User Guide

Revision History

Version	Date	Editor	Comment
v1.0	30.03.23	Sirbu N.	Original document.
v1.1	10.12.24	Sirbu N.	Added information about prepayment.
v1.2	07.05.26	ENG-093-02	Added section 12, Annex 2, Annex 3, Annex 4.
v1.3	13.05.26	ENG-093-02	Revised sections 1, 2.1, 2.2, 2.3, 3, 4, 4.1, 5, References.
v1.4	19.05.26	ENG-093-02	Added section 13.
v1.5	09.06.26	ENG-093-02	Added sections 3.2.4, 14.

Contents

Abbreviations

Abbreviation	Description
AES	Advanced Encryption Standard
APDU	Application Protocol Data Unit
APN	Access Point Name
BLE	Bluetooth Low Energy
CF	Compact frame
CPU	Central Processing Unit
GCM	Galois Counter Mode
GMAC	Generation of Message Authentication Code
GSM	Global System for Mobile Communications
HLS	High Level Security
ID	Identification Number
IP	Internet Protocol
KEK	Key Encrypting Key
LLS	Low Level Security
LTE	Long-Term Evolution
NB-IoT	Narrowband Internet of Things
OBIS	Object Identification System
PC	Personal Computer
PLMN	Public Land Mobile Network
Script	A set of command sequences
TOU	Time-of-Use
UDP	User Datagram Protocol
USB	Universal Serial Bus

1. Purpose

The COSEM Client application is designed for ADDAX Meters local management and presentation.

This document gives brief description of the COSEM Client itself and is intended to demonstrate operation principles of Water Meters within COSEM Client (hereinafter – COSEM, program).

The information in this guide is given with the assumption that user is already familiar with meter key features and operation principles. The present document includes all necessary instructions for operation with meter using COSEM Client.

The following reference documents are provided for further exploration of the concepts discussed should any questions arise:

- Technical description of Water Meters;
- Technical description for Flow control valve;
- ADR Project. DLMS/COSEM Profile;
- ADR Project. DLMS/COSEM Events, Alarms;

COSEM Client supports local data exchange with the device via one or both of the following communication interfaces:

- BLE (Bluetooth Low Energy),
- NFC (Near Field Communication).

COSEM Client supports remote transmission of measurement data to data collection systems via the following communication interfaces:

- LoRaWAN (Long Range Wide Area Network),
- NB-IoT (Narrowband Internet of Things).

For more information see: Annex A1. Meter Interfaces.

COSEM Client includes the following functionality:

- Meter parameterization (configuration);
- Meter clock synchronization;
- Meter software update;
- Reading of actual parameters;
- Reading data from profiles;
- Events monitoring;
- Exporting reports on different types of data.

COSEM Client should include the following plugins:

- Data Notifications;
- BLE Transport;
- IP Profile;
- Test Script Console.

The actual version of COSEM Client supports BLE and NFC wireless technologies for exchanging data between stationary and mobile devices (such as smartphones or tablets) over short distances.

2. Hardware preparation

To communicate with meter using COSEM Client the following hardware is used:

- Personal computer with installed COSEM Client.
- COSEM compliant ADDAX Water Meter;
- Bluetooth Nano USB Adapter;

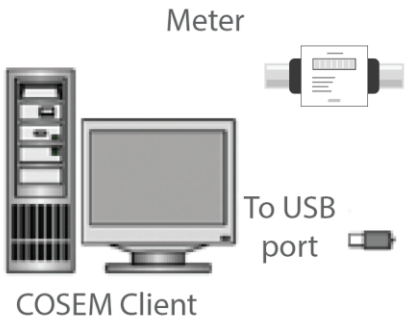
The adapter must support:

- Bluetooth protocol version 4.0 or higher,
- Bluetooth Low Energy (BLE) mode.

2.1. Communication via Bluetooth Nano USB Adapter (Bluetooth Adapter)

Communication via Bluetooth Adapter provides possibility of local data exchange with the meter and meter parameterization using COSEM Client.

To communicate with the meter via Bluetooth Adapter connect the hardware as follows:



1. Connect Bluetooth Adapter to computer.
2. Detect Bluetooth Adapter on your computer (***Computer Management > Device Manager >*** Bluetooth **On**).
3. Meter is ready to communicate via Bluetooth Adapter. Any operations supported by the COSEM Client are available now.
4. Launch **COSEM Client**.
5. Use the transport protocol: **BLE**.
6. Register device within the COSEM Client (see section 5. Device Registration in COSEM Client).

3. Software preparation

Program setup includes two steps:

1. Program installation;
2. Configuring of necessary plugins.

3.1. Hardware & Software Requirements

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The number of COSEM Client application copies is unlimited

The following minimal requirements for the PC hardware and software are applicable:

- Processor: Intel Core i3;
- Memory: 4 GB DDR3;
- Storage: HDD 40-80 GB;
- Monitor: 21″;
- Case and power supply unit: Middle Tower ATX, 450 W;
- At least 1 unit of full-size USB-host interface / port (type A receptacle);
- OS: Windows 10 and higher (both 32-bit and 64-bit).

When installing COSEM Client for the first time, make sure the following Microsoft supplemental components are available, relevant for your OS version:

- Microsoft .Net Framework 3.5 SP1;
- Microsoft Report Viewer 2005.

Address your system administrator for details.

3.2. Plugins Configuring

COSEM Client consists of a set of plugins of different purposes. Number and structure of plugins may vary and extend during program development.

All the plugins are active right after program installation with the exception of those recently developed in case of program updating.

Before configuring COSEM Client, you must close all running instances of the COSEM Client application.

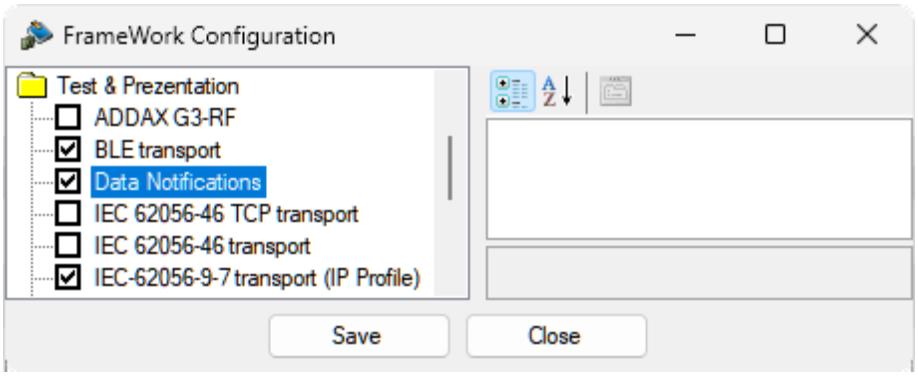
Before you start to operate within COSEM Client for the first time, we recommend activating the following plugins depending on your needs:

- **Data Notifications** – to enable operations with models of push setup object.
- **BLE Transport** - protocol for communicating with the meter over BLE-enabled networks. To provide data exchange between fixed and mobile devices over short distances and building personal area networks (PANs).
- **IP Profile** – protocol to communicate with meter via IP enabled networks.
- **Test Script Console** - to enable operations with Test Console.

3.2.1. Enable Data Notifications

This option is available for full version of COSEM Client or if proper *Add.CC.DataNotifications.dll* file is delivered on request.

1. Launch ***PlgCfg*** file from the folder you installed COSEM software (see Reference 2. COSEM Client. Installation manual.).
2. Click ***Show Config…***.
3. Open **Test & Presentation** folder.
4. From the opened tree select **Data Notifications**.



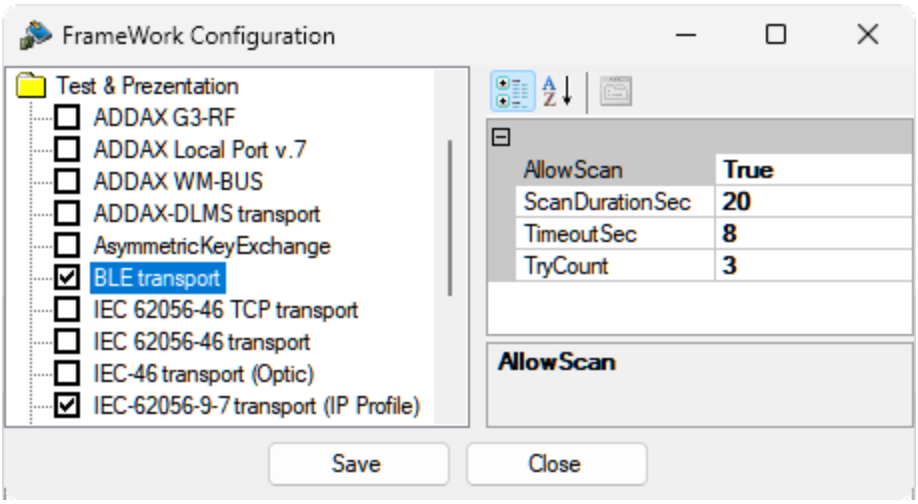
5. Save the configuration and exit ***PlgCfg***.
6. Close the PlgCfg.exe application. In the "***Plugin Component Setting***" window, select the "***Close***" button.

Now you can launch COSEM Client and use ***Data Notifications*** plugin for viewing events.

3.2.2. Enable BLE Transport

This option is available for full version of COSEM Client or if proper *Add.CC.BleTransportPlugin.dll* file is delivered on request.

1. Launch ***PlgCfg*** file from the folder you installed COSEM software (see Reference 2. COSEM Client. Installation manual.).
2. Click ***Show Config…***.
3. Open **Test & Presentation** folder.
4. From the opened tree select **BLE Transport**.



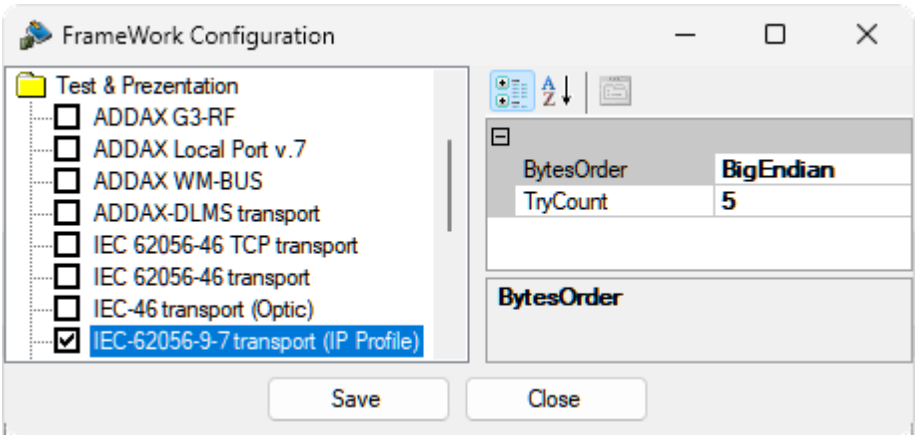
5. Save the configuration and exit ***PlgCfg***.
6. Close the PlgCfg.exe application. In the "***Plugin Component Setting***" window, select the "***Close***" button.

Now you can launch COSEM Client and use ***BLE Transport*** plugin for viewing events.

3.2.3. Enable IP Profile

This option is available for full version of COSEM Client or if proper *Add.CC.Iec6205697Transport.dll* file is delivered on request.

1. Launch ***PlgCfg*** file from the folder you installed COSEM software (see Reference 2. COSEM Client. Installation manual.).
2. Click ***Show Config…***.
3. Open **Test & Presentation** folder.
4. From the opened tree select ***IEC-62056-9-7 transport (IP Profile)***.



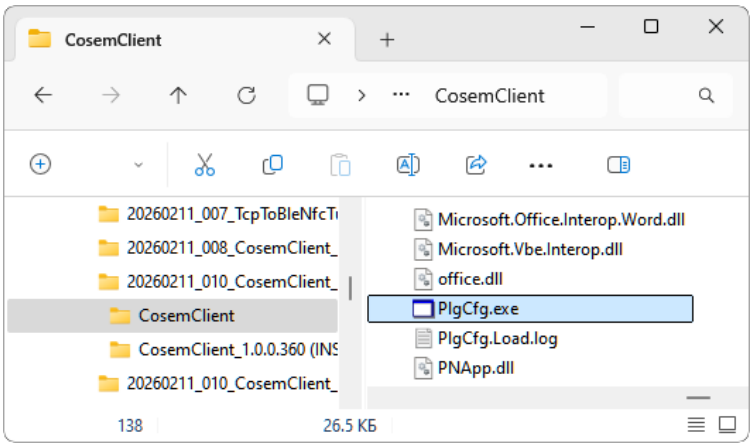
5. Save the configuration and exit ***PlgCfg***.
6. Close the PlgCfg.exe application. In the "***Plugin Component Setting***" window, select the "***Close***" button.

Now you can launch COSEM Client and use ***IP Profile*** plugin for viewing events.

