GPRS/NB-IoT Data Loggers

DTU2xx

Revision 2.1, November 2021

DTU2xx Data Loggers

User Guide (revision 2.1, November 10th, 2021)

This user guide was developed for persons responsible for mounting, configuration and technical maintenance of the DTU2xx data logger series (hereinafter referred to as *DTU* or *Data Logger*). The guide contains information about the intended purpose, design, technical parameters and operating principles of the DTU.

ADGT systems reserves the right, without any prior notice, to make changes to the operating manual related to the improvements in hardware and software, as well as to eliminating misprints and inaccuracies.

Safety Instructions

- **CE WARNING:** In a residential environment this product may cause radio interference. In such cases users may be required to take adequate measures.

WARNINGS!

- Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.
- Do not disassemble the device unless you are qualified as service personnel.
- AC Input voltage:100-240VAC, 230VAC, 50Hz
- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.
- The equipment should not be serviced when powered up. Make sure to power down the equipment before performing service activities.
- Do not use or install this product near water to avoid fire or shock hazard.
- Avoid exposing the equipment to rain or damp areas.

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Content

1. Product Overview

Product Description

DTU2xx – a series of battery-powered data loggers designed for remote metering and monitoring.

Device provides:

- Automated data collection from meters with pulse outputs, meters with serial RS-232 and RS-485 ports and a wide range of sensors (resistive, 4-20mA, 1-wire, etc);
- Data storage in non-volatile memory;
- Wireless data transmission to dispatching server over GPRS or LTE NB-IoT network.

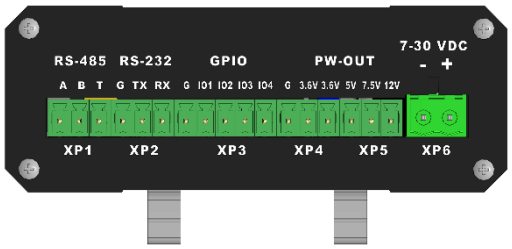
Fig. 1. DTU2xx data logger.

Data logger is made in an IP30 metal case and equipped with four configurable GPIOs, dual SIM slots, serial RS-232 and RS-485 ports, and USB port for device configuring.

Devices are powered either from a 230V AC or from a 7-30V DC network (depending on model), and also have a built-in replaceable 3500 mAh battery to provide backup autonomous operation of the data logger in the event of external power failure. Battery service life ranges from 4 to 10 years depending on the model (GPRS or NB-IoT) and its use.

The model range of DTU2xx is represented by the following base models:

DTU217, DTU227, DTU227-U
7-30 VDC power supply



DTU217-C, DTU227-U, DTU227-UC
100-240 VAC power supply

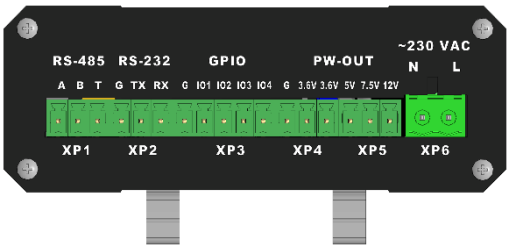


Fig. 2. DTU2xx base models.

Model	Network Type	Transmission Protocol	Power Supply
DTU217	GPRS	TCP	7-30 VDC
DTU217-C*	GPRS	TCP	100-240 VAC
DTU227	LTE NB-IoT	TCP	7-30 VDC
DTU227-U*	LTE NB-IoT	UDP	7-30 VDC
DTU227-C*	LTE NB-IoT	TCP	100-240 VAC
DTU227-UC*	LTE NB-IoT	UDP	100-240 VAC

* **Base model options:**

-U – UDP protocol. A base software option for all DTU2xx NB-IoT models, which means that the device operates over the UDP protocol. Otherwise, if there is no '-U' marking, that means that the device operates over TCP protocol.

-C – a built-in 100-240 VAC power supply unit. A base hardware option for all DTU2xx data logger models. Otherwise, if there is no '-C' marking for these models, that means that the device has 7-30 VDC power supply.

DTU2xx base models can be supplied with the set of **additional options**, which include the following groups:

Hardware Options - minor hardware changes to the device:

-G – RS-485 galvanic isolation

Assembly Options – include replacement or absence of the battery, case and/or type of mounting:

.Z – no battery
.M – no case (for DTU with 7-30 VDC power supply only)
.R – metal DIN rail mounting
.T – wall mounting

The base model in combination with the additional options constitute a modification of the device and indicate the difference between a specific modification and the base model.

Options are added to the name of the base model in the following sequence:

Base Model	– *hyphen*	Hardware options	. *dot*	Assembly options (battery, case, mounting)

Example of a modification name – DTU227-UCG.ZR

Within each group of options, the letters go alphabetically. If the letters of the option group are not present in the modification name, then the letter of the next option group takes its place. If no option is specified, then we have the base model (see the table above).

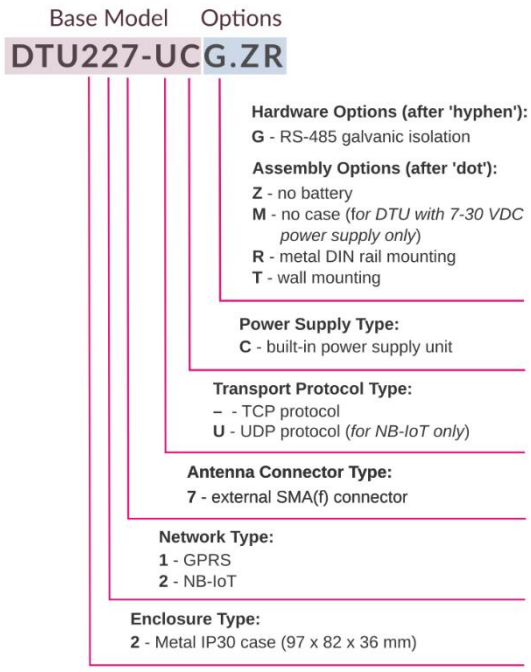


Fig. 3. DTU2xx model code designation.

DTU2xx Features

- Data transmission according to the schedule, at pressing the button and on the event at the object.
- Date and time regular automatic synchronization.
- Dual SIM for communication channel reservation.
- Battery discharge monitoring. If the battery is low, a notification will be sent to the server.
- Several outputs with a voltage of 3.6V, 5V, 7.5V and 12V for powering external sensors.
- Quick and easy device configuration: via PC as well as remotely using web interface.

Application Areas

- AMR/AMI Smart Metering Systems (heat, electricity, water, gas)
- Automated Control Systems (temperature, leakage, pressure, 1-Wire, current loop)
- Power and Energy Industry

Technical Specifications

	DTU217	DTU217-C	DTU227	DTU227-U	DTU227-C	DTU227-UC
POWER SUPPLY						
Main power supply source	7-30VDC	100-240VAC/ 50Hz	7-30VDC	7-30VDC	100-240VAC/ 50Hz	100-240VAC/ 50Hz
Max. power consumption	3W[1]	3W[1]	1W[1]	1W[1]	1W[1]	1W[1]
Connector	2-pin terminal block, pitch – 5.08 mm					
Backup power supply source	Li-SOCL2 A-type battery, 3.6V 3200 mAh					
Current consumption in a sleep mode (when powered by battery)	10 µA (at 2 Hz polling rate), 40 µA (at 20 Hz polling rate), 150 µA (at 100 Hz polling rate)[2]					
Current consumption in data transfer mode (when powered by battery)	150 mA[2]		36 mA[2]		36 mA[2]	
Battery life	Not less than four years[3]		Up to ten years[3]			
CELLULAR NETWORK PARAMETERS						
Module frequency range	GSM 850/900/1800/1900		LTE B1/B3/B5/B8/B20/B28 (multiband)			
Output power	33dBm (850/900 MHz) 30dBm (1800/1900 MHz)		23dBm±2dB			
Data transmission technology	GPRS class: configured 8/10/auto (up to 12)		NB-IoT Cat NB2			
Data transmission rate	up to 85.6 kbps (DL/UL)		125 kbps(DL) / 150 kbps(UL)			
Protocol Stacks	IPv4 TCP		IPv4 TCP	IPv4 UDP	IPv4 TCP	IPv4 UDP
GPIO PARAMETERS						
Universal (pulse) inputs	x4 (**IO1-IO4**)					
Connector type	Terminal block, pitch - 3.81mm					
Unit of measured value	pulse, ohms, mA, °C, ppm					
Pulse counting range	0 - 2^{32}					
Sensor type	pulse counter, high-frequency pulse counter, signal input, leakage sensor, temperature sensor, NAMUR, 1-Wire, 4-20 mA current loop, CO2 sensor, load control, engine hours counter, opening sensor					
Polling frequency[4]	**2Hz** (*default*): min. pulse duration – 500ms, max. pulse frequency at the input – 1Hz; **20Hz**: min. pulse duration – 50ms, max. pulse frequency at the input – 10Hz; **100Hz**: min. pulse duration – 10ms, max. pulse frequency at the input – 50Hz					
Relative acceptable pulse counting error limit	±0,01%					
Input condition	Closed, Open, Short circuit, Break					

[1] Without taking into account the load at the 12V and 7.5V power outputs.

[2] If all inputs are configured as counting and the 12V and 7.5V power outputs are turned off.

[3] In the operating mode envisaging 3 communication sessions per month.

[4] **ATTENTION**! Increasing the loop polling frequency results in a shorter accumulator battery life.

	DTU217	DTU217-C	DTU227	DTU227-U	DTU227-C	DTU227-UC
Input resistance measurement range	0 – 100 kOhm The line is working properly: open state -3-100 kOhm, closed state - 1-3 kOhm The line is faulty: line is broken - more than 10kOhm, short circuit - 0-1kOhm					
OTHER PORTS & CONNECTORS						
Serial Ports	1 x RS-232: non-isolated, Rx, Tx, G signals. Default speed -19200 bps (8N1) 1 x RS-485: non-isolated, A, B signals. Default speed - 19200 bps (8N1). Load capacity – up to 32 unit load (UL) devices (up to 256 1/8 load devices). 1/2UL = 24kOm. Maximum communication range - up to 1000 m					
Power outputs	2 x 3.6V (ENABLED by default) 1 x 5V (DISABLED by default). Enabled when the 1-Wire input is activated ("DS18B20") 1 x 7.5V (DISABLED by default). Enabled when the "Current loop" input is activated. 1 x 12V (DISABLED by default). Enabled when the "Current loop" input is activated.					
SIM	2 x mini-SIM (2FF)					
Antenna	1 x SMA-F connector					
DEFAULT SETTINGS						
Data slice saving	once per hour					
Readings transfer to server	once/day, from 08.00 to 09.00					
IOT24.eu server IP address/server port[5]	iot24.eu:10002 (**GSM**) 139.162.147.141:10003 (**NB-IoT**)					
Server connection	on schedule, pressing configuration button (**SB**), event at facility (short circuit, break), reboot					
Time synchronization	Each connection to server					
GENERAL CHARACTERISTICS						
Overall dimensions	97 x 88 x 36 mm					
Weight	no more than 220 g					
Enclosure	aluminum, protection class - IP30					
Archive depth	10 years (hourly logging)					
Time accuracy	5 sec/day					
Average service life	10 years					
OPERATING CONDITIONS						
Operating temperature	-10...+50°C [6]					
Relative air humidity	up to 80% at 25°C					
Atmospheric pressure	84-106. 7 kPa					

[5] For devices with a GPRS modem, use a domain name to connect to the server.
For devices with an NB-IoT modem, use only the IP address.

[6] When operating from battery at temperatures below 0°C, the battery life could be shorter.

Appearance

DTU2xx is a single-board microcontroller device in a metal case with the possibility of mounting on a DIN rail or on a wall. A description of the buttons and connectors is given below.

