, 8)
Scaling:	Linear, the range of the initial value and end value can be set arbitrary within input range.
Input resistance (Voltage inputs): Uin1 (7-9)	1.1 Mohm (Range ≤ 500 mV) 124 kohm (Range > 500 mV)
Uin2 (7-10)	1 Mohm
Input resistance (Current input):	10 ohm
Error of input @ 25 °C ±2 °C:	±0.05%
Temperature coefficient:	typically: 25 ppm / °C; max.: 50 ppm / °C
Supply-voltage effect:	practically zero

Configuration

Input range of input signal:	The recommended difference between initial and end value of at least (≥)
Uin1 ±200 mV	30 mV
Uin1 ±500 mV	50 mV
Uin1 ±2.5 V	0.2 V
Uin2 ±10 V	0.5 V
Uin2 ±50 V	2 V
Uin2 ±125 V	6 V
lin ±25 mA	1 mA

Output parameters

Interface:	galvanically isolated RS485
Communication protocol:	MODBUS RTU / ASCII slave
Commands:	3 - Read holding registers (register block)
Communication speed:	2400 / 4800 / 9600 / 14400 / 19200 / 38400 Baud
Parity:	None / Even / Odd
Device address range:	0-247 (0: device don't answer any question)
Interface connectors:	two pluggable screw-terminal (one for connect to master, and one for connect to next slave or terminator resistor)

Galvanic isolation

Test voltage:	2500 VDC (between input-output, input-power supply terminals) 500 VDC (between output-power supply terminals)
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Power supply

Power supply:	
DT1102 M	24 VDC $\pm 10\%$
DT1102 M PS	230 V AC/DC $\pm 10\%$
Power consumption:	
DT1102 M	<1.2 W / 1.8 VA
DT1102 M PS	<1.9 VA / 1.3 W

Ambient conditions

Operating temperature range:	0-60 °C
Storage temperature range:	-20 - +70 °C
Relative humidity:	90% (max., non-condensing)
Mounting position:	vertical (horizontal rail position)

Electromagnetic compatibility (EMC)

Accordance with the standard EN 61326-1 (Industrial environment)

Immunity:	-A- criterion @ $U_{in} > 100$ mV -B- criterion @ $U_{in} \leq 100$ mV
Noise emission:	-A- class
Conducted RF immunity (EN 61000-6-2)	10 V; 0.15-80 MHz; A class

General data

Housing:	TS-35 rail mounting housing material: polyamide PA6.6
Fireproof class:	V2-V0 / UL94
Connection:	Pluggable screw-terminal
Connecting cable:	1.5 mm ² (max.)
Dimensions:	12.5 x 108 x 114 mm (width x height x depth)
Mass:	0.15 kg
Ingress Protection (EN 60529):	IP 20

The Manufacturer maintains the right to change technical data.

10.2. Application example