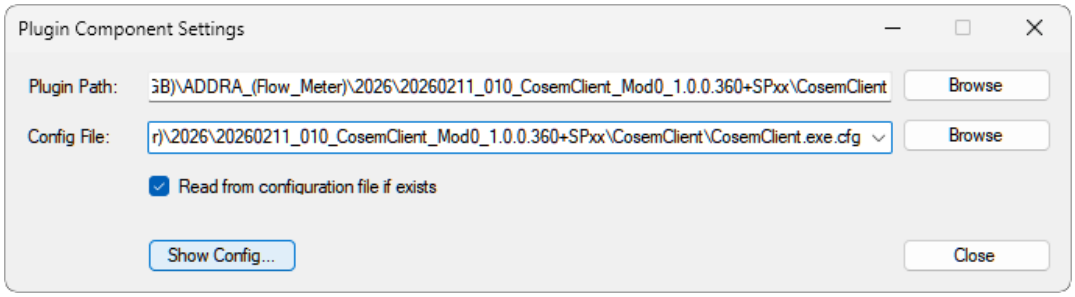
3.2.4. Enable Test Script Console

This option is available for full version of COSEM Client or if proper *Add.CC.TestScriptConsole.dll* file is delivered on request (CosemClient_Mod0_1.0.0.360 abd+Service_Pack_32).

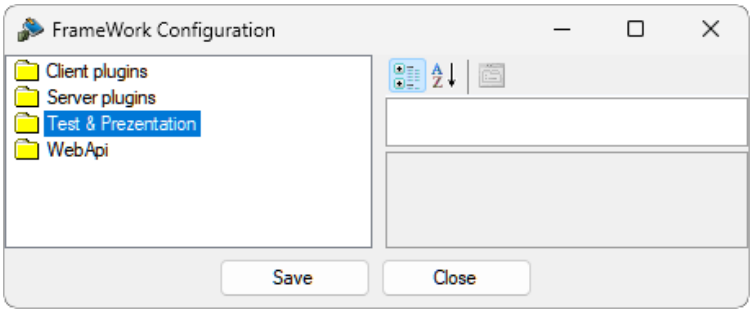
1. Launch ***PlgCfg*** file from the folder you installed COSEM software (see Reference 2. COSEM Client. Installation manual.).



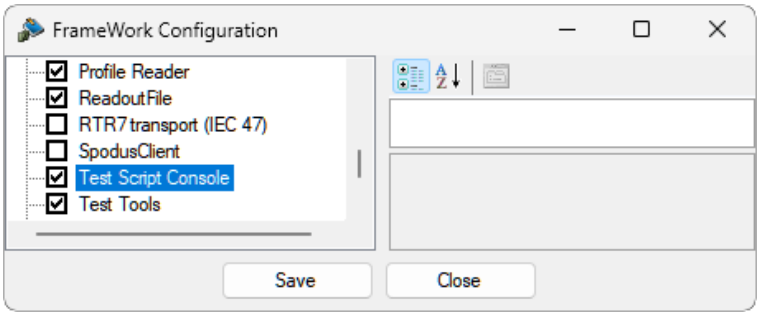
2. Click ***Show Config…***.



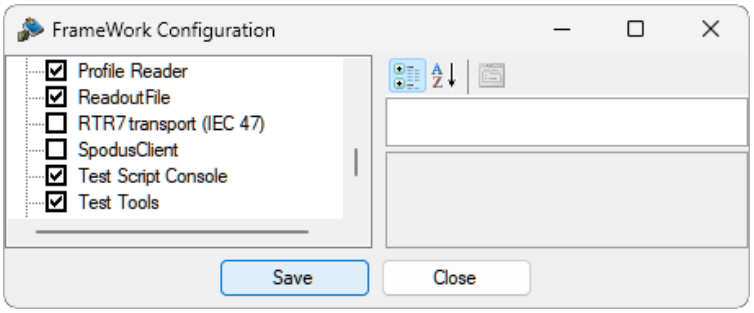
3. Open ***Test & Presentation*** folder.



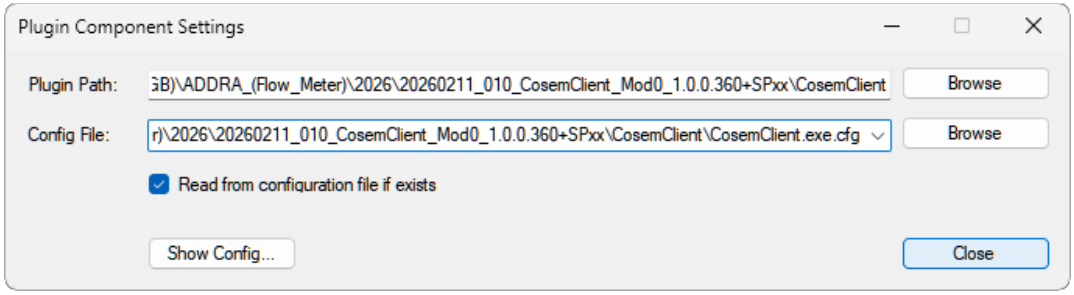
4. From the opened tree select ***Test Script Console***.



5. Save the configuration and exit ***PlgCfg***.



6. Close the PlgCfg.exe application. In the "***Plugin Component Setting***" window, select the "***Close***" button.



Now you can launch COSEM Client and use ***Test Script Console*** plugin for executing scripts on the meter.

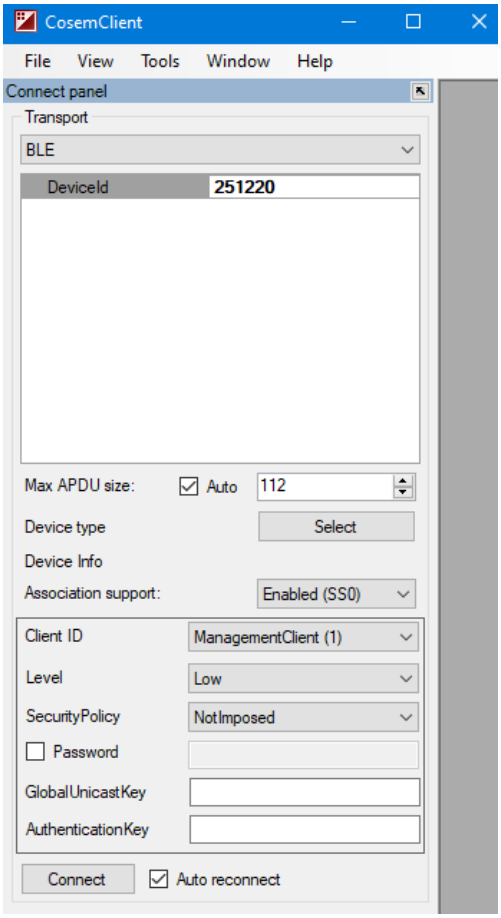
4. Program Interface

COSEM Client has user friendly interface to provide easy work with all plugins. All program windows have Windows standard form view with minimization, maximization and quit buttons.

The document includes screenshots for English language interface. Interface language can be changed according to customer requirements using specified ***COSEMClient.Lng*** file (available in the folder where you installed the COSEM software (see Reference 2. COSEM Client. Installation manual.).

Below main menu commands are described briefly. Menu structure and meaning is the same regardless of language.

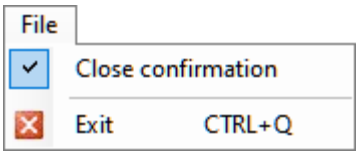
4.1. Connect panel



Displays connection parameter settings information.

- **Transport** – to select data exchange channel and enter connection settings in the table below. For example: water meters **BLE** – Bluetooth.
- **Max APDU size** – limits the size of the client-side application message. When Auto is checked, the default value is used. It is recommended to set this value to Auto.
- **Device type** – type of registered device.
- **Association support** – to enable associations and security features, if supported.
- **Client ID, Level, SecurityPolicy, Password, GlobalUnicastKey, AuthenticationKey** – security features (see section 5 Device Registration in COSEM Client for description).
- **Connect –** to initialize connection process.
- **Auto reconnect** – to connect device automatically if connection interrupts.
- **Report** tab – to display all executed operations and their results. This information is also stored as log-files on computer hard disk. To delete current report right-click respective window and click ***Clear***. In any case, information isn't removed from the computer.
- **Sent, Recv, Timeout, Queue** – number of requests sent to device, received from it, delayed and waiting in queue.

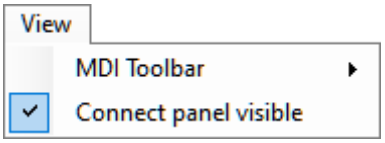
4.2. File



Displays the program basic options.

- **Close confirmation** – Show/Hide a confirmations.
  - (✓) Enable - show dialog boxes.
  - ( ) Disable - hide dialog boxes.
- **Exit** – quit COSEM Client.

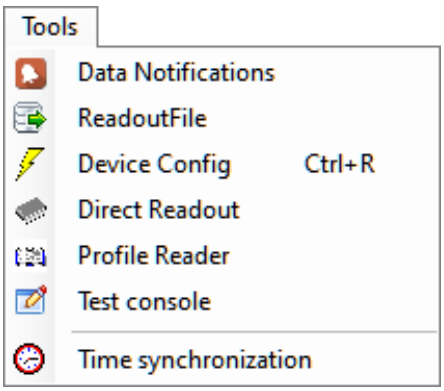
4.3. View



Displays viewing options.

- **MDI toolbar –** to display active windows.
- **Connect panel visible** – to display tab to customize connection settings on the screen.

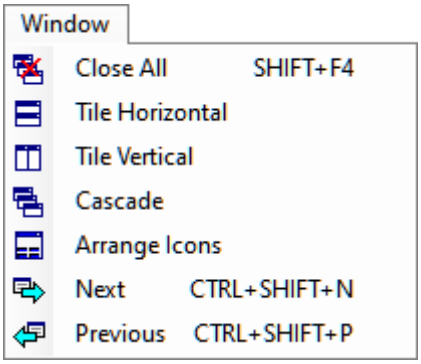
4.4. Tools



Displays enabled functionality plugins.

- **Data Notifications** - to enable operations with models of push setup object.
- **Readout File** – to read files from device.
- **Device Config –** to parameterize (configure) device.
- **Direct Readout** – to read actual data and manage respective reports.
- **Profile Reader –** to read interval data from profiles, view event logs and manage respective reports.
- **Test console –** allows to select and run scripts for test mode.
- **Time synchronization –** to synchronize meter clock.

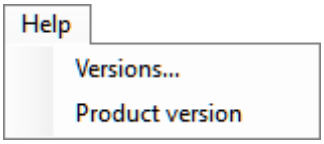
4.5. Window



Displays options for viewing and navigate program windows.

- Contains standard commands to work easily with the program windows and navigate within the program.

4.6. Help



Displays the program specifications.

- **Versions…** - information about COSEM Client plugins used.
- **Product version** – information about COSEM Client in use.

5. Device Registration in COSEM Client

The first step in COSEM Client operation is to register device within the program.

Make sure that proper communication protocols are activated (see section 3.2 Plugins Configuring).

To communicate with meter via Bluetooth connect device to computer, see section 4.1. Communication via Bluetooth Nano USB Adapter (Bluetooth Adapter).

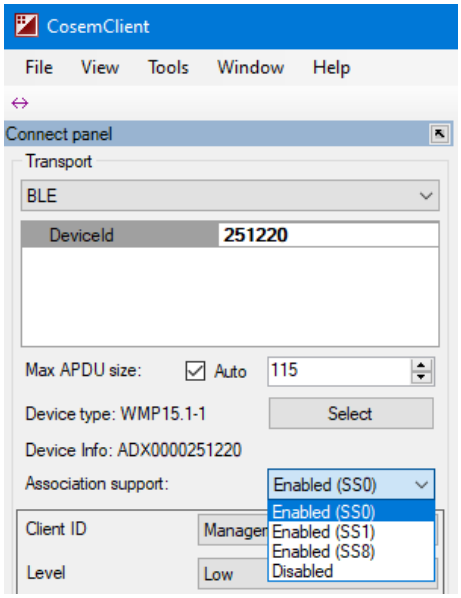
5.1. Transport

From **Transport** drop-down list select BLE - Bluetooth exchange protocol.

The Bluetooth adapter active in the system will be used automatically.

- **DeviceID** – the correct meter serial number must be entered.

  The auto discovery feature is not supported in the **BLE** plugin.



5.2. Max APDU

Select Auto box for Max APDU **size.**

5.3. Device type

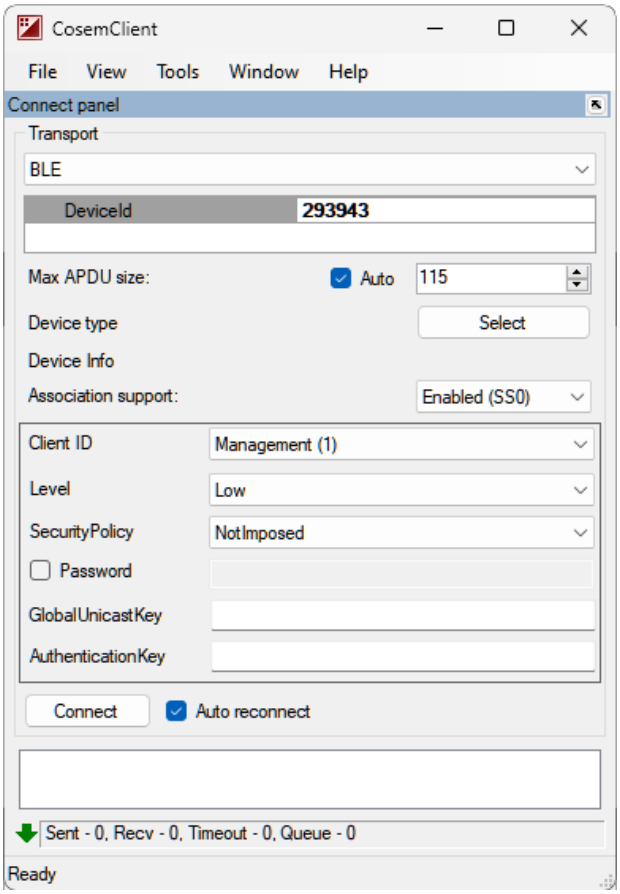
The device type is detected automatically.