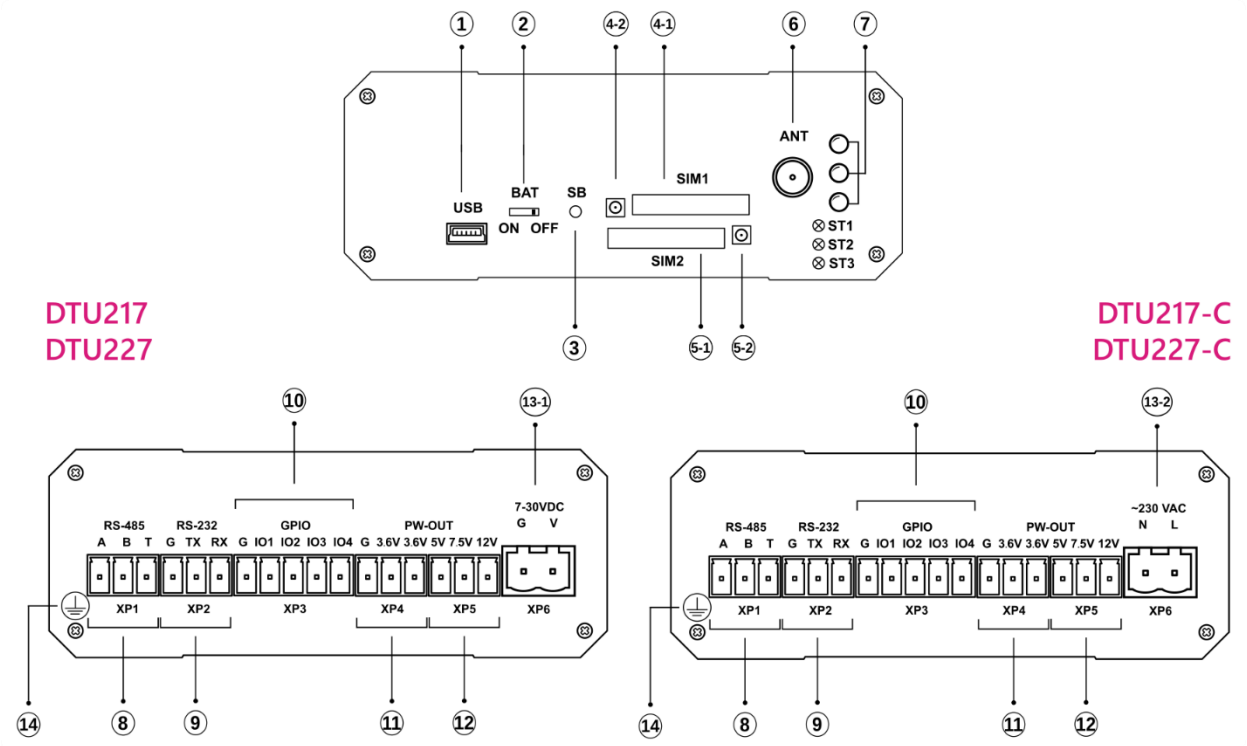


Fig. 4 DTU2xx connectors and buttons.

Table. 1. DTU2xx buttons and connectors.

Connector			Description
Front side			
1	**USB**		mini-USB B connector for configuring data logger via PC
2	**BAT**		Power battery switch (default - **OFF** position)
3	**SB**		Button for connecting to the server/configuring data logger
4-1	**SIM 1**		SIM card 1 holder
4-2			Button to remove SIM card 1
5-1	**SIM 2**		SIM card 2 holder
5-2			Button to remove SIM card 2
6	**ANT**		SMA-F connector for connecting GSM (NB-IoT) antenna
7			LED indicators (ST1, ST2, ST3)
Rear side			
8 **XP1**[7] connector	**RS-485**	**A**	A+ signal, RS-485 line
		B	B- signal, RS-485 line
		T	Built-in terminal resistor output (in order to commute terminal resistor, T-output should be connected to the B- output of RS-485 port)
9 **XP2**[7] connector	**RS-232**	**G**	Ground
		TX	RS-232 interface TX data output
		RX	RS-232 interface RX data input

[7] Mating part is a 3-pin terminal block with a screw clip (pitch - 3.81 mm).

Connector			Description
10 **XP3**[8] connector	**GPIO**	**G**	Ground
		IO1	Universal counting/signal Input/Output 1
		IO2	Universal counting/signal Input/Output 2
		IO3	Universal counting/signal Input/Output 3
		IO4	Universal counting/signal Input/Output 4
11 **XP4**[8] connector	**PW-OUT**	**G**	Ground
		3.6V	3.6 V power output
		3.6V	3.6 V power output
12 **XP5**[8] connector		**5V**	5 V power output
		7.5V	7.5 V power output
		12V	12 V power output
13-1 **XP6**[9] connector	**7-30 VDC** DTU217, DTU227	**G**	Ground
		V	7-30 VDC power supply input
13-2 **XP6**[9] connector	**~230 VAC** DTU217-C, DTU227-C	**N**	**Neutral** input of power supply voltage 100-240 VAC
		L	**Line** input of power supply voltage 100-240 VAC
14	⏚		Data logger grounding screw

[8] Mating part is a 3-pin terminal block with a screw clip (pitch - 3.81 mm).

[9] Mating part is a 2-pin terminal block with a screw clip (pitch - 5.08 mm).

DTU2xx Interfaces and Wiring Diagrams

Universal GPIOs

The data logger has four independent GPIO inputs-outputs **(IO1-IO4),** that support the connection of a wide range of meters and sensors. The inputs can be programmatically configured via the web interface of https://iot24.eu Cloud server or using the DTU Configuration Tool software.

1. **Input types for connecting meters**

Depending on the meter to be connected, when setting up the data logger, it is possible to select the following input types:

- **Counting -** the type of input used when connecting pulse meters with a relay output to DTU, as well as meters with a NAMUR standard output to control the loop integrity. The inputs are configured to connect meters with a pulse repetition rate at the outputs of up to 100Hz.
- **High-frequency meter (or HF pulse meter) -** the type of input used when connecting high-frequency impulse meters to the data logger.

Connection. An example of a possible connection of meters to the data logger is given in figure below. One wire of the meter is connected to one of the inputs **IO1 – IO4**. The other wire is connected to the 3.6V - **3.6V** low current output. The polarity of the wires is not taken into account when connecting.

Up to four meters can be connected to one data logger on one rail.

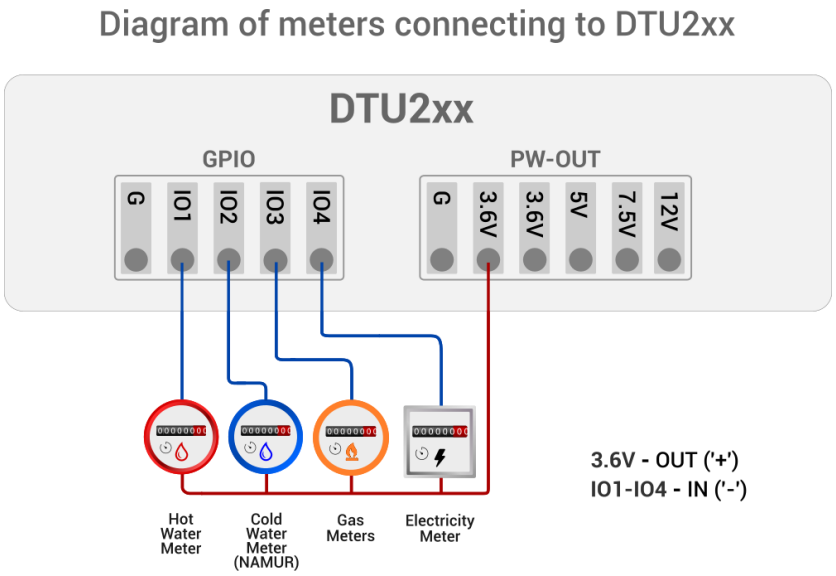


Fig. 5. Connecting meters to DTU2xx.

After connecting the meters, each input must be configured via the https://iot24.eu web interface or in the DTU Configuration Tool software. When configuring, you must select the type of input **(Pulse meter or HF pulse meter)** and set the threshold resistance values at the input.

Depending on the type of meter, the data logger will record 2 or 4 states at the inputs:

- **closed and open** - if the meters are not equipped with a NAMUR circuit.
- **closed, open, short circuit (SC), open circuit** - if the meters have a NAMUR output.

ATTENTION!

When you select the type of input **HF impulse meter**, you do not need to set the threshold resistance value, it will be adjusted automatically.

2. **Type of input for connecting the engine hours meter.**
   - Engine hours meter - the type of input used when connecting to the data logger devices that require prophylaxis in terms of operating time, for example, pumps, filters, compressors to maintain pressure in the system. The engine hours meter allows you to keep track of the time worked by the device to control the remaining resource.

3. **Types of inputs for connecting sensors**

   Sensors of various types can be connected to the **inputs IO1 – IO4** of the data logger: resistance, current loop 4-20mA, 1-Wire, etc. The following types of inputs are available for selection:

   - **Signal** - the two-state input used when connecting resistive sensors to the DTU that measure the resistance for signal transmission (temperature sensors, leakage, magnetic influence, etc.). The open and closed resistance thresholds for this type of input are manually adjustable.

   - **Leakage sensor -** the type of input used when connecting the ADGT leakage sensor to the data logger.

     Connection. The sensor has a two-wire connection scheme: one wire is connected to any of the **IO1-IO4 ("-")** contacts, and the other to the **3.6V ("+")** contact. Connection polarity is not important. The plate is placed where the leak is most likely to occur.

   - **Temperature sensor (DMT-12)** - the type of input used when connecting the ADGT DMT-12 temperature and magnetic sensor to the DTU. The sensor is designed to measure the temperature of the pipe surface and determine the effect of a magnetic field on meters.

     Connection. Magnetic sensors are mounted on both sides of the water meter for high accuracy in determining the impact, and the temperature sensor is installed on the pipe. The sensor is connected to the data logger in a two-wire scheme: one wire is connected to any of the **IO1-IO4 ("-")** contacts, and the second to the **3.6V ("+")** contact. One DMT-12 sensor is provided for one water meter.

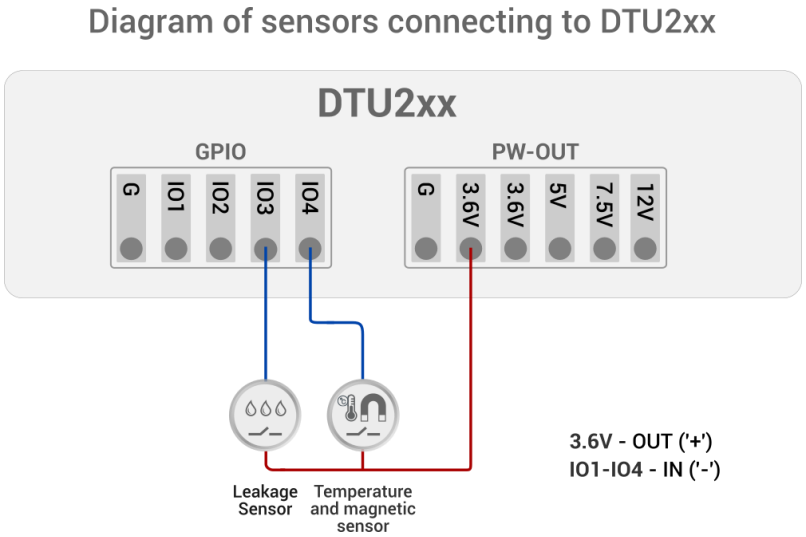


Fig. 6. Scheme of connecting ADGT sensors to data logger.

   - **Temperature sensor (DT-14), or DS18B20 sensor -** the type of input used when connecting an ADGT DT-14 temperature sensor with a 1-Wire interface to the data logger. DT-14 is a waterproof temperature sensor of increased accuracy for measuring temperature at objects. It is a piece of a three-wire loop connected to a temperature-sensitive DS18B20 element.

The sensor converts the temperature into a digital signal and transmits the information to the data logger. The DTU takes temperature measurements with an accuracy of ± 0.5 ° C every 5 minutes and, according to a schedule, transmits the values to the server.

Connection. The sensor has three wires, but is connected in a two-wire circuit. Connect the red *(power)* and black *(ground)* wires together and connect to pin **G** of the **GPIO** terminal block. Connect the yellow DQ wire (*data line)* to any of the **IO1-IO4** pins. The sensor receives power from the data line (in "parasitic" mode).

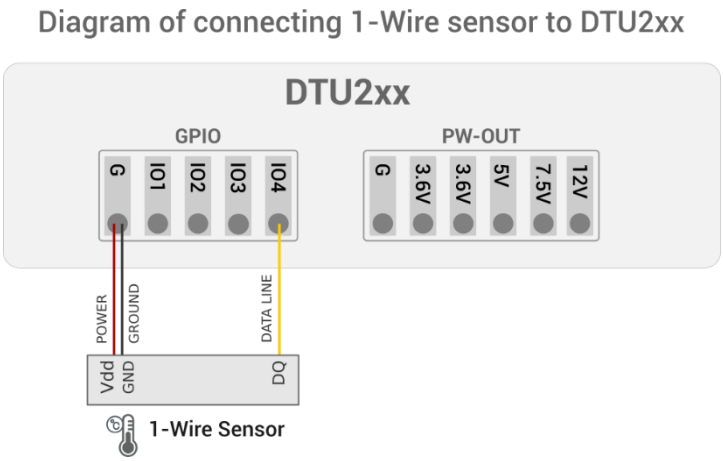


Fig. 7. Connecting the 1-Wire sensor to the data logger.