No user action is required for this setup item. Proceed to the next step.

5.4. Association support

Select **Association support** to activate support of security and encryption features

Define security parameters required for communication with the meter.



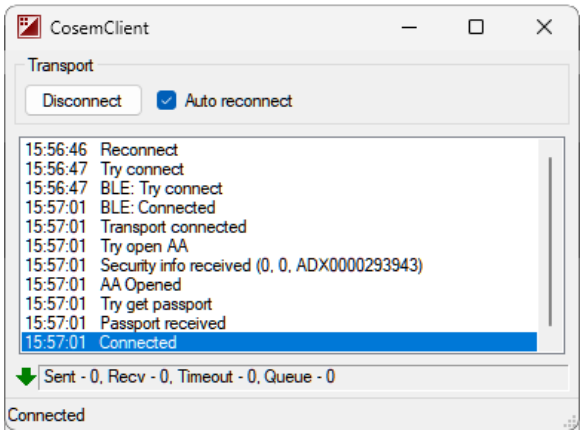
- **Client ID** – identification of the client according to the security policy:
  - ✓ **Management Client (1)** – has the highest right to manage the meter, including changing of meter configuration and setting or removing the meter security context (with the exception of that for Firmware Update Client);
  - ✓ **Reading Client (2)** - has the right only to read certain meter data;
  - ✓ **Firmware Update Client (3)** - has the right to perform firmware update, and exclusive right to set or remove its own security context;
  - ✓ **HAN Controller Client (4)** – has the right to handle data related to the HAN Controller;
  - ✓ **Public Client (16)** – has the right to read only the basic device information;
- **Level** - data access security level corresponding to the selected COSEM Client:
  - ✓ **Preestablished** – no application association required;
  - ✓ **Lowest** - lowest level security (no security);
  - ✓ **Low** - low level security (LLS) - allows the authentication of clients by verifying the password (low level secret) supplied in the field Password (see section 7.1.4. Set Low Level Security Secret for details about password setting);
  - ✓ **High** - high level security (HLS) - requires that both the client and the server mutually authenticate each other using security keys that must be supplied in **Global Unicast Key** and **Authentication Key** fields.
- **Security Policy** (see section 7.1.3. Activate Security Policy for details about policy setting):
  - ✓ **Not Imposed** - security is not imposed (default);
  - ✓ **Authentication Only** - all messages are authenticated;
  - ✓ **Encryption Only** - all messages are encrypted;
  - ✓ **Authenticated Encryption** - all messages are both encrypted and authenticated.
- **Password –** security secret for LLS;
- **Global Unicast Key** – security key for HLS*;
- **Authentication Key** – security key for HLS* (see section 7.1.1. Set a Key for details about key setting).

5.5. Auto reconnect

Select **Auto reconnect** check box to reconnect device automatically, if no connection is established after **RequestTimeoutSec** expires or if connection interrupts.

5.6. Connect

Click the "**Connect**" button to start establishing a connection with the meter.



5.7. Connected

Message **Connected** will be displayed in the log tab for successful connection, COSEM Client will register device.

5.8. Device info

The **Device Info:** value will appear in the Connect panel (for example: **ADX0000293943**).The program will ready for data exchange and other operations after device registration is finished.

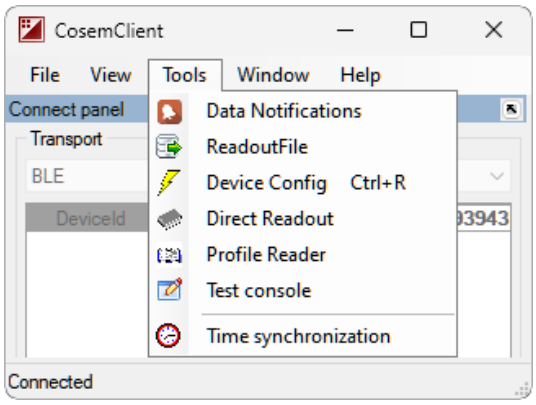
6. Time Synchronization

For correct operation of the COSEM Client together with devices after their registration we recommend to synchronize local clock of devices with the clock of PC, where COSEM Client is installed, or with the national standard time. To do this use **Time synchronization** command from the **Tools** menu.

COSEM Client provides **two ways** of time synchronization:

- **automatic** (5.a) synchronization with the PC clock;
- **manual** (5.b) setting of the local time. In this case date and time may vary from those actual on the PC.

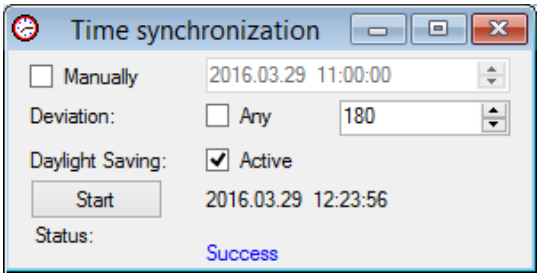
1. Run ***Tools > Time synchronization***.



2. Opened window **Time synchronization** displays current device time.
3. If, daylight saving time is actual now (summer time) select **Daylight Saving** to be **Active**. If daylight saving time is not actual now (winter time) deselect it.
4. Set **Deviation** to **Any** or enter time in minutes if you want to jump in time relatively to current time or that, set in the **Manually** field.

5.**a** Click ***Start*** to synchronize meter time with the PC clock **automatically** or

5.**b** Select **Manually** and enter required date and time. Click ***Start.***



6. For successful synchronization respective message appears - **Success** and device clock is synchronized. Otherwise, error message appears – **Error**. Verify the correctness of data set and/or connection and start synchronization process again.

7. Device Configuring

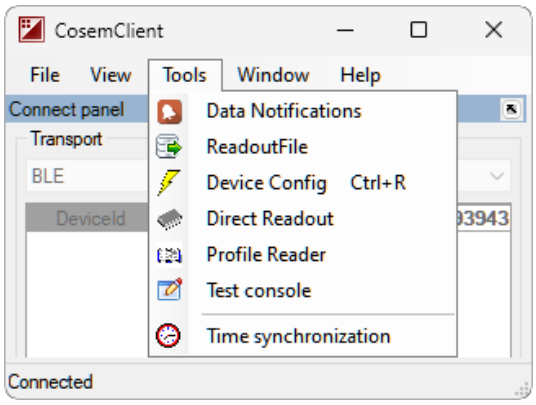
All the ADDAX devices are delivered to the customer with a default configuration according to their functionality and customer requirements. Configuration provides operation with a set of parameters. This set is defined by device type, hardware version and by its functional possibilities. Some of the configuration parameters may be changed by the customer itself during exploitation. List of parameters may vary and extend during program development.

To configure ADDAX meters, use **Device Config** command. You may send or get configuration command for a single parameter or to a group of parameters.

If some configuration parameters which are described in this document are not available in your **Device Config** list, this means that such parameters are not supported by the given meter.

Standard COSEM Client parameterization process includes the following steps:

1. Run ***Cosem Client > Tools > Device Config*** or press ***Ctrl+R*** on your keyboard.

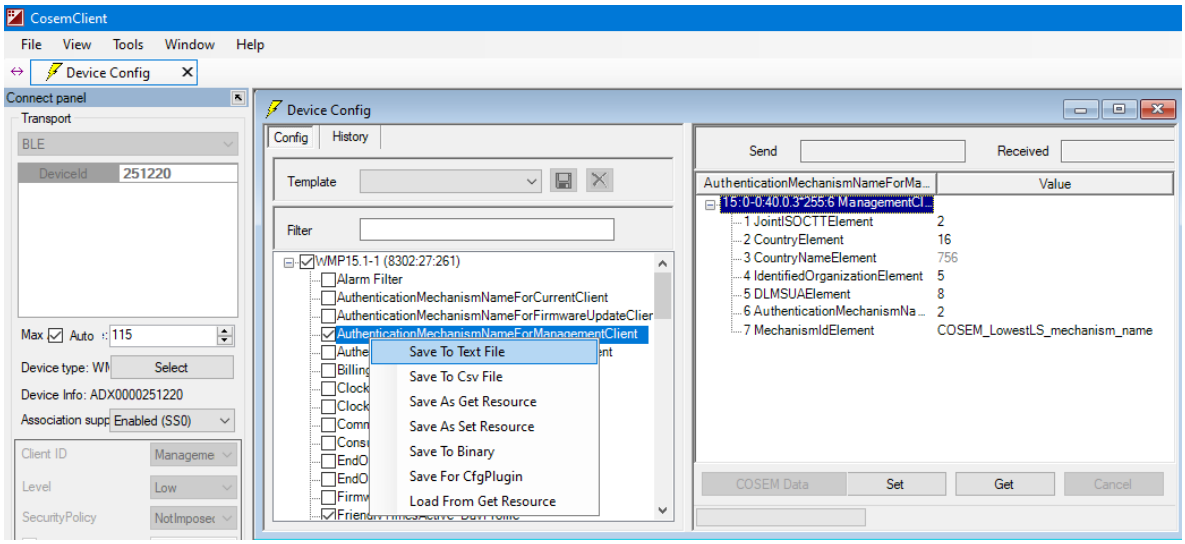


2. **Device config** window appears, including list of parameters to configure, view or trigger an action and a set of service buttons. To operate within the COSEM Client use the following common buttons and fields, where available:

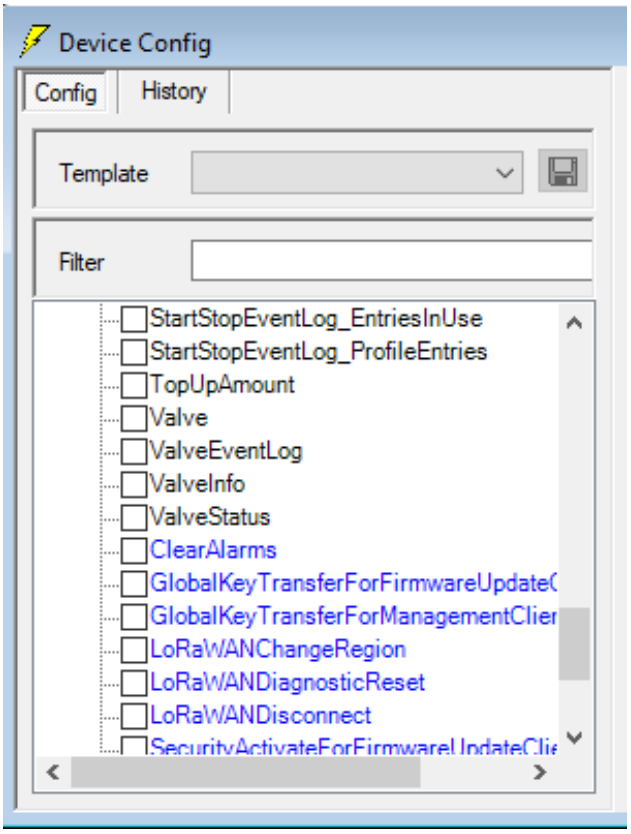
   - ***Get*** – gets current configuration of the selected parameterization object;
   - ***Set*** – sets new configuration for the selected parameterization object;
   - ***<Add>*** - adds an object to the list of parameters to configure;
   - ***<Remove>*** - removes an object from the list of parameters to configure;
   - ***<…>*** – selects an object from the list of parameters to configure;
   - **Template** – provides possibility to work with configuration templates.

     See section 7.5. Configuration Templates for details.
   - **COSEM Data*** – displays information about an invalid value sent by meter in COSEM format;
   - **Save To Text File** – exports selected configurations in a text format;
   - **Save As Get Resource** – saves selected configurations in a file, which being activated requests current configurations for all the parameters in the file;
   - **Save As Set Resource** – saves selected configurations in a file, which being activated sets preconfigured configurations for all the parameters in the file;
   - **Save To Binary** - exports selected configurations in a binary format;
   - **Save For CfgPlugin** – exports selected configurations in **.xml* file format.

* *This button is only used for debugging purposes.*



3. For user convenience configuration commands and actions are marked with different colours:
   - parameterization commands and viewing commands (e.g. set, get commands) are coloured in black;
   - actions (e.g. relay disconnection/reconnection, resets) are coloured in blue.



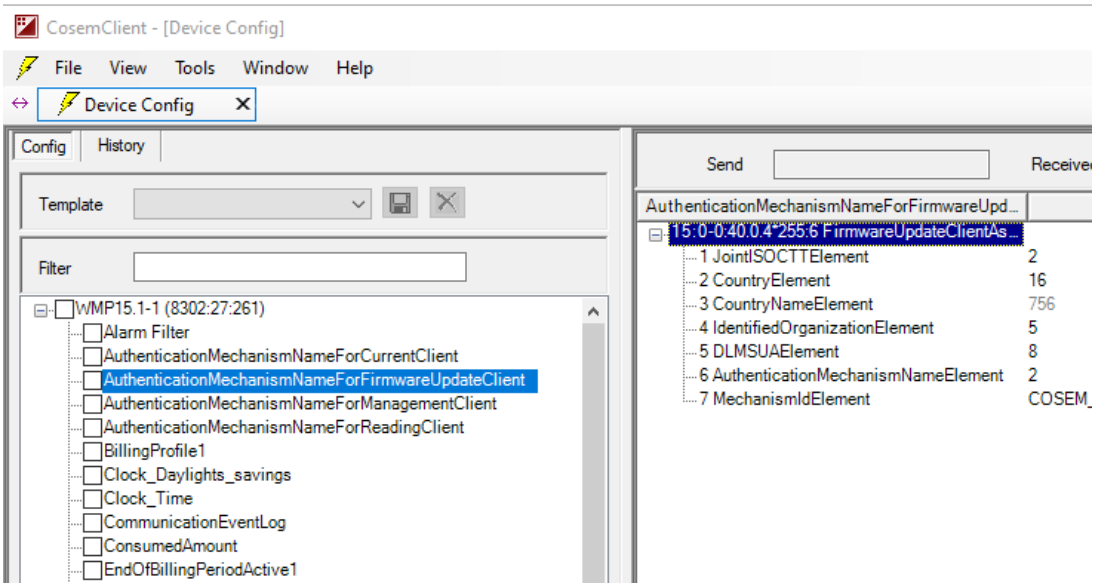
4. Any command for setting/getting a parameter or for triggering an action is accompanied with time stamps for, respectively, command/request initiation (**Send** box) and command/request reception(**Received** box). Depending on results a number of errors can be displayed in the **Received** field for unsuccessful setting or getting a command, e.g.:

   scope_of_access_violated – actual Client (association) does not have proper rights to get or set the given parameter;

   object_undefined – parameter is not supported by the meter with actual firmware version;

   view error – parameter is not configured;

   other_reason – other cause.



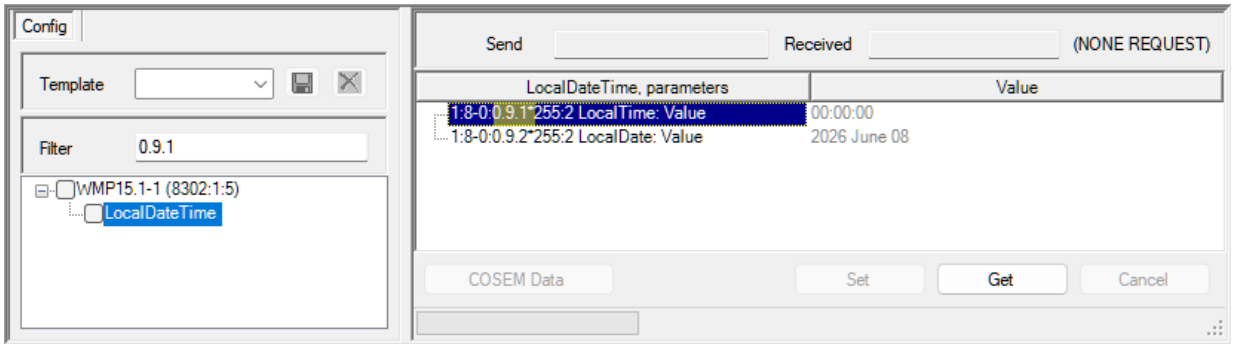
5. For user convenience **Filter** field is available, which provides possibility to filter the list of parameterization parameters by a keyword or OBIS code. At least 3 symbols should be entered to start the filtering.

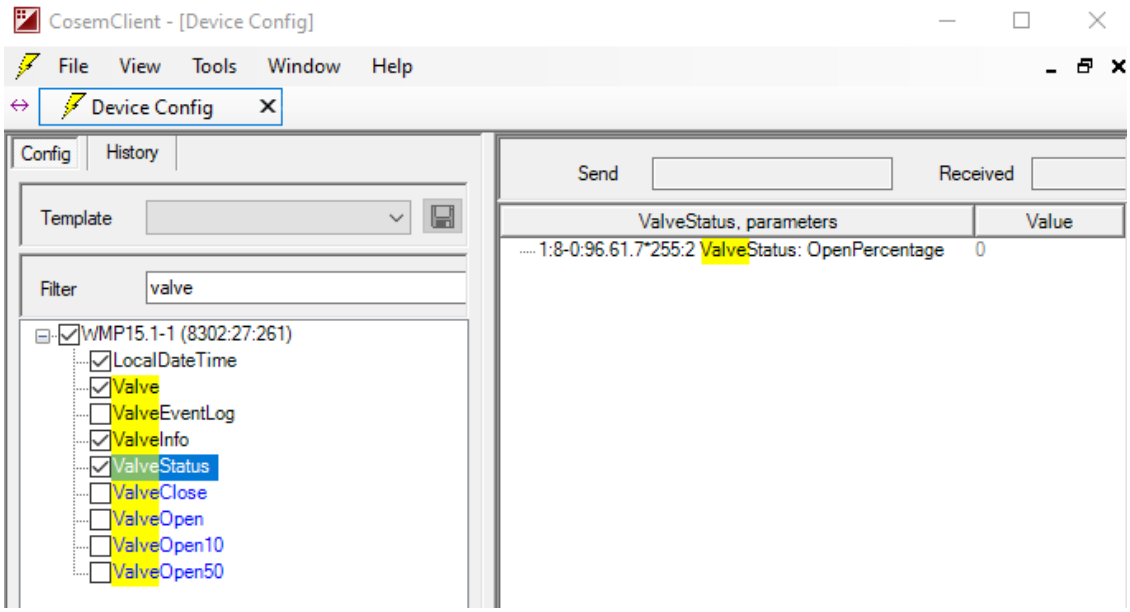
Filtering is possible by part of the name or by part of the OBIS code.

To begin filtering, you must enter at least three characters (numbers, letters, symbols).

Example: valve or 0.9.1

When filtering with a(some) configuration(s) being selected, the latter remain visible, i.e. will be displayed in the filtered list together with relevant (searched) parameters.





7.1 Manage Security Features

Meter security architecture is based on the *"DLMS/COSEM. Architecture and Protocols. Green Book"* concepts. AES-GCM-128 (Galois/Counter Mode with AES-128) Security Suite 0 is implemented for data encryption and authentication and key transport methods. (see Reference 1 DLMS/COSEM.Architecture and Protocol.Green Book Edition 8.1.)

Actual firmware of meter uses symmetric **global keys.** A global key may be a unicast encryption key, a broadcast encryption key or an authentication key. Before ciphering can be used, global keys have to be generated and delivered to the COSEM logical device participating in the system. For delivery, the global keys shall be wrapped by master key using AES-128 wrap algorithm.

For delivery, the open global keys have to be wrapped by a **master key** – a unique key of the meter (key encrypting key, KEK). This key is set in the meter during the manufacturing process, but can be changed later on (optional, depending on meter version). In this case, new master key is delivered to the meter being wrapped by the previous master key. Master key as well as global keys shall be unique and consist of 128 bits.

All settings, described in the sections below, may be edited only by the user with the Management Client rights with the exception of the Firmware Update Client, which possesses the exclusive rights to edit its own security context (see section 5. Device Registration in COSEM Client for clients description).

The following order of security setting is specified:

1. Keys wrapping (out of scope of this document).
2. Setting of security material (password for LLS, wrapped keys for HLS).
   See section 7.1.1. Set a Key, section 7.1.4. Set Low Level Security Secret.
3. Determination of authentication mechanism.
   See section 7.1.2. Define Authentication Mechanism.
4. Determination of security policy.
   See section 7.1.3. Activate Security Policy.
5. Customizing of locking settings (optional, if necessary).

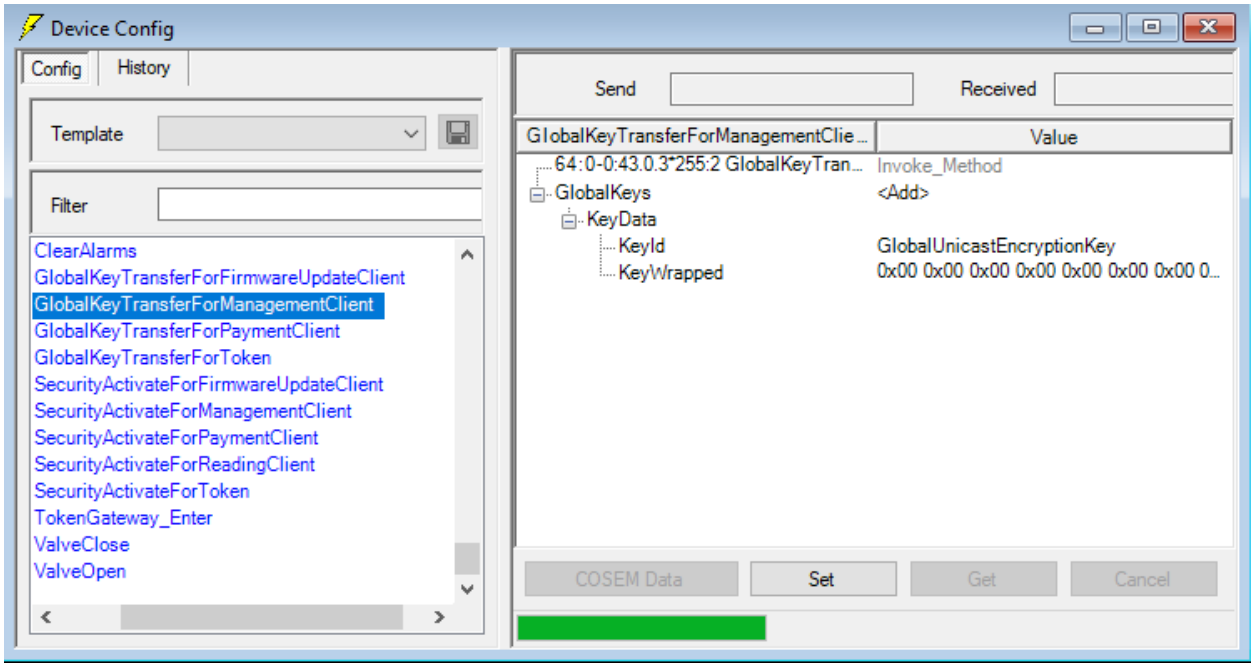
Note: For security reasons, the security context for field devices can only be strengthened. Editing of security context is described in this document for demonstration and testing purposes only. It should be mentioned, that changing of security materials and their further potential fraud usage may have dangerous impact and customer bears all responsibility for problems that may occur.

7.1.1 Set a Key

To set/replace a key use **GlobalKeyTransferFor*X*Client** setting, where ***X*** stands for the type of client.

See section 5. Device Registration in COSEM Client for clients description.

1. Go to ***Tools > Device Config > GlobalKeyTransferFor*X*Client.***
2. In the **KeyId** field select key type according to the required policy.
   See section 7.1.3. Activate Security Policy.
3. In the **KeyWrapped** field in **Binary** tab enter key value preliminary wrapped the proper way:
   - **Global Unicast (Broadcast) Encryption Key** or **Authentication Key** – for LLS (if necessary, instead of LLS secret password).
     See section 7.1.4. Set Low Level Security Secret for details.
   - **Global Unicast (Broadcast) Encryption Key and Authentication Key** – for HLS.
   - **Master key** (if it is necessary to change the Master key).
4. Repeat steps 2 and 3 for HLS. Make sure, that different keys are entered for the **GlobalUnicastEncryptionKey** (or **GlobalBroadcastEncryptionKey**) and **AuthenticationKey.**



5. Click ***OK*** and ***Set***.

6.**a**. If key(s) is(are) set for the first time or replaced using connection without encryption use these new keys during further connection via LLS or HLS profiles, if necessary.

6.**b**. If previously set key(s) is(are) replaced using connection with encryption, meter responds (to the Client, here - *COSEM Client* application) for successful key(s) setting with the message encrypted by the old key. To continue further proper communication using new key(s), disconnect from the meter and reconnect to it using the new key(s). Otherwise, connection will be aborted.

See section 5. Device Registration in COSEM Client.

7.1.2 Define Authentication Mechanism

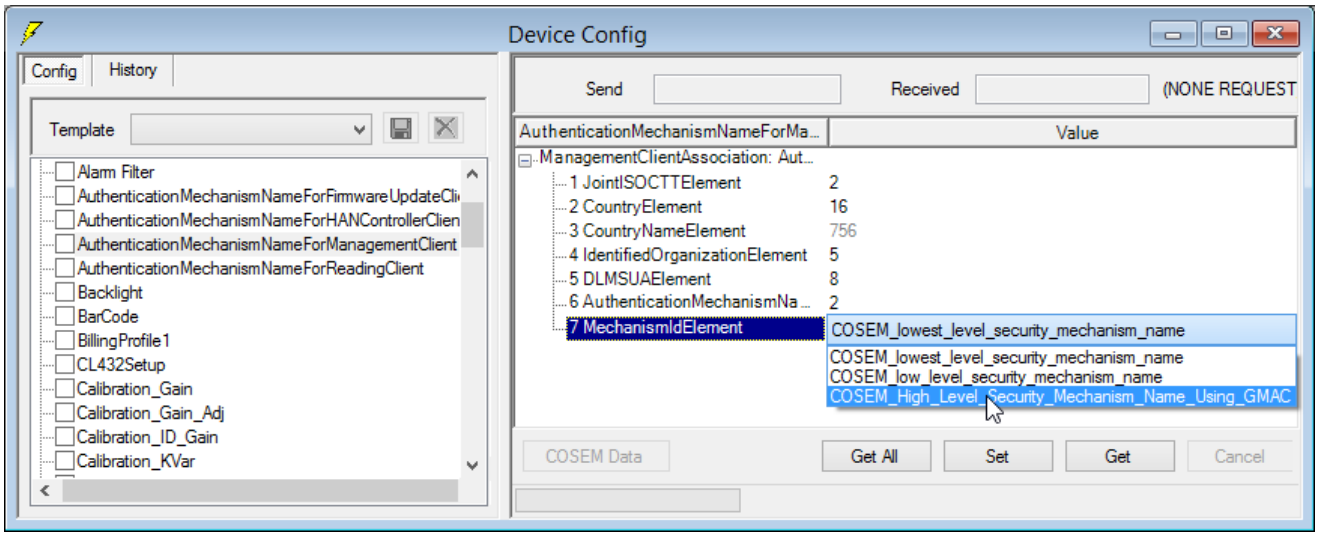
To activate an authentication mechanism, use **AuthenticationMechanismNameFor**X**Client** setting, where X stands for the type of client.