- **Current Sensor 4-20 ma** – the type of input used when connecting 4-20mA current sensors to the data logger. When this type is selected, a 100 Ohm load resistor is switched on at the configurable input, and the **12V** and **7.5V** outputs of the **PW-OUT** terminal block are automatically switched on to enable power supply of current sensors.

  The sensor can be connected in accordance with the following diagrams:

  – The sensor is powered from the built-in data logger power supply. The 4-20mA output of the sensor is connected to any of the **IO1-IO4** inputs, and the **+Upow** output is connected to one of the DTU power outputs - **7.5V** or **12V.**

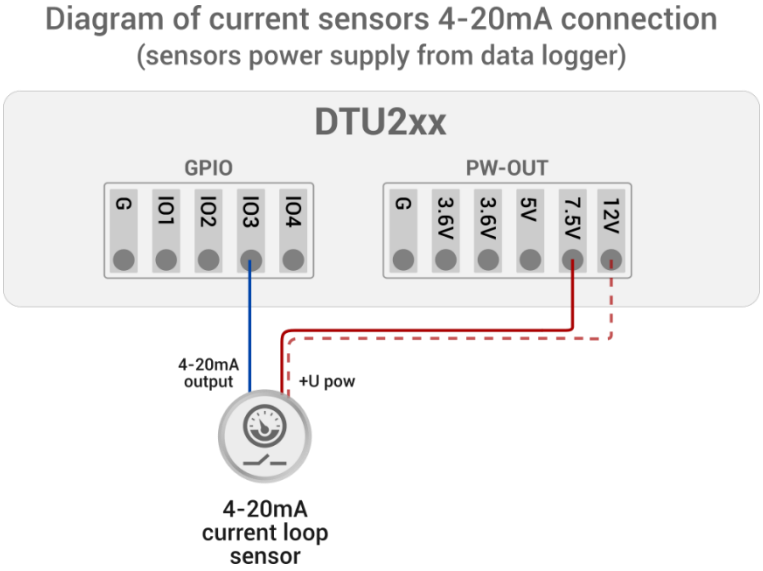


Fig. 8. Connecting the current sensor to the DTU (powered by the data logger).

– The sensor is powered from an external power supply source. Such a scheme is used if the supply voltage at the DTU outputs (**7.5V** and **12V**) does not correspond to the voltage that must be supplied to the sensor.

  In this case, the sensor is connected according to the diagram below. 4-20mA output is connected to any of the inputs **IO1-IO4** of the DTU, the **+Upow** contact of the sensor is connected to the **+Upow** of the power supply, and the **–Upow** of the PSU is connected to any contact **G** of the data logger.

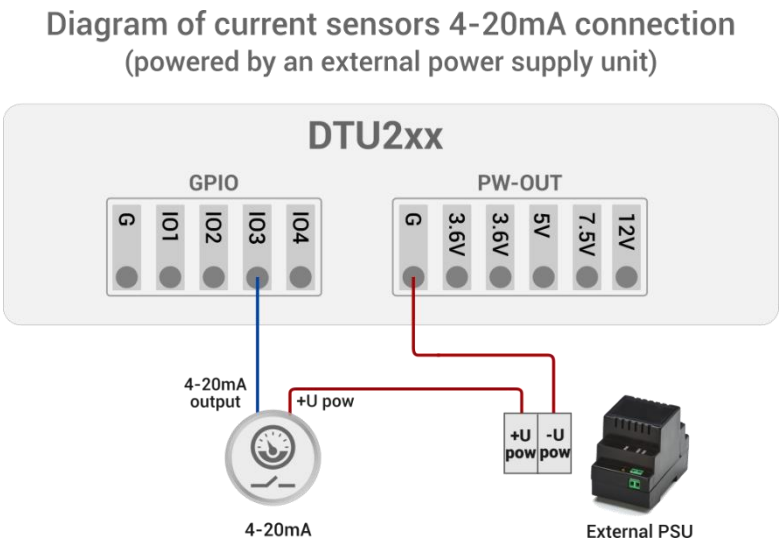


Fig. 9. Connecting the current sensor to the DTU (powered by an external power supply unit).

RS-232 and RS-485 Interfaces

RS-232 and RS-485 interfaces are designed for remote data collection from devices. DTU allows organizing a transparent communication channel between serial devices and upper-level software even in cases where there is no external power supply at the facility, since the device can operate autonomously, from a 3500 mAh battery.

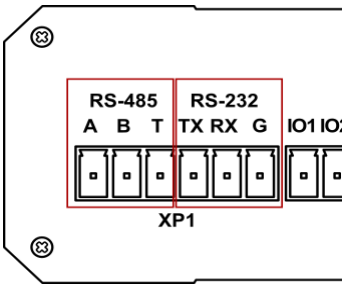


Fig. 10. RS-232 and RS-485 ports.

The interfaces are co-located, so all information received over a transparent TCP channel goes to both serial ports, and the response received over any of the interfaces is transmitted into a single transparent TCP channel. At one point in time, data exchange is possible between one of the interfaces ("Client") and a remote node ("Server").

The RS-232 interface uses three signals: **Rx, Tx, G.**

The RS-485 interface supports **A (+)** and **B (-)** signals, and also has a built-in 120Ω **(T)** terminal resistor output that is connected to the line when shorted to **B (-).**

The load capacity of the RS-485 interface allows you to simultaneously connect:

- up to 32 devices with a single load (1UL);
- up to 64 devices with 1/2-unit load (1 / 2UL);
- up to 128 devices with 1/4-unit load (1 / 4UL);
- up to 256 devices with 1/8-unit load (1 / 8UL).

The value of the input resistance 1/2 of the unit load of the RS-485 driver is 24 kOhm.

> **ATTENTION!**
>
> The number of devices physically connected to the line can be up to 256, but the total number of UL in one line should not exceed 32. When connecting devices via the RS-485 interface, be sure to take into account the load and other limitations of the network and meters, for example, the number of devices supported by the meter protocol.

Data logger supports the following transparent channel operation modes:

- **Separate transparent channel**[10]. When the option is enabled, the data logger starts working in the "two-channel" mode. On the one hand, the data transfer channel from the GPIO ports via the ADGT DTU protocol is kept active, and at the same time, a separate transparent communication channel between RS-232/RS-485 and the upper-level software is activated. Both channels work in parallel, with a single scheduled communication output.

- **Combined transparent channel.** In this mode, a transparent data transfer channel from serial ports is combined with a data transfer channel using the ADGT DTU protocol, which allows you to simultaneously process the archive of readings from the GPIO ports and data from serial ports. This mode is necessary if the customer wants to integrate the ADGT DTU protocol into his own data collecting and processing system.

- **Transparent channel is off.** In this mode, data logger does not process commands from serial ports.

[10] The option is applicable only for GPRS data logger.

DTU2xx Operating Modes

The device supports several modes of operation:

Sleep mode

The mode of *reduced electricity consumption*, being in which, the DTU collects data from metering devices and monitors the state of the inputs. In the sleep mode, the data logger works most of the time, going into the connection mode only according to the schedule, when setting up the device or in case of emergency situations.

> **ATTENTION!**
> When connected via USB, the device does not go into a sleep mode.

Server connection and data transfer mode

Data transmission from the DTU to the dispatching server occurs via the TCP (GPRS) or TCP/UDP (NB-IoT) protocol, which has a client-server architecture. The device always works in the "Client" mode and independently establishes an outgoing connection with the "Server", to which it sends data after the connection. The default "Server" is the online dispatching server https://iot24.eu. The server is accessed through the web interface.

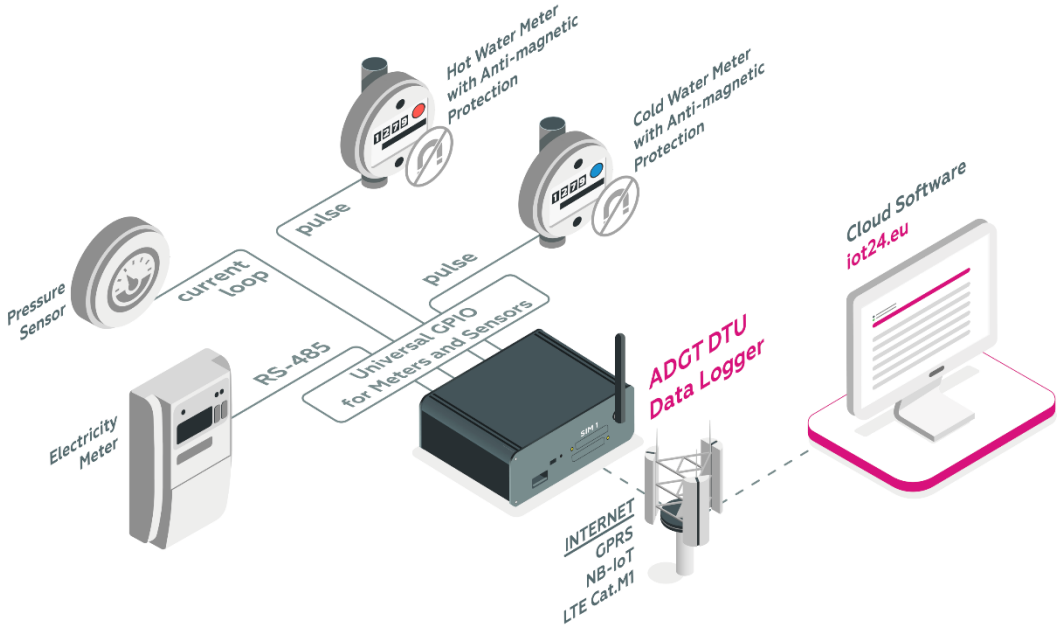


Fig. 11. DTU2xx in the utility monitoring system.

Data logger establishes a connection with the server in the following cases:

- **According to the established schedule** for the scheduled transfer of the accumulated archive readings. Within 2 minutes after connecting, the device transmits data for the past period to the server, after which it goes into sleep mode until the next activation. If during one connection not all information is transmitted, the rest of the data will be sent the next time you connect.
- **When abnormal events occur at the object.** Data logger sends alarm messages to the server in the event of a short circuit, an open circuit, when sensors are triggered, as well as when the maximum value of the pulse repetition rate at each of the inputs is exceeded.

- **When turning on and rebooting the data logger**.
- **When you press the SB button** – data logger setup/connection to the server button.

Configuration mode

The device comes with pre-configured settings and does not require additional configuration. If necessary, you can change the operating parameters remotely, via the web interface or by locally connecting the DTU to a PC, using the **DTU Configuration Tool** software.

LED Indication

DTU2xx data logger has three LED indicators:

- **ST1** – external power indicator
- **ST2, ST3** – indicators of connection with the server and data transmission.

LED indicators modes are presented in table below:

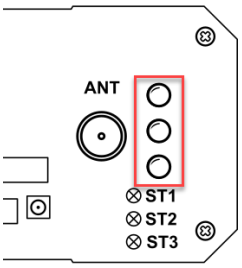


Fig. 12. LED indicators.

Table. 2. DTU2xx LED indication modes.

Function	Condition	Description
External power connection	**ST1** reading is ON	External power supply 12V or 230V connected
	ST1 reading is OFF	External power is not connected
Switching the device to configuration/connection with the server mode by pressing the SB button	**ST2** and **ST3** flash 3 times at the same time	The device has entered the USB configuration/ server connection mode
Server connection and data transfer mode	**ST3** flashes 1 time every 3 seconds	The device has registered in the GSM/NB-IoT network
	ST2 flashes 1 time every 3 seconds	Initializing the connection to the server
	ST2 and **ST3** flash **simultaneously**	Connection to the server via TCP (UDP) established/data transmission is in progress
	ST2 and **ST3** flash **alternately** for 3 seconds	All data has been transferred to this communication session. *The indication is triggered at the end of the communication session if the connection to the server was accessed by pressing the SB button.*

Collection and storage of information

After connecting the wires and power supply, the device connects to the server, synchronizes the date and time parameters and automatically starts collecting data from the meters according to the preset settings. In accordance with the given configuration, the DTU performs a continuous counting of the number of pulses for each channel, with a cumulative total, fixing the meter readings at a given frequency and storing the slices in non-volatile memory.

To store data, a nonvolatile memory (Flash) microcircuit is installed on the board, which stores the following service and diagnostic information:

- accumulated counting data on an accrual basis (number of pulses);
- firmware version;
- event log: history of software and hardware restarts, history of pressing the data logger setup button, information about faults at the inputs.