See section 5. Device Registration in COSEM Client for clients description.

Note, that if you intend to use **HLS** profile, proper **keys** should be already installed in the meter.

See section 7.1.1. Set a Key.

1. Go to ***Tools > Device Config > AuthenticationMechanismNameFor**X**Client.***
2. In the **MechanismIdElement** field select authentication mechanism type according to the policy required. See section 7.1.3. to Activate Security Policy.
   - **COSEM_Lowest_Level_Security_Mechanism_Name** – for lowest level security, when no authentication is required;
   - **COSEM_Low_Level_Security_Mechanism_Name** – for LLS authentication;
   - **COSEM_High_Level_Security_Mechanism_Name_Using_GMAC** – for HLS authentication, which supports both modes with encryption and without encryption imposed.



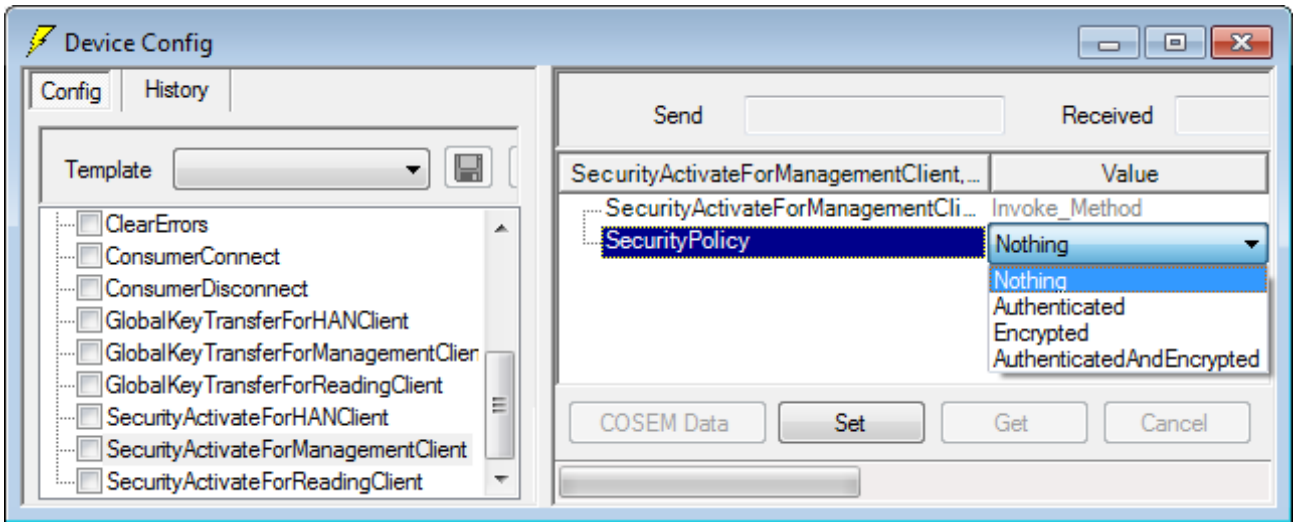
3. Click ***Set.***

7.1.3 Activate Security Policy

To set a security policy use ***SecurityActivateForXClient*** command, where **X** stands for the type of client.

See section 5. Device Registration in COSEM Client for clients description.

1. Go to ***Tools > Device Config > SecurityActivateForXClient.***
2. In the **SecurityPolicy** field select required policy:
   - ***Nothing*** - no security policy is imposed;
   - ***Authenticated*** - all messages are authenticated only;
   - ***Encrypted*** - all messages are encrypted only;
   - ***Authenticated and Encrypted*** - all messages are both authenticated and encrypted.



3. Click ***Set.***

7.1.4 Set Low Level Security Secret (Password)

To set/edit secret (password) for client's authentication at the low security level (LLS), use **LLSSecretForXClient** setting, where **X** stands for the type of client.

See section 5. Device Registration in COSEM Client for clients description.

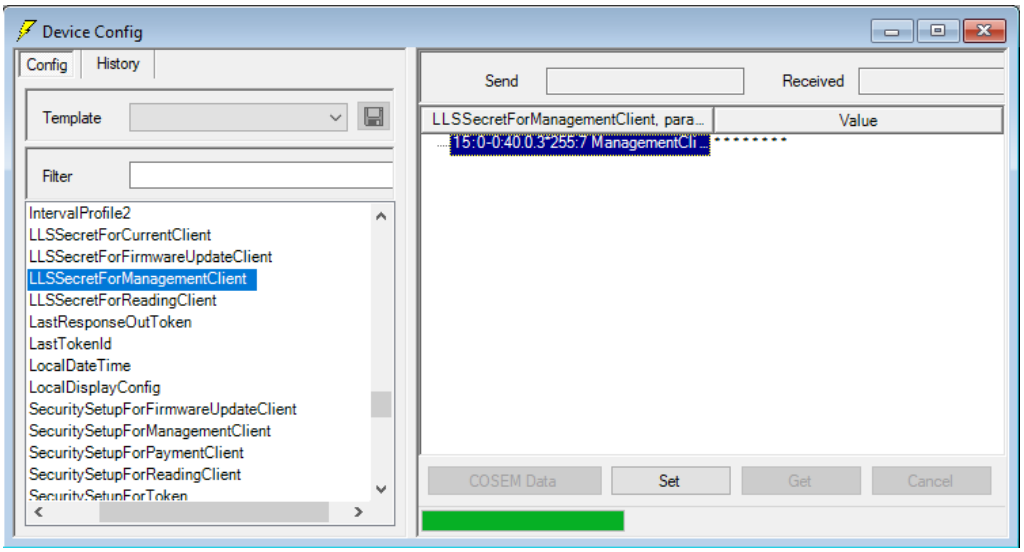
Meter may be temporarily locked for access in case of several attempts to enter the wrong password, when connecting to the meter.

Note: For security reasons, the security context for field devices can only be strengthened. Editing of LLS settings and restoring of HLS settings to LLS is described in this document for demonstration and testing purposes only.

1. Go to ***Tools > Device Config > LLSSecretForXClient.***
2. In the X**ClientAssociation: LLSSecret** filed enter the password.

   8 to **15** symbols strictly, including letters, numbers, punctuation marks or any combination of them.
3. Click ***Set.***
4. Use this password for client authentication during meter registration, if LLS is set to access the data.

   See section 5. Device Registration in COSEM Client.



7.2 Customize Clock Settings

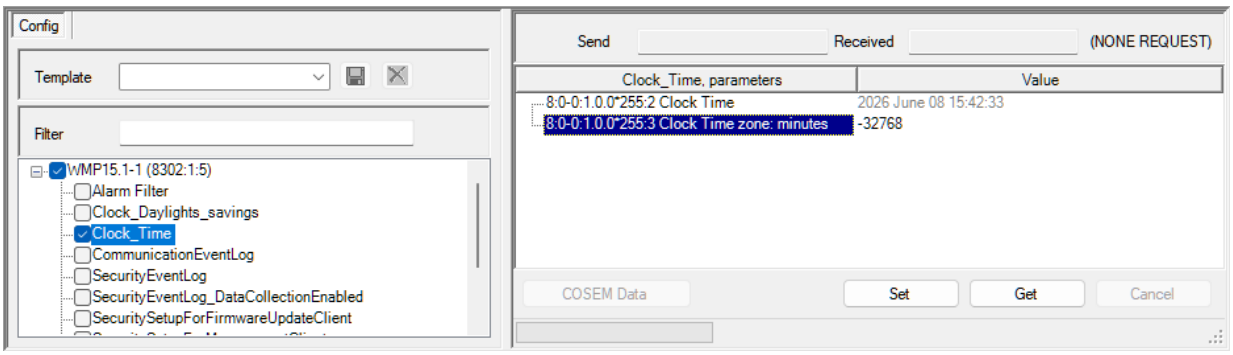
To ensure meter proper operation within the system it is necessary to set the correct time zone and Daylight Saving Time (DST) on meter.

7.2.1 Set Time Zone & Clock Time Shift Limit

To set meter time zone use **Clock_Time** setting. This setting also provides the possibility to set maximum allowed time shift limit relative to the network time, without registration of a time shift event - **ClockTimeShiftLimit**.

1. Go to ***Tools > Device Config > Clock_Time.***
2. In the **Clock_Time zone** field enter local time zone in minutes.

   For example: enter 120 for the GMT+02:00.



3. Click **Set.**

7.2.2 Set Daylight Saving Time (DST)

For correct daylight savings time setting make sure that proper time zone is selected in the **Clock_Time**.

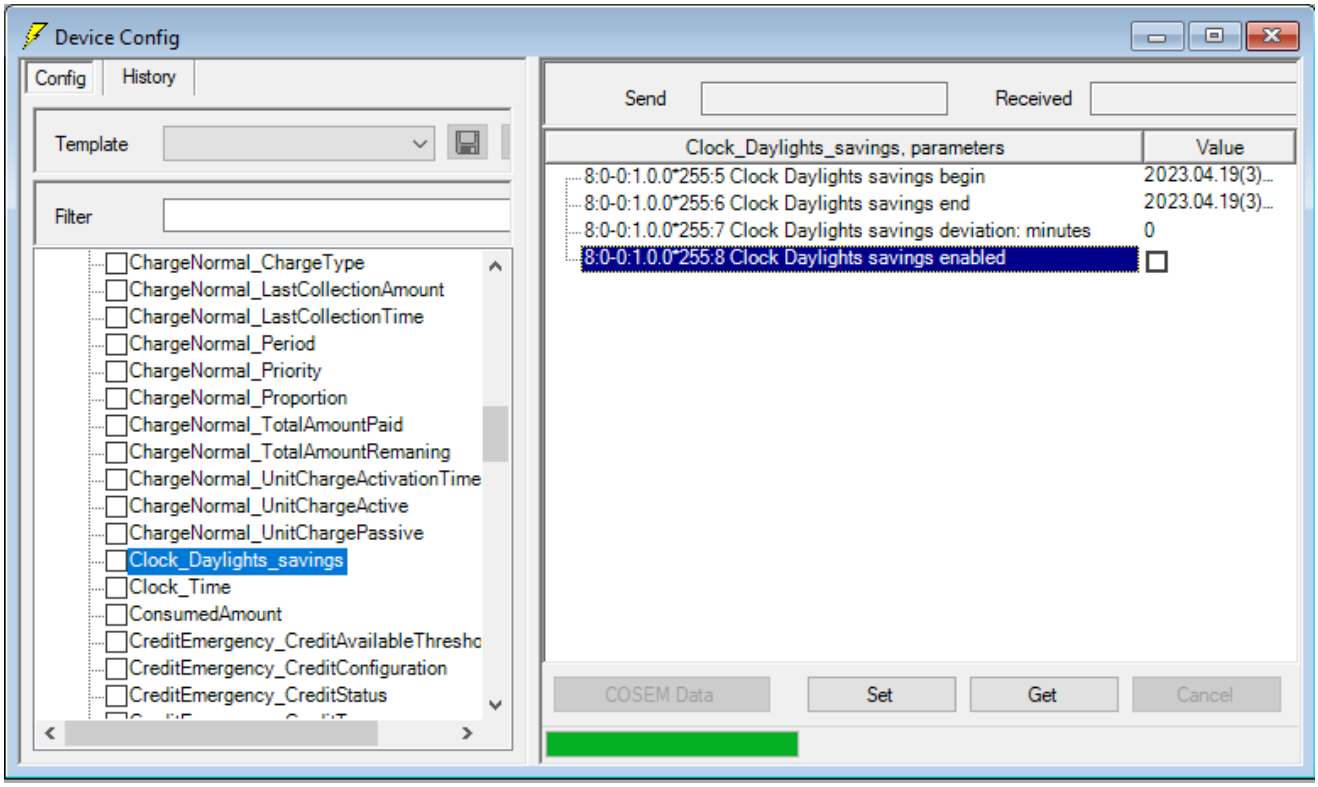
See section 7.2.1. Set Time Zone & Clock Time Shift Limit.

Note: when daylight saving time is not set, meter operates according to standard time, i.e. without time “jumping”.

To set daylight saving time use **Clock_Daylights_savings** setting.

To get current daylight savings state use ***Get*** button.

1. Go to ***Tools > Device Config > Clock_Daylights_savings.***
2. In the opened window click **Clock Daylights savings begin**, to indicate date for summer time beginning.



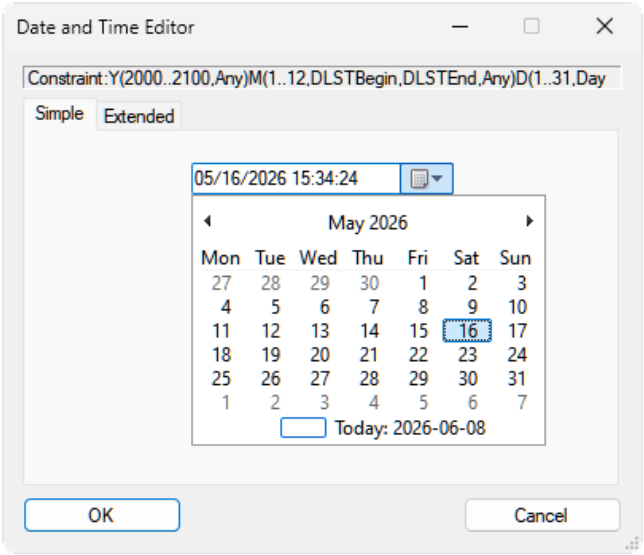
3. In the opened window in the **Constraint field** an example to indicate the date is displayed.

   Two ways of date indication are provided:

   - **Simple** – concrete date is selected manually within the program calendar;
   - **Extended** – floating date is indicated.

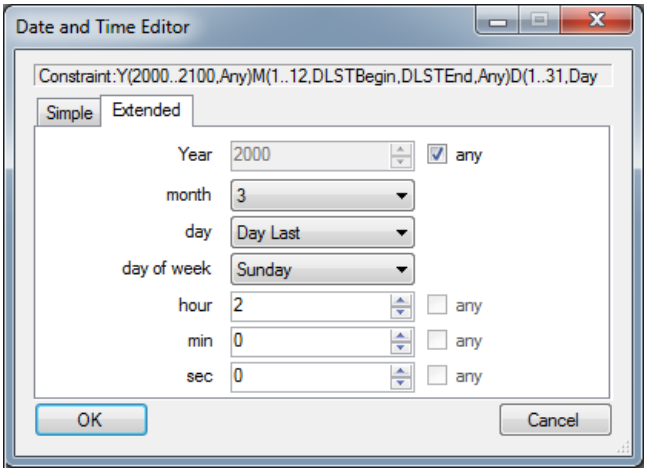
     For example: the last Sunday of the concrete month for each year.

3. **a**. Select **Simple** and indicate the date manually.



3. **b**. Select **Extended** and indicate necessary settings:

- **Year** – indicate the year or select **any** to indicate date for years ahead;
- **month** – indicate the month;
- **day** – indicate the day of the month or select **Day Last**, to indicate the last Sunday within the month;
- **day of the week** – select **WeekDayAny,** if in the **day** field concrete day is indicated, or **Sunday**, if in the **day** field **Day Last** is selected, to indicate the last Sunday within the month;
- indicate the concrete time in the **hour**, **min** and **sec** fields.



4. Click ***OK***.
5. In the ***Clock_Daylights_savings*** main window click **Clock Daylights savings end**, to indicate date of winter time beginning.
6. In the opened window repeat the steps, analogical to those for the summer time.

   See steps 3-4, section 7.2.2. Set Daylight Saving Time (DST).
7. In the ***Clock_Daylights_savings*** main window click **Clock Daylights savings deviation**, to indicate time deviation in minutes.
8. Select **Clock daylights savings enabled** check-box, to activate daylights savings option.
9. Click ***Set.***

Note: when DST is activated and meter current time matches the DST period, then meter immediately enters the DST mode. If meter current time is not within the DST period, then meter enters the DST mode only when proper time comes.

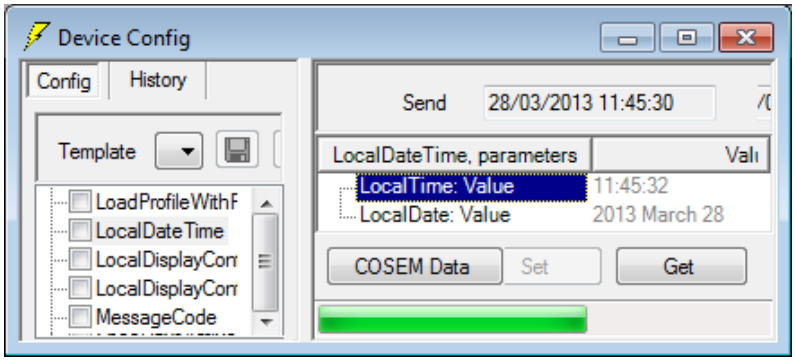
7.2.3 Get Current Date & Time

To get meter current date and time use **LocalDateTime** command.

To set local date and time use **Time synchronization** command.

See section 6. Time Synchronization.

1. Go to ***Tools > Device Config > LocalDateTime.***
2. Click ***Get.***



7.3 Customize Interval and Billing Profiles

7.3.1 Set Interval and Billing Profiles

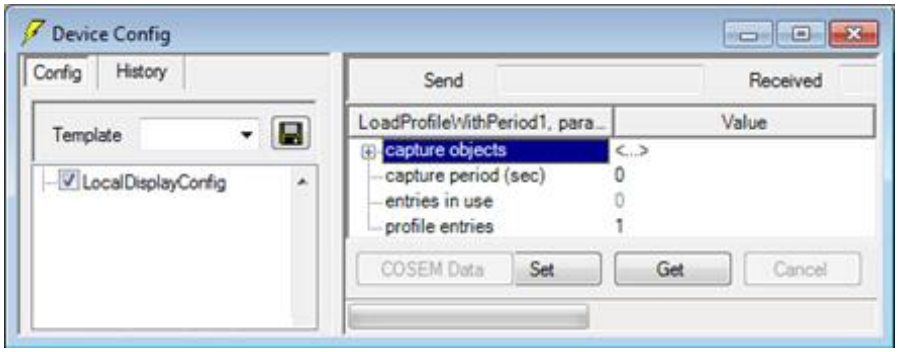
Depending on meter version it can support up to 2 interval profiles and a billing profile. Each profile has a separate reserved storage capacity.

Billing profile is configured for one month period.

Interval profiles may be configured for 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, hourly or daily periods (depending on meter model).

To subscribe meter for interval data capturing and set interval profiles use **LoadProfileWithPeriod1..2(3)** settings. To subscribe meter for billing data capturing and set billing profile use **BillingProfile1** setting.

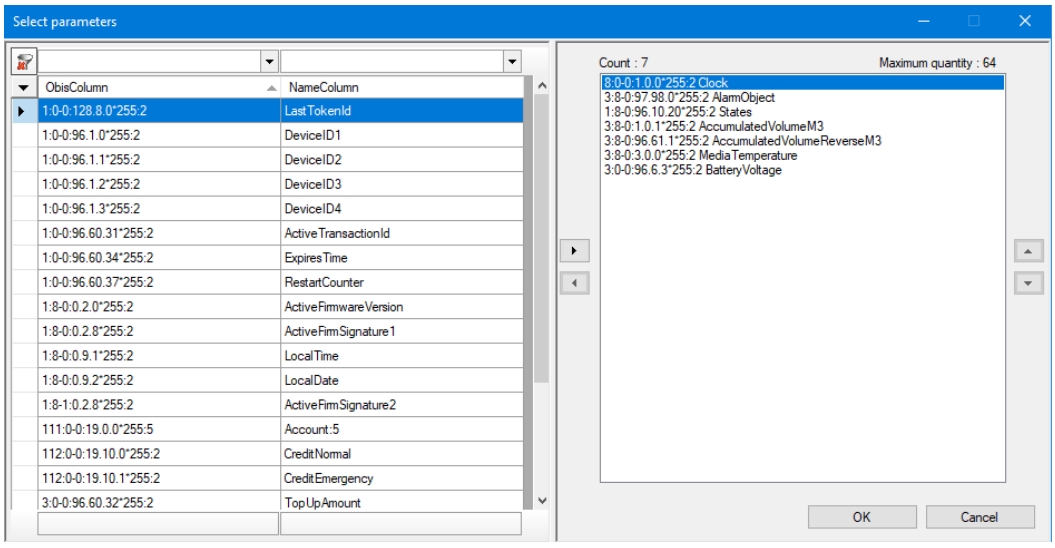
1. Go to ***Tools > Device Config > BillingProfile1*** to set billing profile.
2. In the **capture_objects** field click **<...>** to select parameters to control.



3. In the opened field select necessary parameters and click ***OK***.

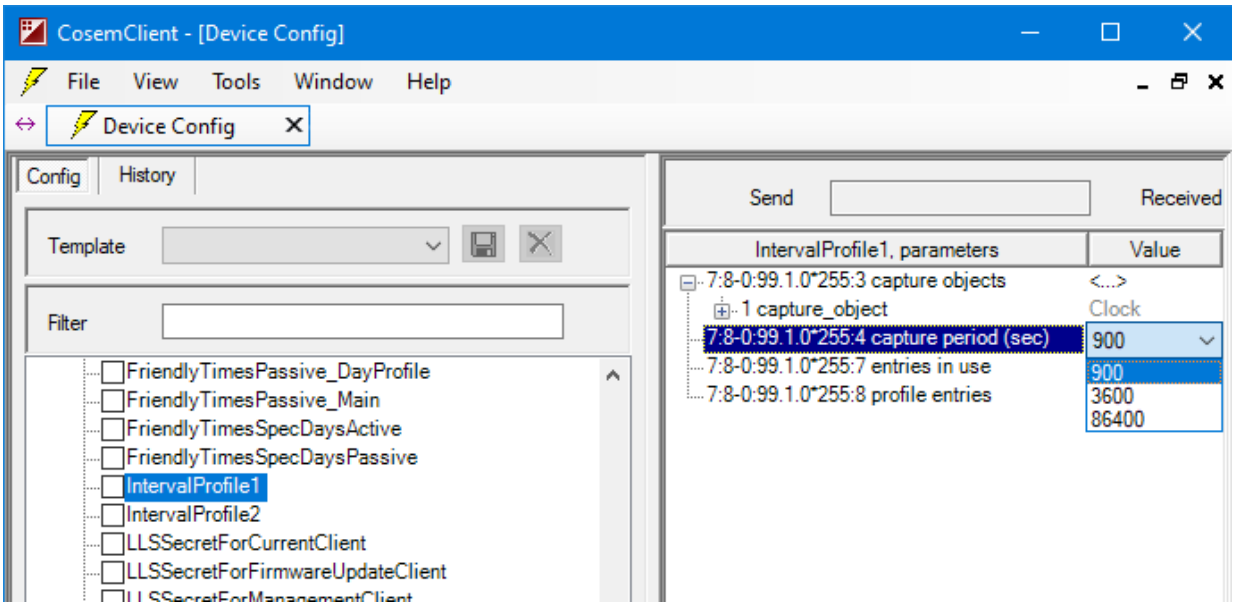
Clock parameter should obligatory be selected for all the profiles to register all the parameters with the time-stamp. **AlarmObject** is also recommended to be selected to get alarms on faults.

See section 7.4. Manage Events and Alarms.

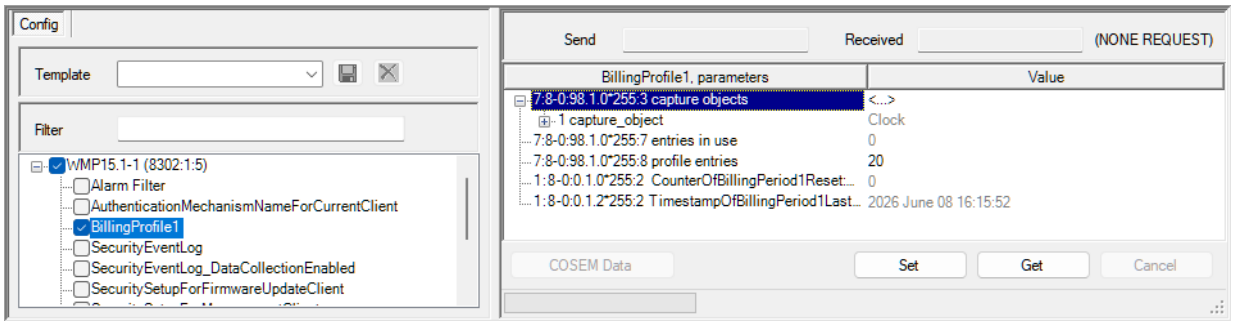


4. List of selected objects is displayed in the working part of the **Device config** window.
5. In the **capture period (sec)** field for I**ntervalProfile**X select respective interval period to capture data in seconds:
   - **900** – for 15 minutes;
   - **3600** – for hour;
   - **86400** – for day.

Note: Set of time intervals may differ for different meter types.



Exception for **Billing Profile 1** is done, for which period of data capturing is set to **00:00** of the first day of each month by default. Date of the previous billing profile capturing is indicated in addition in the **TimestampOfBillingPeriod1LastReset** field and/or number of billing profile resets is indicated in the **CounterOfBillingPeriod1Reset** field.



6. Leave the rest of parameters unchanged.
7. Click ***Set*** to send configuration for selected parameter.
8. To view received data for an interval, use **Profile Reader** command from the **Tools** menu.

   See section 10. Interval Data Request.

7.4 Manage Events and Alarms

During meter exploitation a lot of **events** are generated by the meter itself or by its environment. Every event has a unique **code** to identify the action, which has triggered it. Every event is assigned to one **event log** and is only stored there. This assignment is fixed and can't be changed dynamically. Therefore, the event filter is not visible from outside.

Depending on meter version it can support up to 11 types of event profiles, which correspond to respective event logs:

- **CommunicationEventLog** – contains all events related to communication.
- **FirmwareEventLog** – contains all events related to firmware change.
- **ManufactureSpecificEventLog** – contains events related to manufacturing.

  For example: reset of system, hard fault etc.
- **ManufactureSpecificEventLog_DataCollectionEnabled** – contains events related to data collection.
- **PaymentEventLog_CaptureObjects** - contains events related to capture objects.
- **PaymentEventLog_EntriesInUse** - contains events related to entries in use.