The amount of stored data is determined by the time taken of the slices. With cuts with a frequency of once an hour, the depth of the archive will be at least 10 years.

Algorithm of data logger communication

When setting up the schedule, the output of the DTU for communication with the server is set in the "hh" format (hh - hours, minutes are not set), however, if a large number of connected data loggers communicate at the same time, this can cause a heavy load on the server. In order to reduce the load, each device communicates with a delay of several minutes ahead of the specified hour. The delay has a fixed value, which is calculated based on the IMEI number of the connected DTU and can range from 0 to 60 minutes (but not more than 60 min).

SIM card operation

To reserve the GSM/NB-IoT communication channel, the data logger has two SIM card slots (2FF) with the ability to configure an active card and support for automatic switching between cards in the absence of communication on one of the cards. Setting the priority of SIM cards is performed only when connected locally via a PC, in the **DTU Configuration Tool. You cannot set a priority SIM card via the web interface.**

By default, the data logger is configured for the **SIM1** operating mode, which means that SIM-card 1 is active by default, the modem works on it and if the connection fails, it does not switch to SIM-card 2. The option **Enable control of the SIM-card activity** does not work in this case.

In **Auto mode**, data logger tries to register on a SIM card, the communication session on which was successfully established earlier (when the data logger is turned on for the first time — on SIM card 1). If registration is unsuccessful, data logger automatically switches to another SIM card and tries to register on it. If the communication session was successful, the data logger remains on this SIM card.

Operating in NB-IoT network

In order for the DTU2xx to connect to the NB-IoT network, the name of the operator's NB-IoT network through which it is planned to transfer data must be indicated in the modem module.

This parameter is called **PLMN (public land mobile network)** and is a 5-digit mobile network service area code including the **mobile country code (MCC) and the operator's mobile network code (MNC).**

The PLMN code can be set only when the DTU is connected locally to a PC using the **DTU Configuration Tool.**

To set the PLMN code for your device:

1. Ask your service provider for the PLMN code for the NB-IoT network.
2. Install the PLMN code into the DTU module. In the **DTU Configuration Tool**, on the **System** tab, enter the PLMN in the **Operator name** line.

Backup battery power supply

NB-IoT DTU22x data loggers are supplied with or without a built-in power supply unit (depending on the model, see **Product Description**). Therefore, the devices can be powered both from an external 7-30 VDC source and from the 100-240 VAC network through a two-contact terminal block.

Additionally, data logger is equipped with a built-in Li-SOCL2 ER18505 (3.6V, 3500 mAh) battery, which when external power is disconnected, ensures full operation of the data logger in an autonomous mode (GPRS - up to 4 years, NB-IoT - from 4 to 10 years).

Backup battery is replaceable. By default, the battery is in transport mode, that is, it is turned off (the **BAT** switch is in the **OFF** position). To activate the ability to switch the data logger to the stand-alone mode when the external power is turned off, turn the switch to the **ON** mode.

2. Getting Started

Important safety information

WARNING! Data loggers with the built-in 100-240V power supply unit (**DTU217-C, DTU227-C, DTU227-UC**) have electronic equipment safety CLASS I and need to be properly grounded before applying power. To ensure reliable grounding of the device, use a suitable 3mm∅ hole ring lug.

DTU217-C
DTU227-C, DTU227-UC

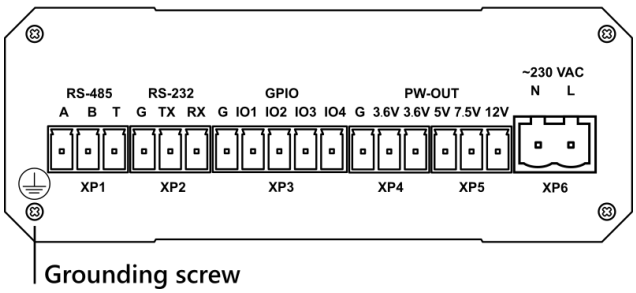


Fig. 13. DTU2xx grounding screw.

To connect the ground, follow these steps:

1. Attach grounding wire to grounding ring lug.
2. Unscrew the grounding screw on the rare side of the terminal (near the ground icon.
3. Insert the grounding screw into the hole of the ring lug and then into the hole on the rear side of the data logger. Use a spring washer between the screw and the DTU to prevent the connector from loosening.
4. Tighten the grounding screw and the ring lug to the data logger panel. Do not overtighten the screw!

ATTENTION! DTU217-C, DTU227-C, DTU227-UC have a built-in power supply unit and can be connected directly to a 100-240V power supply source. Since the device does not have its own power switch and can be installed into hard-to-reach places (electrical cabinets, etc.), for safety reasons, equip the device with an external power-off switch. The switch should be placed in an easily accessible place and its designation should be visually accessible and easily identified by the function performed.

NOTE: When using a 230v powered DTU2xx-C device, for double protection against electric shock, use the diagram in the Application 1.

Installing DTU data logger

Before installing the data logger, you need to register **on the dispatching server** https://iot24.eu and add your data logger to the server by the IMEI number and PIN code (see on the label of the case cover).

1. Check the data logger for compliance with the completeness of the technical documentation and make sure that there is no visible damage to the case and markings. Prepare cable glands for meters and sensors for operation.

2. Install the SIM-card (-s) into the DTU, having previously disabled the PIN codes. To insert a SIM card, extract a SIM card tray out of the SIM slot by pressing SIM card tray ejection button with a SIM ejection tool. Place the SIM cards into the trays and insert each tray back until it clicks:

– the SIM1 tray - into the **SIM1** slot with the contact pad down

– the SIM2 tray - into the **SIM2** slot with the contact pad up.

Fig. 14. Installing SIM cards.

3. Connect the GSM or LTE NB-IoT SMA-m antenna to the **ANT** SMA-f connector.

Fig. 15. Connecting antenna.

4. Connect meters and sensors to the corresponding DTU GPIO connectors (**IO1-IO4**). For pinouts see section Appearance.

   Recommended wiring diagrams are presented in Universal GPIOs.

ATTENTION!

When connecting wires to GPIOs, take into account:

IO1-IO4 – negative ("–") pole;
3.6V – positive ("+") pole power output contacts.

Fig. 16. Connecting meters.

5. Mount the device using the supplied hardware. Depending on the type of mounting design, the data logger can be placed horizontally, or mounted on a wall or on a DIN rail *(for the type of fastening, see the label on the case*).
6. Connect the power supply:

For DTU with 100-240 VAC PSU:

Connect the supply voltage wires to the **N** and **L** contacts of the **~230VAC (XP6)** terminal block.

Please note, the connection polarity is not taken into account for this type of power supply.

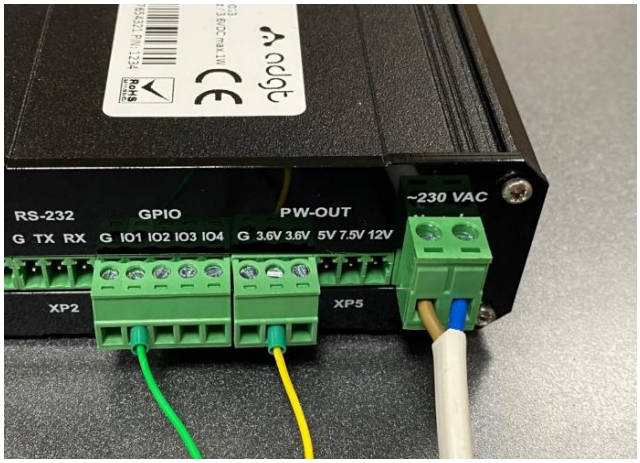


Fig. 17. Connecting 230 VAC power supply.

For DTU with 7-30 VDC power supply:

Connect the 12V power supply unit to the **G** and **V** contacts of the **7-30 VDC** (**XP6)** terminal block.

Please observe the correct polarity:

- **G** – Ground (negative) input.
- **V** – 7-30 VDC (positive) input.

The maximum operating voltage input must not exceed 30V DC. Reverse polarity will not cause damage, but the data logger will not operate.

Fig. 18. Connecting 7-30 VDC power supply.

ATTENTION!

- **Power supply shall be switched ON only after all the wires are connected!**
- **Using a power supply with a different voltage than the one included with your product will cause damage and void the warranty for this product. Please refer to power supply voltage ranges specified in the Technical Specifications.**
- **If you are connecting an external power supply and you do not need battery power, check that the battery "BAT" switch is in the OFF position.**
- **If you need to use internal battery as a backup power supply source, turn the "BAT" switch to the "ON" position.**

Fig. 19. BAT ON/OFF button.

7. After power supply is switched on, the data logger will automatically configure the device inputs in accordance with the settings of the internal software, after which it will initiate network registration and connection with the https://iot24.eu server (the **ST2, ST3** indicators should light up), synchronize the time and start transmitting the data.

   After all data is transmitted, device will reboot and reconnect to the server.

8. After about 1 minute after connecting the power (this time is required to configure the inputs and establish a connection), press the **SB** button to transmit the readings to https://iot24.eu server. Remember or write down the meter readings at the time of pressing the button. You will need this data for the subsequent entry of initial readings.

Fig. 20. SB button.

9. After 20-120 seconds, the indicators will go off, while the device's microprocessor will continue working, and the power of the module will be turned off - the device will go into a sleep mode.

10. After pressing the button and recording data, you can leave the object on which the data logger is installed. You can make further configuration of the device remotely, via the server web interface https://iot24.eu.

3. Configuring data logger via PC

Connecting DTU to PC via USB

When commissioning, the data logger is supplied with preset settings. If necessary, the parameters can be changed locally, via the mini–USB B connector, in the **DTU Configuration Tool**:

1. Turn on the power supply of the data logger.
2. Connect your DTU device to your PC using a mini-USB B to USB A cable *(not included)*. In the **Device Manager → Ports (COM and LPT)** menu, DTU will be defined as *Unknown device*. To display the device correctly, you need to install the driver.
3. Download the archive with the **ADGT USB Universal Driver** from our website https://adgt.cz and unpack the archive to any folder on your PC. The driver must be installed manually: to do this, right-click on the unknown device and click **Update driver → Search for drivers on this device**. Then click **Browse** and point to the folder with the driver. Click **Next** and the driver installation will begin. After installation, DTU will be defined on the PC as **ADGT Device.**
4. Start the **DTU Configuration Tool** on the computer. You can download the latest version of the program (archive with the .zip extension) for Windows 32-bit / 64-bit and Linux 64-bit versions at https://adgt.cz.

> ⚠ **ATTENTION!**
>
> The **DTU Configuration Tool** program is written in Java, therefore, to start it, you need to have **Java Runtime Environment (JRE)** software version 1.7 or higher installed on your PC in accordance with the bitness of your OS (32-bit / 64-bit). If the data logger setup program does not start or starts with errors, install the latest version of the JRE from the developer's website: http://java.com/ru/download/
>
> To check the Java version on your PC:
>
> 1) Run Command line (**Win** + **R** on the keyboard), type **cmd** in the window that appears and press **Enter**)
> 2) Enter the command **java-version** and press Enter.

5. Press the data logger **SB** setup button to switch the device from sleep mode to configuration mode. When the **ST2** and **ST3** indicators blink three times at the same time, the data logger is ready for setting. If the device goes into sleep mode, press the **SB** button again.
6. In the **DTU Configuration Tool**, click the **Read current settings** button 

   Thesoftware interface consists of the following blocks:

   - **Control panel** – buttons to manage data logger settings.
   - **Information about Connected Device** – displays information about the connected device.
   - **Main window with operating tabs**: System, GPIO, Interfaces (available for DTU2xx only), Schedule, SMS, Energy Saving.
   - **Debug console** – console window with log massages about current processes and changes in device operation.