- **PaymentEventLog_ProfileEntries** - contains events related to profile entries.
- **SecurityEventLog** – contains events related to security.
- **SecurityEventLog_DataCollectionEnabled** – contains events related to data collection.
- **StandardEventLog** – contains all events not recorded in a special log.

  For example: changes of the configuration, clearing of profiles, all kind of self-check errors, alarms, directions of flow, dry/fill status, etc.
- **ValveEventLog** – contains all events related to valve.

  For example: valve close/open status, magnetic impact, valve communication etc.

A set of events taking place in the meter or in the system are treated as **alarms** or **errors**. If one of these events occurs, the corresponding flag is set in the respective **alarm** or **error register**.

All alarm flags in the alarm register remain active until the alarm register is cleared from the COSEM Client.

See section 7.4.3. Clear Alarm Register.

Each event log has filters that define events to be saved within it and sent or registered in session mode. Set of events for each event log depends on meter version. All supported events can be registered in the session mode at the same time or specified events (any of supported) can be selected.

All events selected to be transferred can be viewed in session mode as well by requesting proper Event Log using **Profile Reader** plugin.

Critical alarms such as a **burst** or **reverse direction of flow** can be sent in **session mode**, using the **Data Notification**, **Compact Frame**, or **Push Setup** plugins, as can lesser events such as a Bluetooth connection.

For more details about ADDAX meter errors and alarms handling, see References 1.

7.4.1 View Additional Registers to Be Captured on Event

When an event takes place, it is captured in the respective event log and is stored there with the respective timestamp, event code and another relevant information, if any. Simultaneously with this event any other meter parameter can be captured at the moment of event occurrence.

For example: client ID and interface ID for **Security Events Log.**

List of these parameters is set separately by the manufacturer for each event log but can be negotiated and revised on request. To view list of additional registers for each event log use **XLog** command, where **X** refers to respective type of event log.

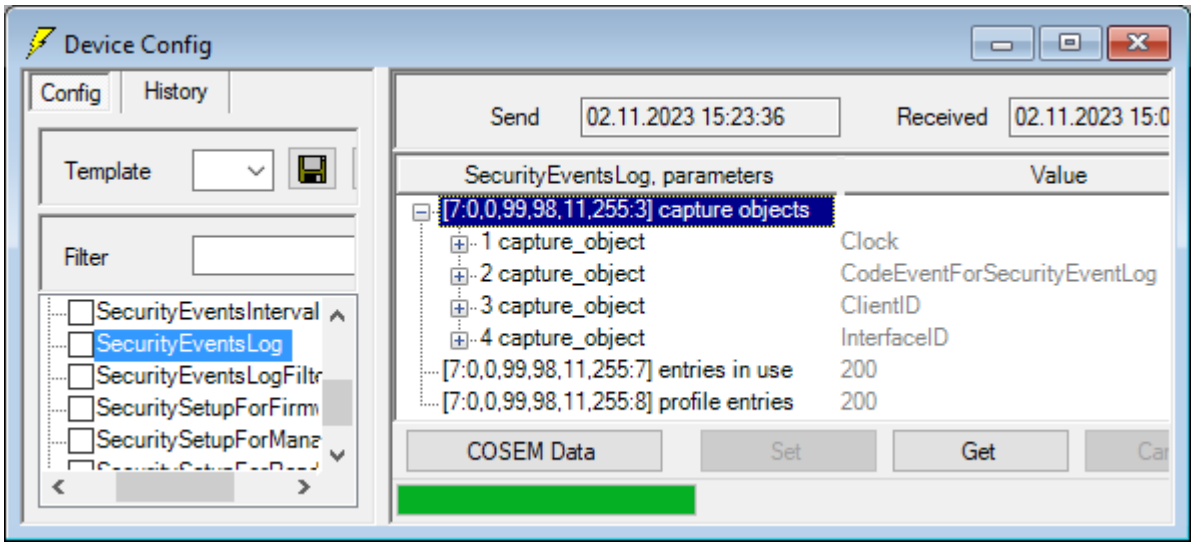
For example: **StandardEventLog.**

To view captured data on events together with the data on selected parameters use **Profile Reader** command from the **Tools** menu.

See section 9. Event Monitoring.

To select registers to be captured on an event, follow the next steps:

1. Go to ***Tools > Device Config> XLog.***
2. Click ***Get.***
3. In the opened window expand capture objects list.



4. List of selected parameters appears in the working part of the **Device Config** window in the **capture objects** list.
5. To view events from the respective event log together with data on selected parameters use **Profile Reader** command.

   See section 9. Event Monitoring.

7.4.2 Set Alarm Filter

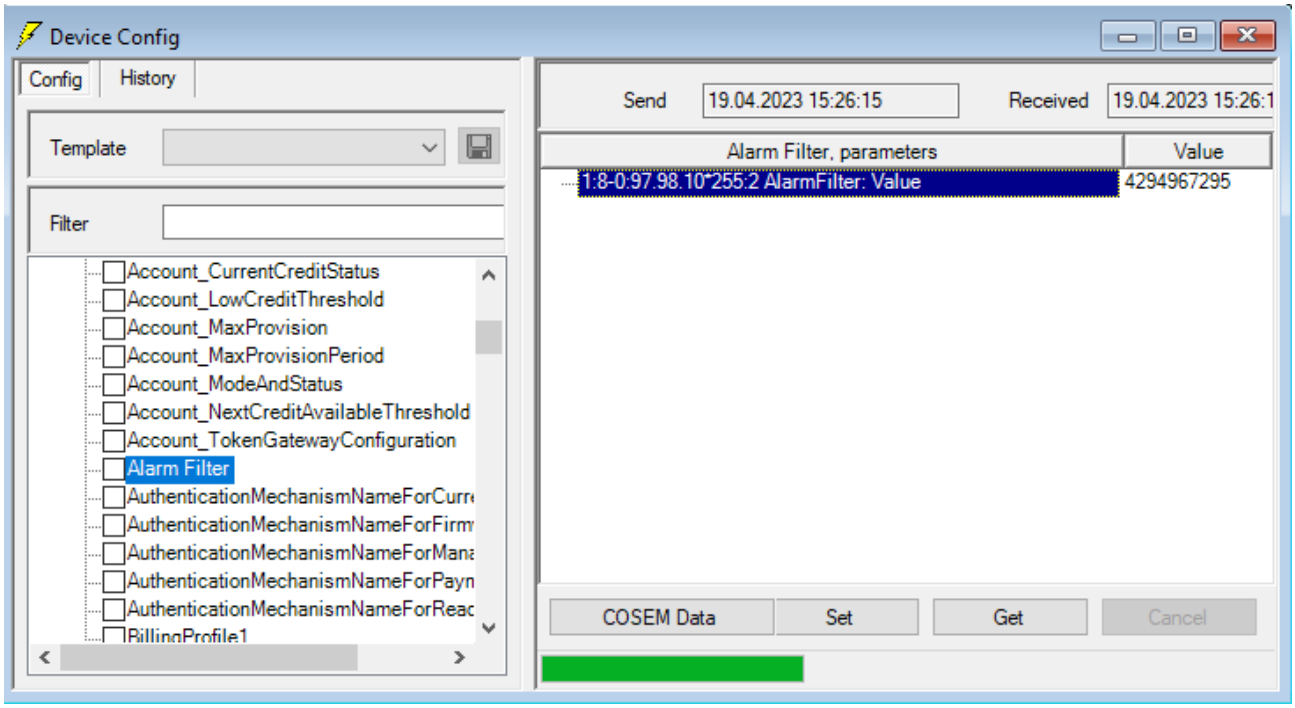
Depending on the Master Station needs and communication capabilities not all the possible alarms are wanted. Therefore, an alarm filter can be used to select only necessary alarms.

Alarm Filter defines if an event is handled as an alarm when it appears.

1. Go to ***Tools > Device Config> AlarmFilter.***
2. In the open window set flags for alarms you want to register.

   It is recommended to set **4294967295** value, the value which permits to register all types of alarms.

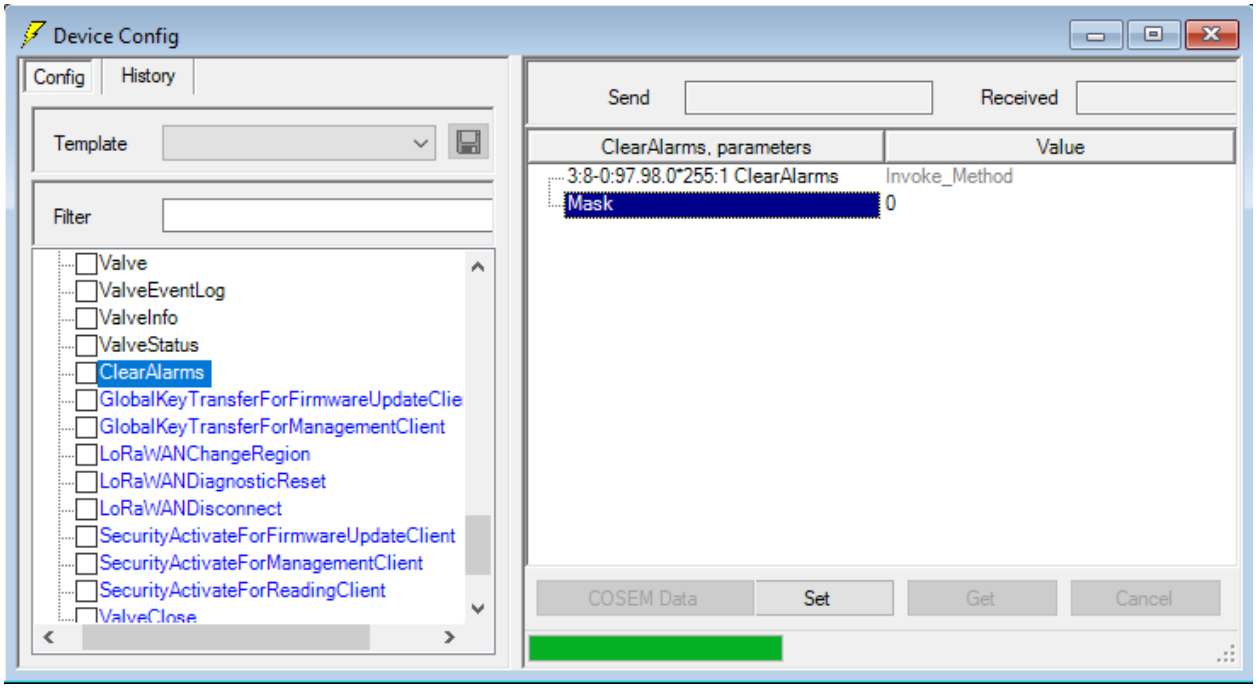
   If it is necessary to register specific values – address the **service centre**, please.
3. Click ***Set.***



7.4.3 Clear Alarm Register

To clear alarm register use **ClearAlarms** command.

1. Go to ***Tools > Device Config> ClearAlarms.***
2. In the open window set flags for alarms you want to clear**.**
3. Click ***Set.***



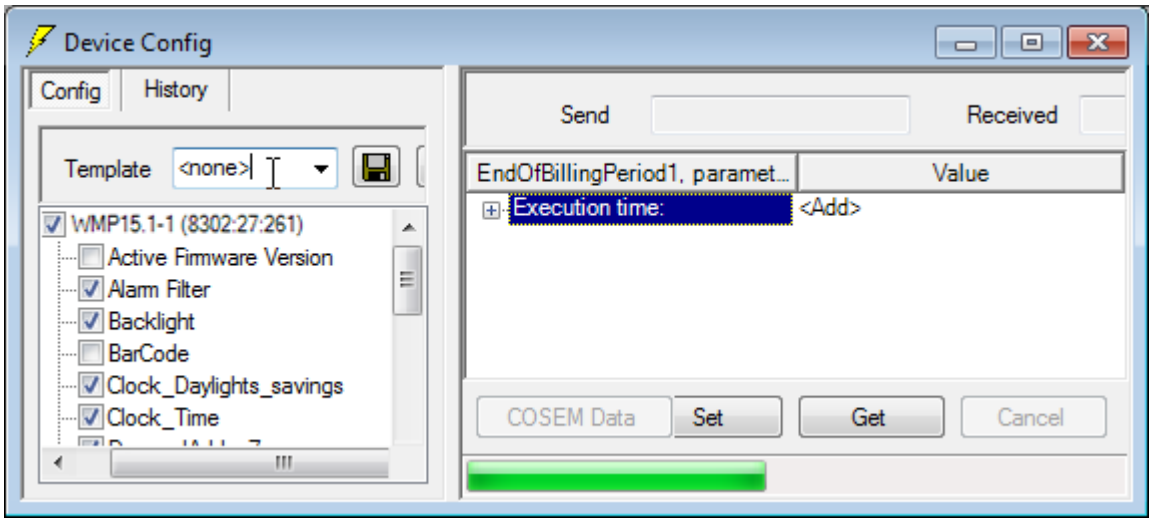
7.5 Configuration Templates

To create configuration templates **Device Config** plugin is provided.

Principle of setting configuration parameters is described in sections above.