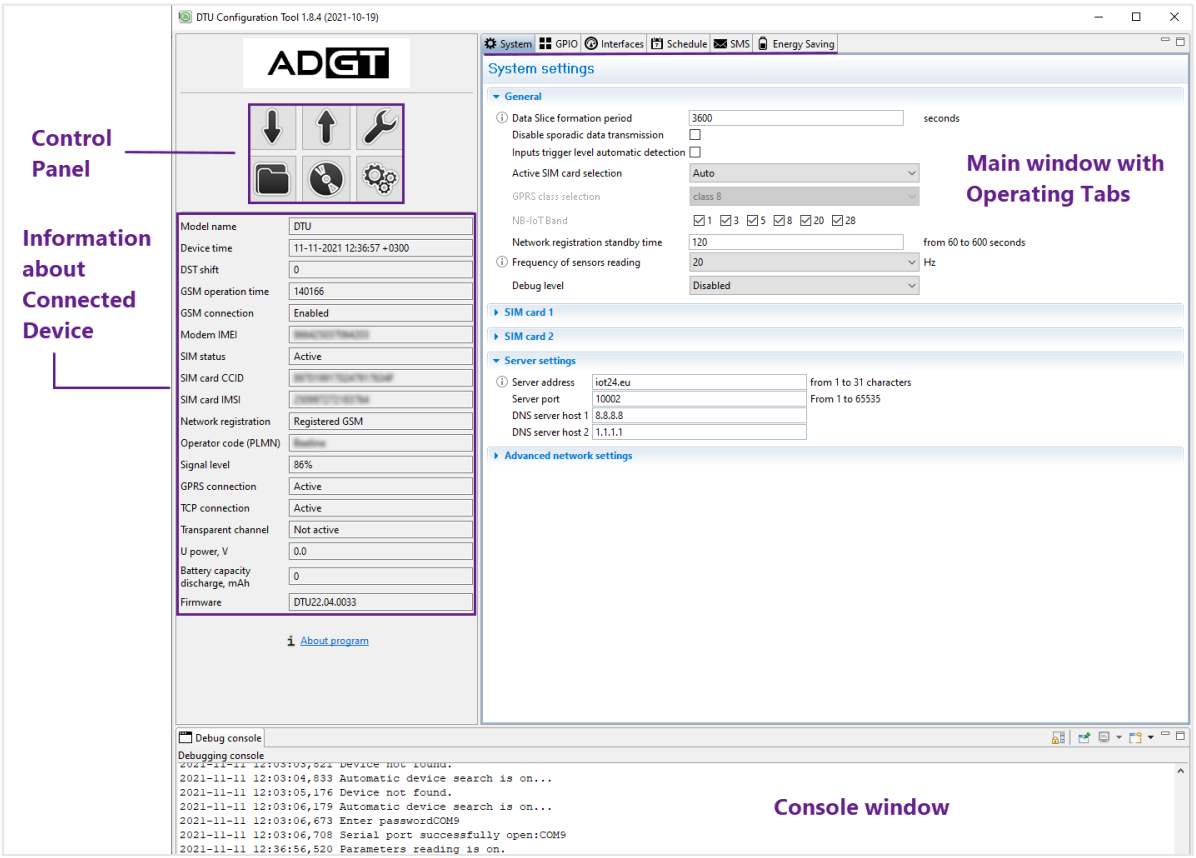


Fig. 21. DTU Configuration Tool.

DTU Configuring Tool Overview

Control panel contains six buttons to control data logger settings.

Table. 3. Control panel buttons.

Button		Function
	Read current settings	Button to read the current parameters obtained from the connected DTU.
	Write settings	Button to save any changes made. The button should be pressed after each change of the parameters.
	Service functions	Button opens the window, where it is possible to update the firmware version, reboot the device, reset the DTU configuration to factory settings, as well as set the time values from the computer to device.
	Open settings file	Button to download the previously saved settings from PC (in the .xml format).
	Save settings file	Button to save modifications in DTU configuration on PC (in the .xml format).
	Program settings	Button to configure data logger connection parameters.

Information on connected device

In order to read the information on the connected data logger in the table, click the Read Current Settings button on the control panel. In case any parameters are not displayed, wait for a while and click the button once again.

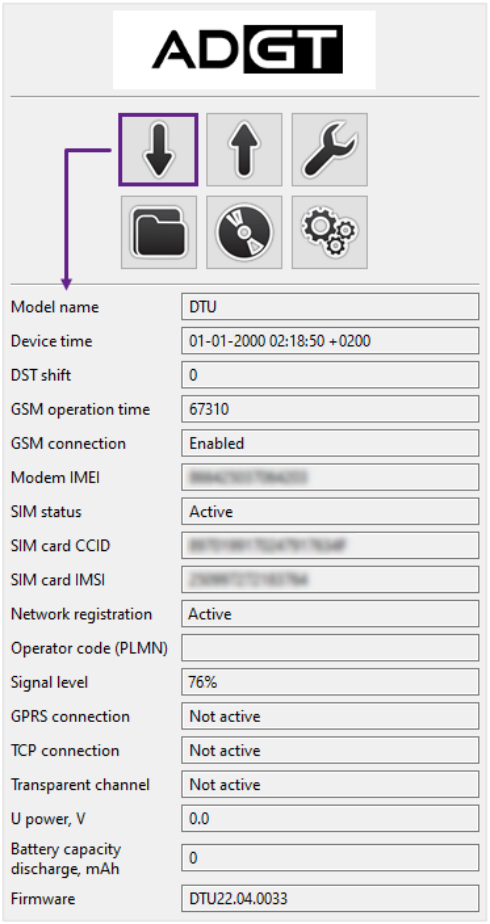


Fig. 22. Information about the connected device.

The following information is displayed in the table:

- **Model name** – DTU data logger model name.
- **Device time** – current date and time established in data logger at the first connection to the server. When you first configure, and if the synchronization with the server was not performed, the device could display the date and time parameters that differ from the current ones.
- **DST shift** – parameter displays daylight saving time shift (if enabled). If the DST option is enabled (on the **Schedule** tab), data logger reads the shift value depending on the set DST mode. If the DST option is disabled, no information is displayed in the line.
- **GSM operation time** — time period of the device power supply operation starting from the device switch-on and to the current moment. The parameter is non-resettable.
- **GSM connection** — GSM module status (Enabled/Disabled).
- **Modem IMEI** — Data Logger GSM module identification number.
- **SIM card parameters:** SIM status (active/not active), serial number (CCID), international mobile subscriber identity (IMSI), DTU cellular network registration.
- **Operator code (PLMN)** — see Operating in NB-IoT network
- **Signal level, %** — signal emission power level in the GSM network.
- **GPRS connection** — parameter becomes active, when the GPRS connection is established.
- **TCP connection** — parameter becomes active, when the TCP connection is established (the indicator starts flashing red).
- **Transparent channel** — parameter becomes active only when the transparent channel on the **Interfaces** tab is enabled in the Separate mode. Possible states: Not active, Authorization, Active. Parameter for DTU2xx only.
- **U power supply, V** – accumulator battery voltage (in Volts).
- **Battery capacity discharge, mAh** — the current amount of consumed battery power (in mAh)
- **Firmware** — the current version of firmware installed in the data logger.

Configuring System and Network Setting

System settings appears to be a tab designed to ensure data transmission parameters configuration. Default values and range of values for each parameter are indicated in Table 4.

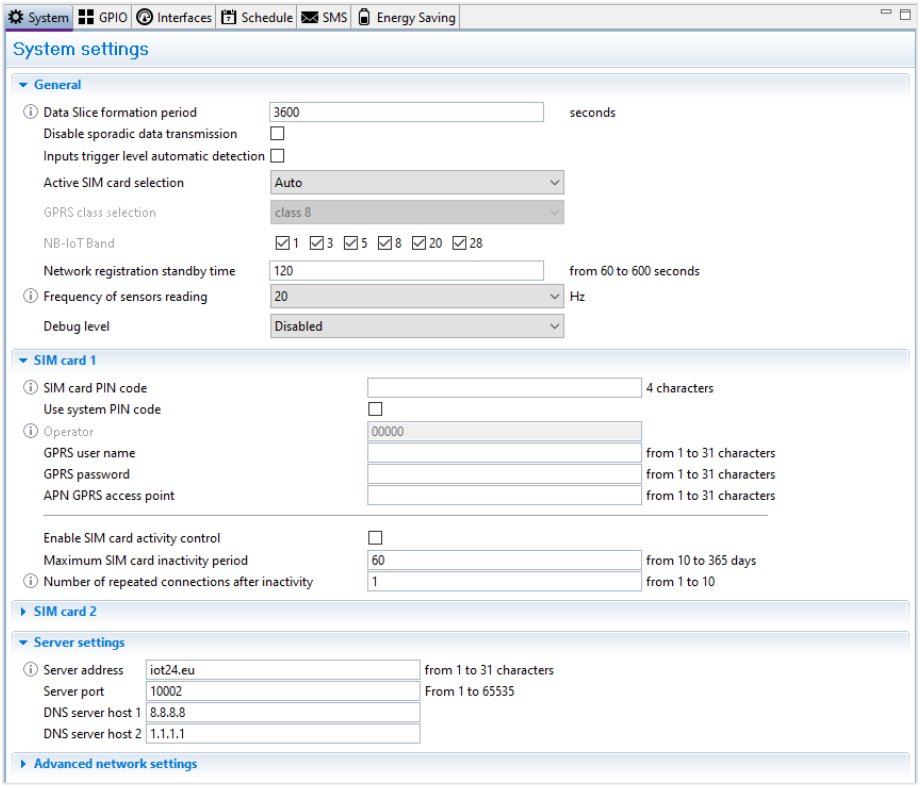


Fig. 23. DTU Configuration Tool. Configuring System settings.

Table. 4. System settings parameters.

Parameter	Description	Default value	Value options
General			
Data Slice formation period	Data Slices periodicity registration in the log	*3600 seconds (once an hour)*	60-86400 sec
Disable sporadic data transmission	Disables data transmission initiated by the Data Logger. The data archive is transmitted only on request from the server	*Sporadic data transmission enabled*	Enabled/ Disabled
Inputs trigger level automatic detection	Automatic detection of input response states by resistance: 1 - 15 kOhM – 4 states (NAMUR circuit) Short circuit/break – 2 states	*Enabled*	Enabled/ Disabled
Active SIM card selection	Setting up SIM cards operating mode	*SIM 1*	SIM1/SIM2/Auto
GPRS class selection	GPRS class selection: class8, class10 or Auto (class 8/10/12)	*class 8*	Class8/class10/class12/Auto
NB-IoT Band	*for NB-IoT data loggers only* Selecting frequency bands for NB-IoT network	*all bands selected*	1/3/5/8/20/28

Parameter	Description	Default value	Value options
Network registration standby time	Maximum time to register in a network using both SIM cards (in case both cards are installed). If communication session fails, the next attempt to register in the network will occur after 1 hour, then after 2, 4, 8, 24 hours, and then every 24 hours	*120 seconds (if both cards are inserted, 60 seconds each)*	60 – 600 seconds
Frequency of sensors reading	Setting inputs polling frequency	*2Hz*	2 Hz/20 Hz/100 Hz
Debug level	When "AT-commands " mode is selected, "Debug Console" window shows a log of AT-commands displaying device status	*Disabled*	Disabled/AT commands
SIM card (1, 2)			
SIM card PIN code	Required to enter, if a SIM card is used with the PIN code enabled. **If the system PIN is enabled, the parameter is not filled in!**	*not set*	4 characters
Use system PIN code	System PIN automatic generation to prevent SIM card use in other devices	*Disabled*	included/disabled
Operator	*for NB-IoT data loggers only* Public Land Mobile Network (PLMN). Specified by the network operator	*00000*	Set by the telecom operator
GPRS user name	Specified by the network operator	*Not set*	1 – 31 characters
GPRS password			
APN GPRS access point	Specified by the network operator	*Not set*	1 – 31 characters
Enable SIM card activity control	*The option works only, if in the **Active SIM card selection** parameter **Auto** is set.* Enabling the option to monitor modem activity on SIM cards. On an inactive SIM, a periodic connection to the server will be initiated in order to prevent SIM card disconnecting for non-use. DTU will establish the connection from this card after the end of the period specified in the **Maximum SIM card inactivity period line**. If the device does not establish the connection after the end of the period specified in the **Maximum SIM card inactivity period**, the event "The period of no connection on SIMx exceeded" will be generated, and then device will repeat connection attempts in accordance with the parameter **Number of repeated connections after inactivity**	*Disabled*	Enable/ Disable
Maximum SIM card inactivity period	Number of days, when the data logger is allowed not to perform the SIM card activity control	*60*	10 – 365 days
Number of repeated connections after inactivity	Number of attempts to check the activity of an inactive SIM card after the maximum period of inactivity has expired	*1*	1 – 10
Server settings			
Server address	IP address or server domain name, where the DTU is connecting to transmit data.	*iot24.eu: iot24.eu (TCP) 139.162.147.141 (NB-IoT)*	1 – 31 characters

Parameter	Description	Default value	Value options
Server port	TCP (GSM) or UDP (NB-IoT) server port number.	*iot24.eu:* *10002 (TCP)* *10003 (UDP)*	1 – 31 characters
DNS server host 1	DNS-server address	*8.8.8.8*	
DNS server host 2		*1.1.1.1*	

ATTENTION!
Each ach time you change the parameters, do not forget to click the **Write settings** button. 
Unsaved changes will be highlighted in yellow.

Configuring Inputs

Each input parameters configuration could be performed at the **Inputs** tab. Types of sensors that could be connected to data logger inputs and the description thereof are indicated in Universal GPIOs.

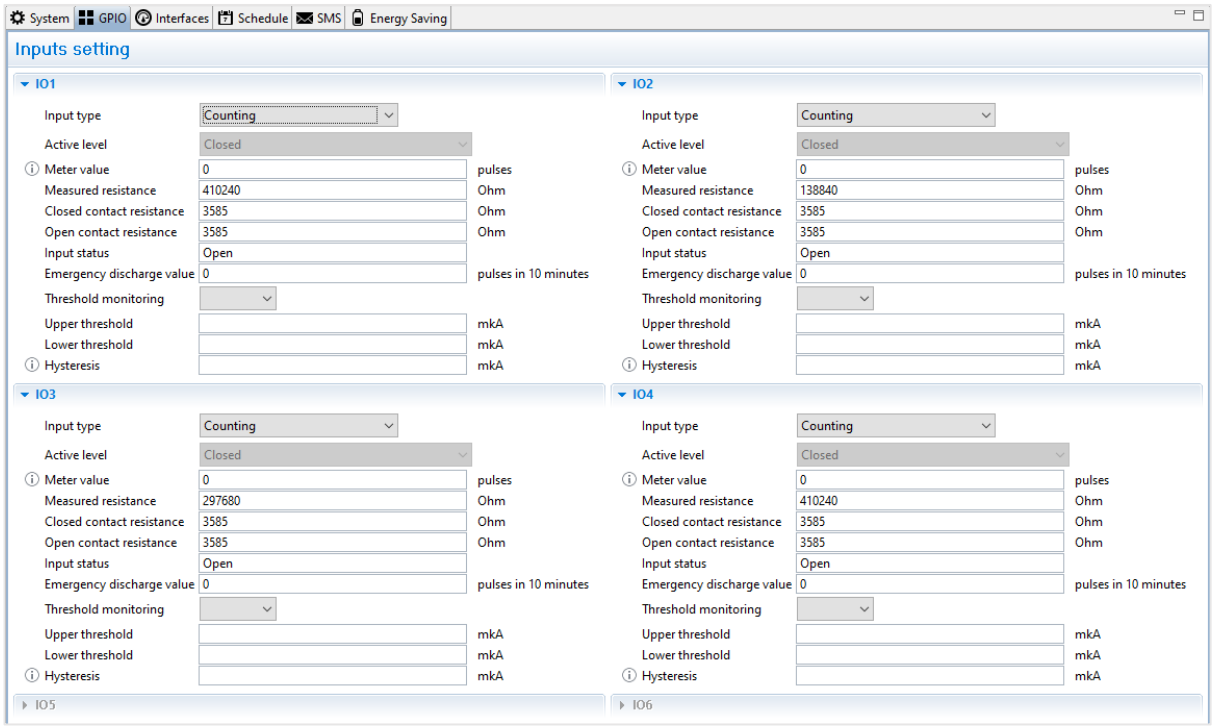


Fig. 24. DTU Configuration Tool. Configuring inputs.

Table. 5. Parameters of GPIO ports.

Parameter	Description	Default	Value options
Input type	Type of device connected to the input.	*- IO1 – IO4 – counting*	- Counting - Signal - Leakage sensor

Parameter	Description	Default	Value options
			- Temperature sensor (DMT-12) - Opening sensor - Not used - Temperature sensor (1-Wire) - Engine hours counter - High frequency meter - Current loop
Active level	Active input level for engine hours counting. This option is active only when the input type "Engine Hours" is selected".	*closed*	- closed - open
Meter value	Accumulated value of the number of pulses, that is read from the measuring device. When selecting the "Temperature sensor" input type, this field displays not the number of pulses, but the technological information on connecting the temperature sensor.	*read from the metering device*	0 and above
Measured resistance	The value of the input resistance measured at the time of connection to server. This parameter is applicable only to those types of sensors whose operation is based on the measurement of resistance.	read from the metering device	0 and above
Closed contact resistance	If you select the two-state (level) scheme, the values of these two parameters should match. When the NAMUR circuit (four-state) is selected, it is necessary to set different values for the closed and open states.	*- IO1 – IO4: 3 585 Ohm*	500 – 100 000 Ohm
Open contact resistance		*- IO1 – IO4: 3 585 Ohm*	500 – 100 000 Ohm
Input status	Current input status, that is read from the measuring device (non-setting parameter).	*Read from the meter*	Closed, Opened Open, short circuit
Emergency discharge value	Maximum pulse repetition rate at the input for 10 minutes. When the pre-established threshold is exceeded, data logger will send an alarm message to the server. If the frequency is 0, discharge control is disabled.	*0 pulses (discharge control disabled)*	0 – 600 000 000 pulses
Threshold monitoring *Only for input mode "Current loop"*	The parameter enables the option of monitoring the maximum and minimum values of the current at the input, which operates in the "Current loop" mode. When the current indicators go beyond the permissible values, the DTU will transmit alarm messages to the server. When the values return within the "normal" range, data logger will also send notifications to the server.	*Switched off*	Off , On
Upper threshold *Only for input mode "Current loop"*	The upper limit of the permissible value of the current at the input. The parameter is intended for monitoring impermissible deviations of input current values.	*0*	0 and above
Lower threshold *Only for input mode "Current loop"*	Lowwer allowable limit value of the current at the input. The parameter is intended to control invalid deviations of input current values.	*0*	0 and above
Hysteresis *Only for input mode "Current loop"*	The parameter sets the delta of deviations from the threshold values and is designed to protect the system from repeated tripping in the case when the current level fluctuates within this delta.	*0*	0 and above (but not more than the upper/lower threshold of values)

ATTENTION!
Each ach time you change the parameters, do not forget to click the **Write settings** button. 
Unsaved changes will be highlighted in yellow.

Configuring Serial Interfaces

The **Interfaces** menu, you can configure the parameters of the serial interfaces and transparent channel modes - separate and combined a detailed description of the transparent channel operating modes in DTU data logger is given in the RS-232 and RS-485 interfaces section.

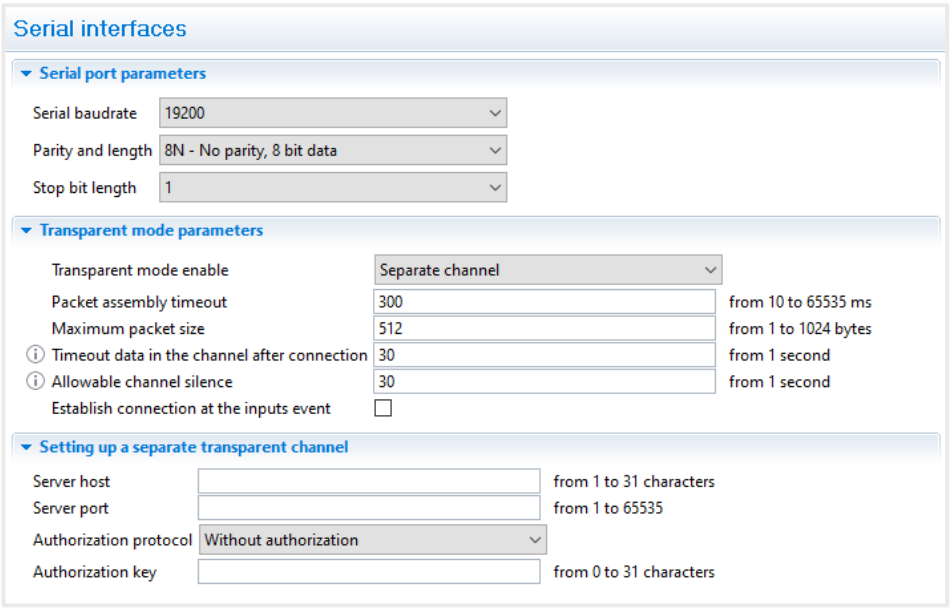


Fig. 25. Setting parameters of serial interfaces.

Table. 6. Serial interfaces.

Parameter	Description	Default	Value options
Serial port parameters			
Serial baudrate	Serial port speed of the connected meter	*19200 bit/s*	from 600 to 115200 bits/c
Parity and length	Parity check mode and data block size	*8N*	8N, 7E, 7O, 8E, 8O
Stop bit length	Stop bit size	*one*	1, 0.5, 2, 1.5
Transparent mode parameters			
Transparent mode enable	• **Separate channel** - data logger operates in "two-channel mode": a separate transparent TCP-channel for communication with RS-232 / RS-485 devices works in parallel with the main channel for transferring data archives from GPIO lines. When this mode is selected in the **Configuring a separate transparent channel** submenu, it is necessary to register a	*Switched off*	Separate Combined Switched off

Parameter	Description	Default	Value options
	separate path (address: port) for data exchange in transparent mode. **The mode is available only for devices with a GPRS modem!** • **Combined** - in this mode, the transparent data transmission channel from RS-232 / RS-485 devices are combined with the main transmission channel under the **ADGT DTU data logger** protocol. • **Disabled** - commands from serial ports are not processed		
Packet assembly timeout	If no data is received from the serial port after this time, the packet will be sent immediately.	*300 ms*	10 to 65535 milliseconds
Maximum packet size	Maximum number of data bytes after receiving which the packet will be immediately sent to the TCP channel.	*512 bytes*	from 1 to 1024 bytes
Timeout data in the channel after connection	*The parameter is only active when the device is powered by an ER18505 battery.* *After connecting* to the server, the device waits for the start of data exchange in a transparent channel for a specified time: • If data transmission starts during this time, then the waiting timer will start, set in accordance with the **Allowed silence time in the channel** parameter. • If data does not begin to arrive within this time, the device will go into sleep mode.	*30 sec*	from 1 second
Allowable channel silence	*The parameter is only active when the device is powered by an ER18505 battery.* If there is silence in the channel during data transfer (data is no longer transmitted), the device is in standby mode for a specified time, and then terminates the current connection and goes into sleep mode.	*30 sec*	from 1 second
Establish connection at the inputs event	*The parameter is only active when the device is powered by an ER18505 battery.* Establishing a connection to a transparent channel by event at the GPIO inputs.	Disabled	
Setting up a separate transparent channel			
Server host	The address of the server with which a transparent TCP connection is established in a separate transparent channel	Not set	from 1 to 31 characters
Server port	Server port with which a transparent TCP connection is established in a separate transparent channel	Not set	from 1 to 65535
Authorization protocol	Algorithm for authorizing a device on the server, on the basis of which the server differentiates connected devices and determines access rights for them. In most cases, the protocol is not required, but in some cases the authorization procedure is necessary for the correct operation of the dispatch software. When connecting to the IOT24.EU Cloud server, you must select **Analytics** as the authorization algorithm	Without authorization	- Without authorization - ADGT V1 - ADGT V2 - ADGT V3
Authorization key	The key is set only when the **ADGT V2** authorization protocol is selected.	Not set	0 to 31 characters

ATTENTION!

- When operating in the **Combined** or **Separate channel** modes, it is necessary to enter the initial readings only when the device is in communication with the server.
- After each parameter change, do not forget to click the **Write settings** button to record the changes made to the data logger. Unsaved changes will be highlighted in yellow. After saving the changes, restart the data logger.

Configuring Schedule

DTU data loggers support a scheduled connection to the server. By default, data is transmitted to the server on the 1st, 11th and 21st of each month, at 08.00. In order to prevent high loads on the server, each device establishes communication not precisely at the specified time, but with a delay of a few minutes in advance from the specified hour.

DTU supports three types of schedule: daily, weekly and monthly.

The schedule configuration is performed at the **Schedule** tab using the following algorithm:

1. In the **Time zone** line, if necessary, change the time zone settings (by default, it is set to GMT +1).
2. In the **Schedule type** line, select the periodicity of connecting to the server you need: daily, weekly or monthly.
3. Depending on the selected type, specify the hours (Hours of day), days of the week (Days of week) or days of the month (Day of month), when the device should be connected.
4. In the **Transmission hour** line, specify the time of connection to the Server on the specified days (by default, 08.00 am). Transmission time is set in the hh format (hh - hours, minutes are not specified). The possible values are from 00 to 23.
5. In order to register the selected parameters in the Data Logger, click the **Write settings** button on the control panel.

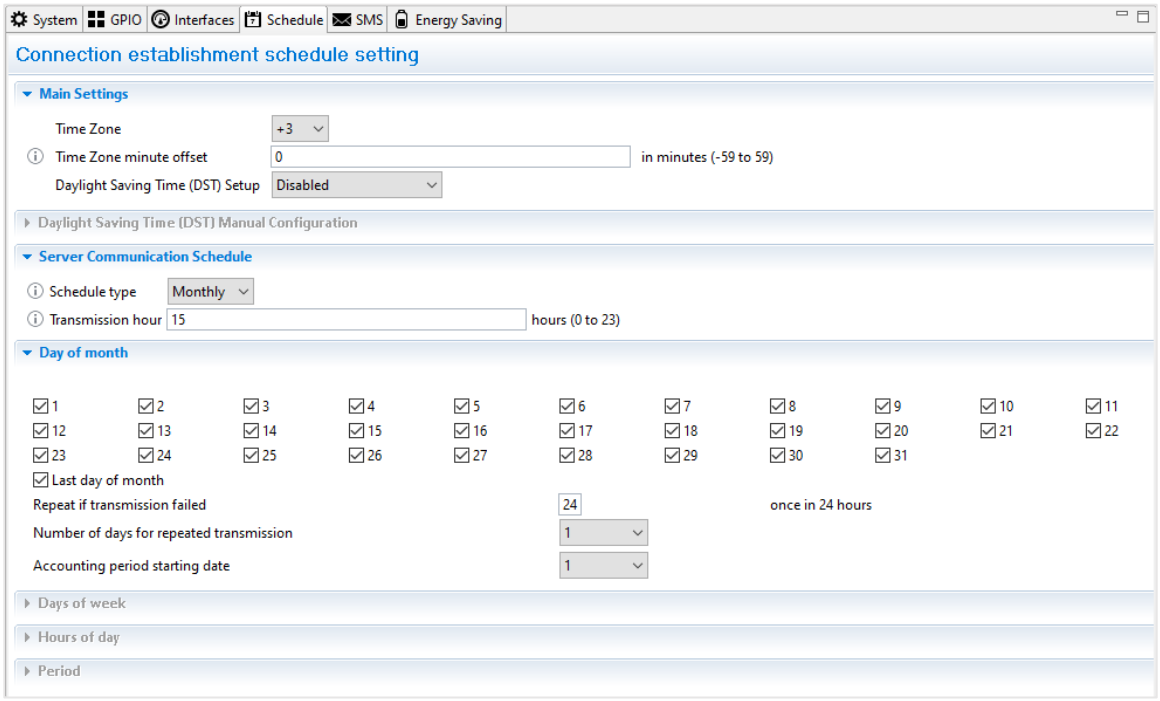


Fig. 26. DTU Configuration Tool. Schedule setup.

EXAMPLE:

For example, you prefer that the device is transmitting data to the server three times a week: on Mondays, Wednesdays and Fridays, at 15.00:

1. Select the **Weekly** type of schedule.
2. In the **Days of week** line, check Monday, Wednesday and Friday in the checkboxes.
3. In the **Transmission hour** line, enter 15.
4. Click the **Write settings** button for saving the changes in the Data Logger.

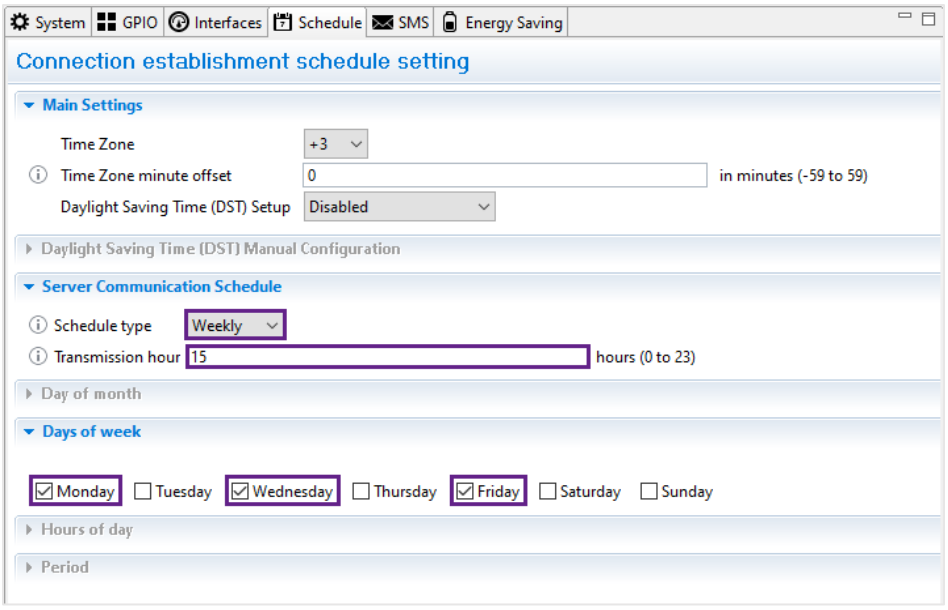


Fig. 27. Configuring the "Weekly" schedule.

If you select the Monthly type of schedule, and in order to ensure that the data is transmitted in full and in the term, three more parameters should be additionally set (in case of possible connection problems):

✓ **Repeat if transmission failed** — the maximum number of attempts to transmit data on the day of the DTU connection to the Cloud Server (by default, 24 attempts, one attempt for each hour). If the data is not transmitted at the specified time Transmission hour or is not transmitted in full, the Data logger will initiate additional attempts to connect within the course of the day. The possible values are from 1 to 24.

✓ **Number of days for repeated transmission** — the number of days, when the device will attempt to connect to the Server after the predefined day of connection, in case the transmission attempts on the predefined day were unsuccessful (by default - 1). The possible values are from 1 to 10.

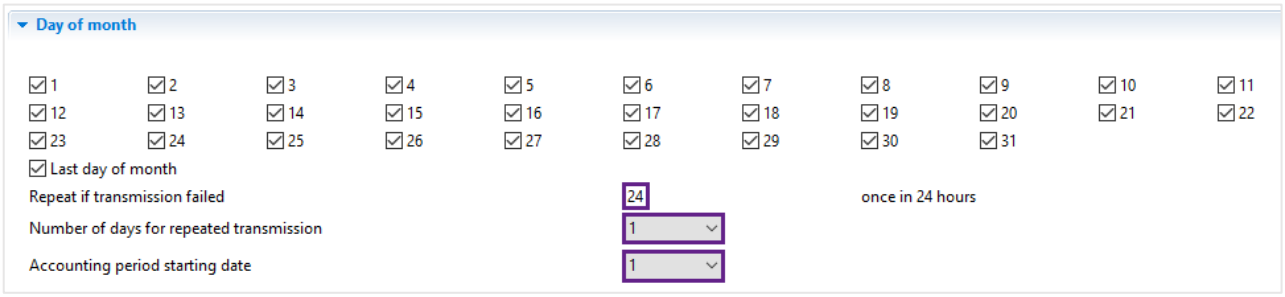


Fig. 28.

EXAMPLE

You selected:

- Schedule type: **Monthly**.
- Readings' transmission to server: **1 time/month, 10th day, at 12.00pm.**
- Number of attempts to connect to the Server (Repeat if transmission failed parameter) – **4**.
- Number of days in the reporting period – **2**.

Supposedly, 12.00pm August 10th the Data Logger connected to the Cloud Server iot24.eu, but transmitted data not in full. According to the schedule setting, during the day the device will make 3 more attempts to connect to the server with an interval of 6 hours (24/4) to transmit the remaining data. If not the entire data is transmitted within the course of this day (supposing, the whole day there was no communication with the object), the DTU will attempt to establish contact in the course of the next two days, i.e. on the 11th and the 12th of August (4 attempts per day).

In selecting the Monthly schedule type, it is possible to activate the function ensuring the regular readings transmission via SMS (see Configuring SMS Notifications).In order to send via SMS, one more parameter should be configured:

Accounting period starting date — is selected based on which day of the month it is required to read and to send meter readings SMS (for example, to the housing and utility services or to the management company). The parameter is directly connected with the **Number of days for repeated transmission** parameter:

- If the value of the **Number of days for repeated transmission** is equal to 1, then the SMS messages are transmitted in any case on the date of the **Accounting period starting date**.
- If the value of the **Number of days for repeated transmission** is more than 1, then the SMS will be sent on the second day after the **Accounting period starting date** and only in case it was impossible to send all the data via GPRS in the course of the first day.

For the **Hourly** schedule type, you can select transmission periods:

- every 5 minutes,
- every 10 minutes,
- every 15 minutes,
- every 20 minutes,
- every 30 minutes.

Configuring SMS Notifications

DTU2xx data logger has the function of sending readings via SMS as an additional communication channel in case of possible problems with GPRS or NB-IoT connection.

The option could only be implemented, when the **Monthly** type of the schedule is selected, and allows regularly to transmit current readings not only to the server, but also via SMS, for example, to utility companies. By default, the option is disabled.

In order to activate this option, check the **Enable SMS transmission** check box and in the **Notifications delivery phone number** line specify the phone number, where the messages will be sent.

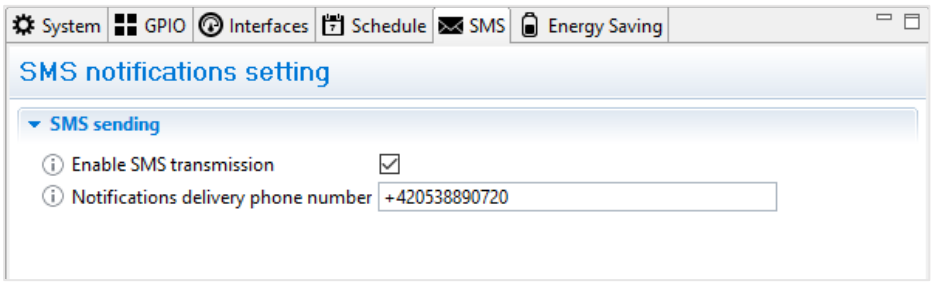


Fig. 29. DTU Configuration Tool. Configuring SMS Notifications.

The date of taking and transmitting the readings via SMS is configured in the **Accounting period starting date** of the **Schedule** tab.

Configuring Power Consumption Mode When Switching Power to Battery

The DTU2xx data logger provides the ability to supply power from a 3200mA battery when the external power is disconnected. To conserve battery power and extend battery life, you can customize the power mode settings to be automatically activated when you switch to battery power.

To set the power consumption mode:

1. On the **Energy Saving** tab in the **Power saving** menu**,** you can configure the 5V, 7.5V and 12V power outputs to be disabled when switching to battery power. To do this, check the box in the appropriate field.

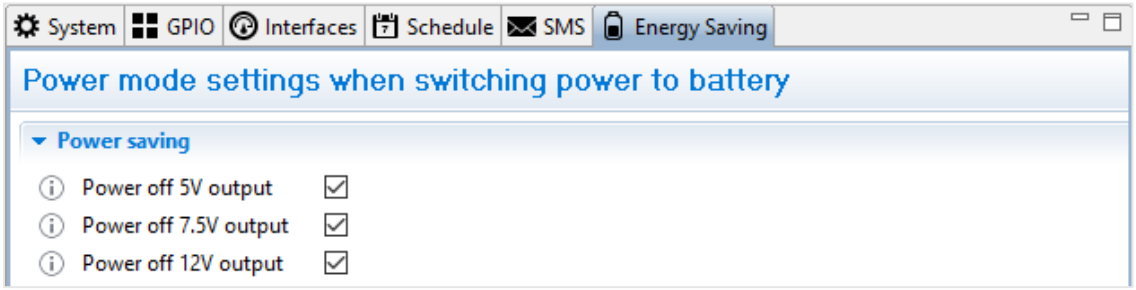


Fig. 30. DTU Configuration Tool. Disconnect power outputs.

2. If any of the data logger inputs operates in the **"Current loop"** mode and power is supplied to it from the 7.5V and 12V data logger outputs, you need to enable and configure one more function – **Reading period of the "Current loop" input battery power supply**: never, measurement every 15 minutes, measurement every 30 minutes, measurement every 60 minutes.

   In this case, even if the 7.5V and 12V outputs are turned off (check boxes), they will be forced to turn on to supply power to the current inputs with a specified frequency.

   When powering the "Current loop" sensor from an external source, we recommend turning off the power supply to the 7.5V and 12V outputs to save battery power.

   Set up the schedule for the data logger output to communicate with the server when the device is powered from the battery:

a) Select the **Enable special schedule when using battery power**.

b) In the **Schedule type** field, select the frequency of connection with the server you need: Daily, Weekly, Monthly or Hourly.

c) Depending on the selected type, specify the hours **(Hours of day)**, days of the week **(Days of week)**, day of the month (**Day of month)** or the time period **(Period)** in which the device should communicate.

d) In the **Transmission hour** line, specify the time of communication on the specified days (by default - 08.00, it is valid only for the **Monthly and Weekly** schedule types). The response time is set in the hh format (hh - hours, minutes are not specified). Possible values: from 00 to 23.

e) To record the changes in the data logger, click the **Write settings** button.

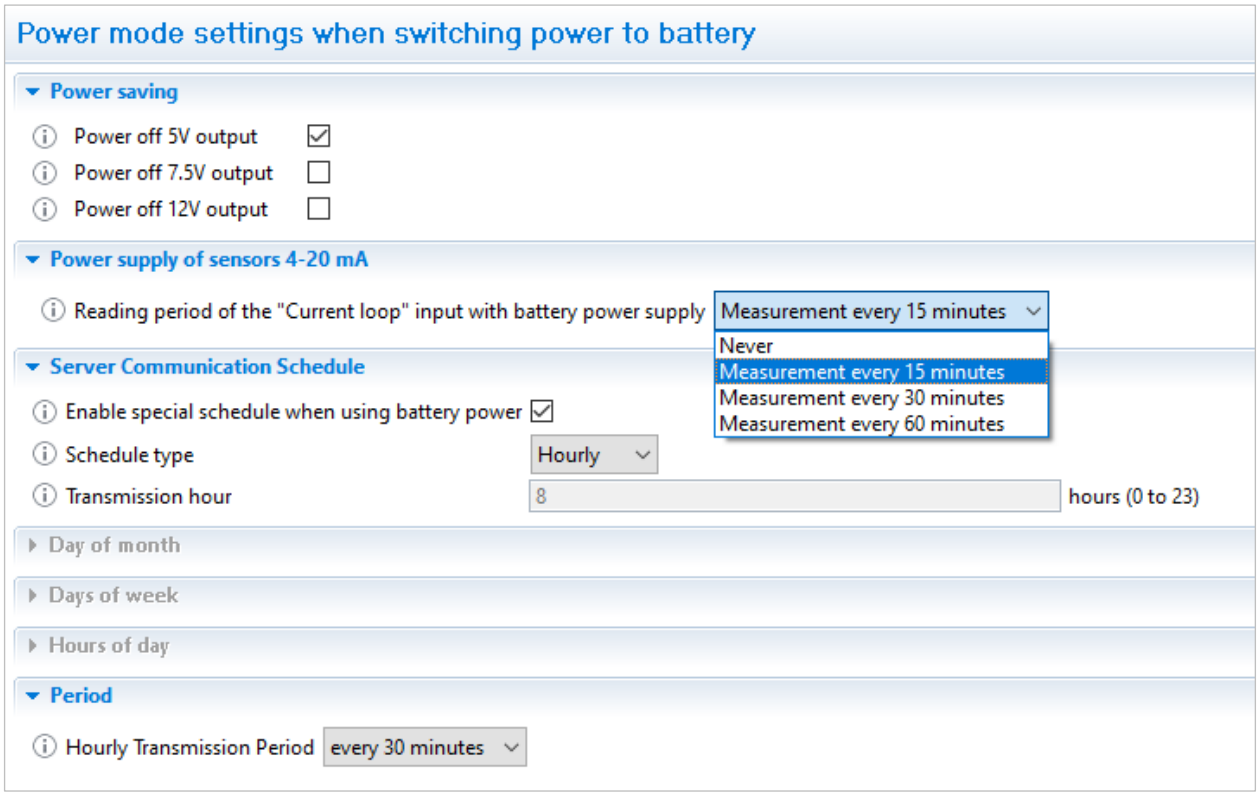


Fig. 31. DTU Configuration Tool. Setting up a schedule when the device is on battery.

Reboot and Reset

DTU Data Logger should be rebooted each time the device configuration is changed to accept new changes.

A reboot can be performed in two ways:

- Soft reboot using **DTU Configuration Tool. Service functions** button → **Reboot device**.

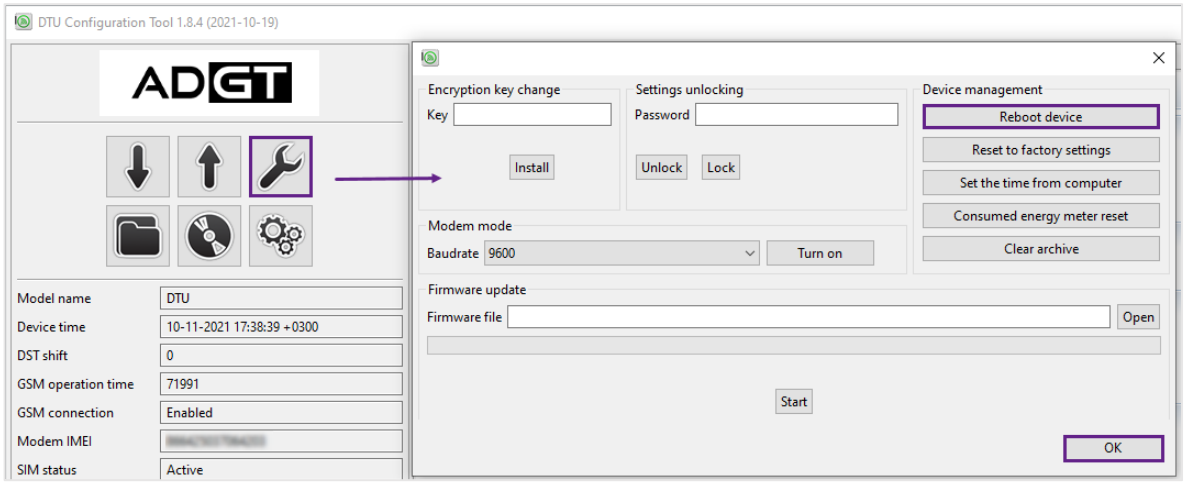


Fig. 32. Software reset data logger RTU2xx.

- Hard reboot using power supply switching.

  Take off the jumper from the power supply **ON/OFF** connector and then put it back. When the hardware reboot is performed, the DTU is connected to a server and supports connection thereto for about two minutes; after that the device stays in the active mode for 15 minutes more and then passes to the sleep mode.

  DTU Data Logger reset back to default settings is executed using the **DTU Configuration Tool** software in the **Service functions** menu.

Firmware Update

In order to update the data logger firmware version using the **DTU Configuration Tool** software:

1. Download the .zip archive with the latest firmware **(DTU22.04.00xx.zip)** from our official website https://adgt.cz and unpack it.

2. Click the **Service functions** button on the control panel.

3. In the window that opens, click **Open**, select on the PC the firmware file with extension .crt and click **Start**. After the successful firmware reflashing Data Logger will automatically reboot.

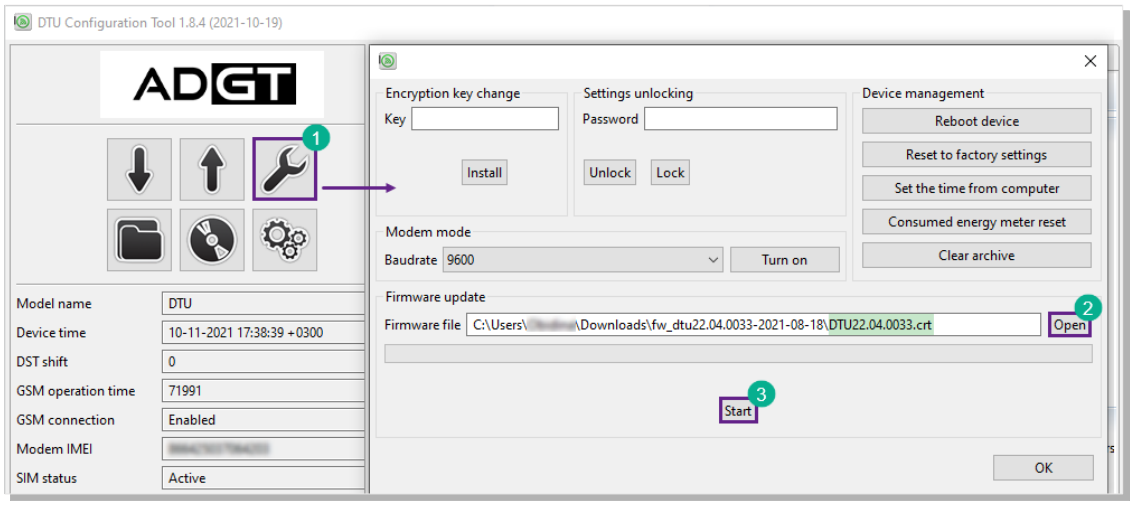


Fig. 33. Updating the firmware of the DTU2xx data logger.

Application 1

When using a DTU2xx-C data logger with 230 VAC power supply, for double protection against electric shock, use the diagram below:

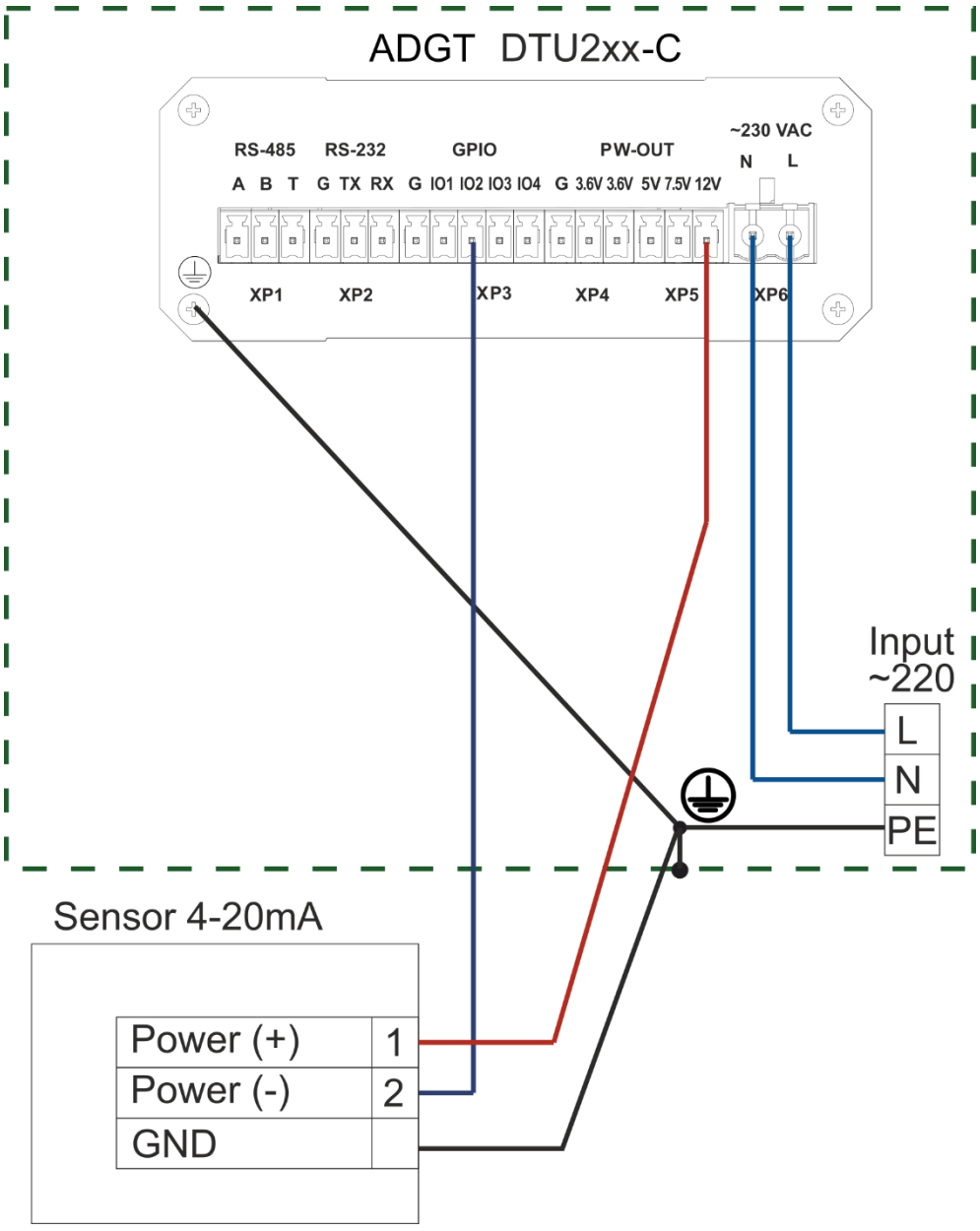


Fig. 34. Double protection diagram against electric shock.