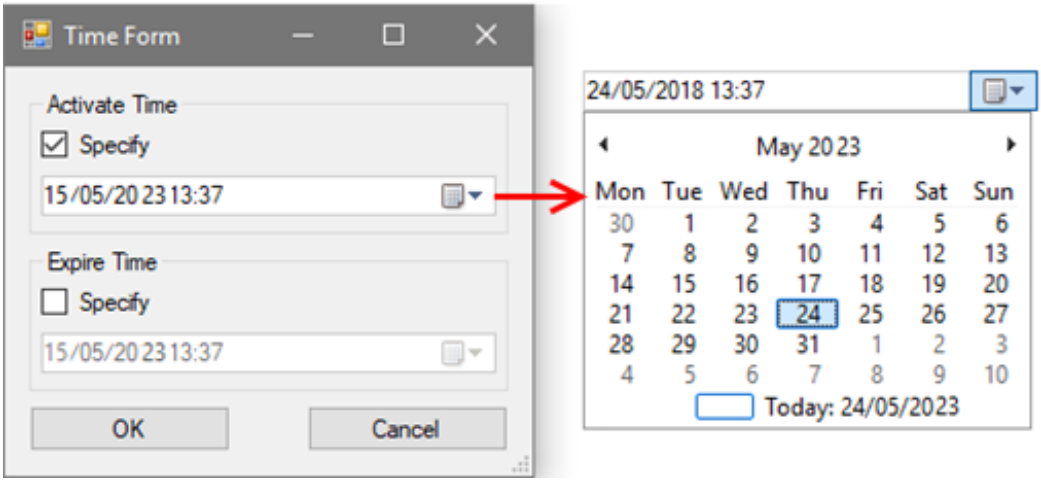
7.5.1 Create Configuration Template

1. Go to ***Tools > Device Config***.
2. Set necessary configuration settings, as it is described in sections above.
3. Select configurations to save.
4. In **Template** field click **<none>** and enter name of the template.



5. Click the **Save** button  .

6. In the open **Time Form** window indicate the time, when the template will be available for the user with **Assembler** role and the time, when the template will expire.



Note that if both **Specify** check boxes are cleared, then the template will be activated immediately and its 'lifetime' will not be limited.

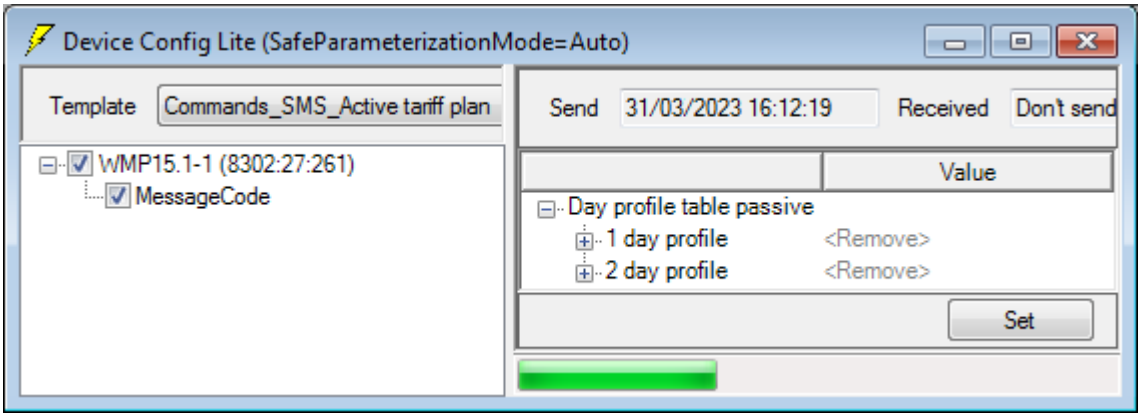
7. The configuration will be saved in the **CfgTemplates** subfolder in the folder where you installed the COSEM software.

   Note that only users with **Administrator** role can create and remove templates.

7.5.2 Use Configuration Template

Before you start to use **Device Config** plugin, make sure it is activated properly.

1. Go to ***Tools > Device Config***.
2. From the drop-down list in **Template** field select previously created configuration and click ***Set*** to activate it. The settings will be applied immediately after template activation.



3. Go to ***Tools > Device Config.***
4. Select parameters, specified in the template, and click ***Get.***
5. Verify that new settings are applied.

7.6 Manage Valve

The valve has states below: connected or disconnected.

The valve features the following operation modes:

- **Remote** – disconnection/reconnection by using remote (external) communication command.

  For example: over Bluetooth;

- **Local** – internal disconnection/reconnection by a function of the meter.

  For example: valve may be switched off, if a predefined burst is exceeded.

See Technical description for Flow control valve for more details about ADDAX meters valve operation.

Valve management includes the following steps:

1. Setting of valve operation mode.

   See section 7.6.1. Set Valve Control Mode.

2. Remote valve disconnection/reconnection by command.

   See section 7.6.2. Disconnect Valve and section 7.6.3. Reconnect Valve.

3. Analysis of the current state of valve.
   - Getting current physical valve state.
   - Getting current logical valve state.

   See section 7.6.4. View Current State of Valve.

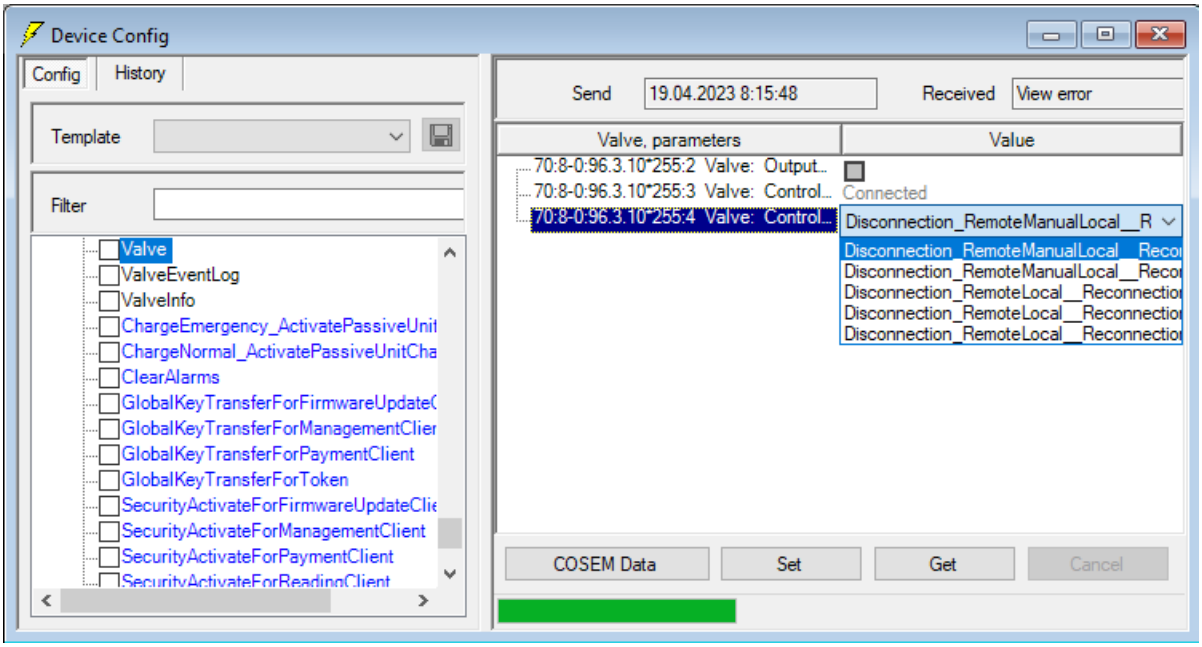
4. Viewing Disconnect Control Event Log.

   See section 9. Event Monitoring.

7.6.1 Set Valve Control Mode

To set valve control mode use **Valve** setting.

1. Go to ***Tools > Device Config > Valve.***



2. In the **Control mode** field select necessary control mode.

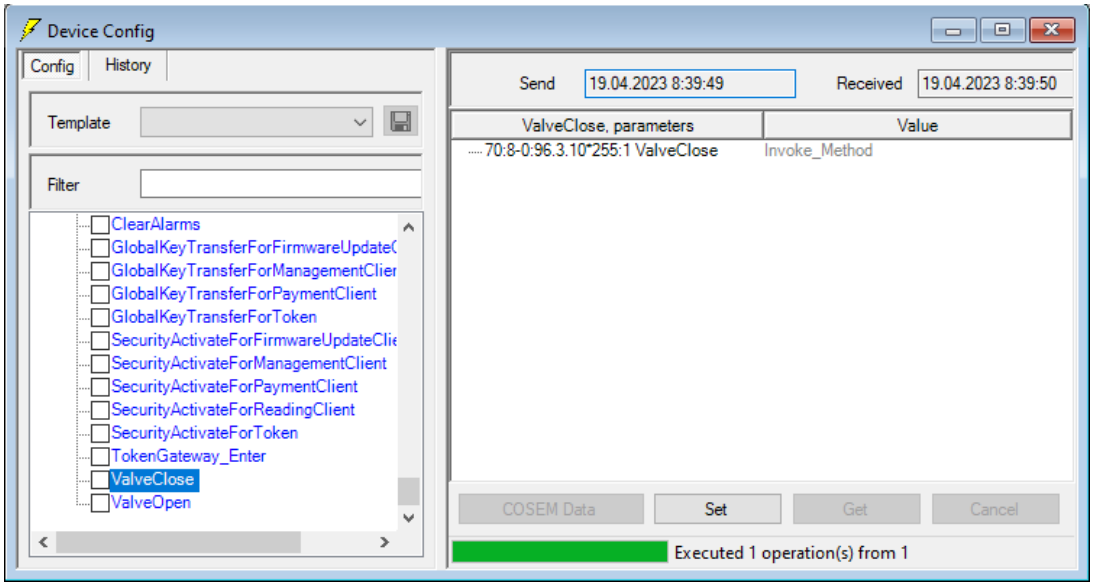
   See the Technical description for Flow control valve for a detailed description of valve control modes.

3. Click ***Set.***

7.6.2 Disconnect Valve

To disconnect the consumer using valve use **ValveClose** command.

1. Go to ***Tools > Device Config >*** **ValveClose.**



2. In the opened window click ***Set.***
3. After valve receives the command, it switches off. You may verify this by the characteristic sound.

7.6.3 Reconnect Valve

To reconnect the consumer using valve use **OpenValve** command.

Valve is reconnected according to control mode.

See the Technical description for Flow control valve for details about valve operation in different control modes.

1. Go to ***Tools > Device Config > OpenValve***.
2. In the opened window click ***Set*** (by analogy with that, described above for valve disconnection).

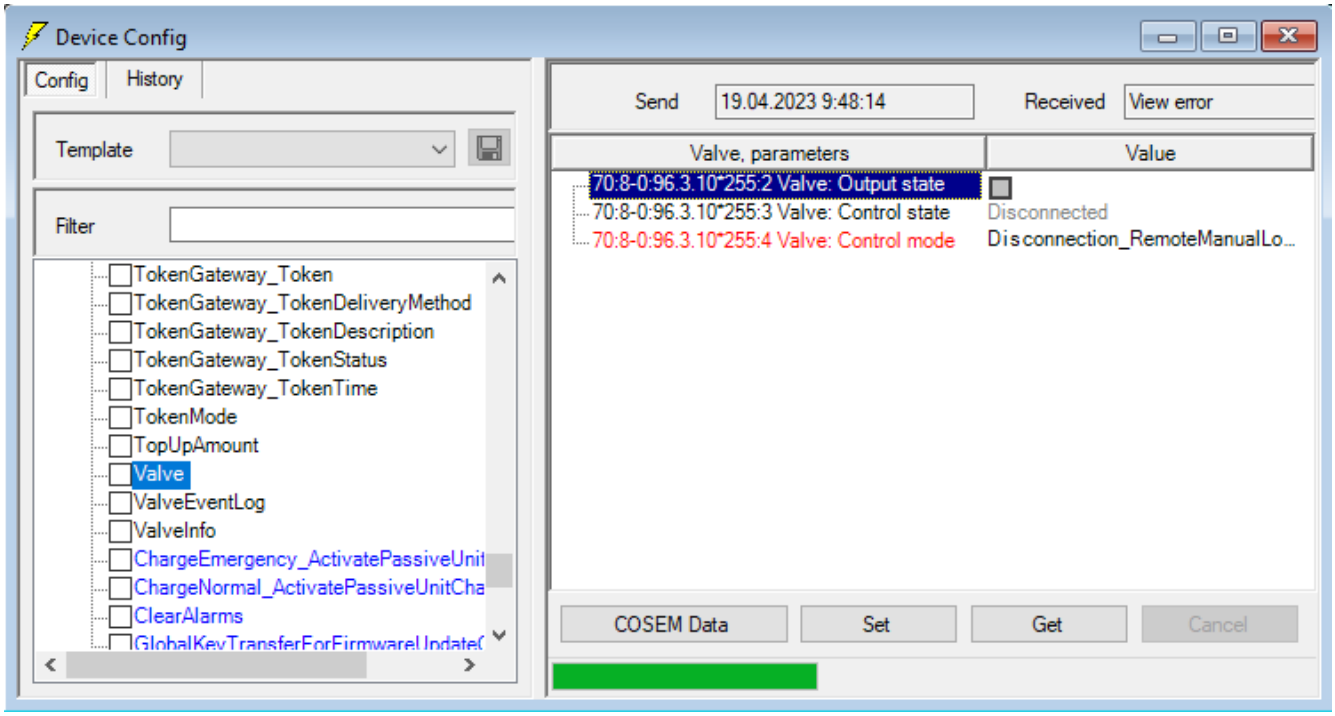
   See section 7.6.2. Disconnect Valve.
3. After valve receives the command, it opens on according to configured operation mode. You may verify this by the characteristic sound.

7.6.4 View Current State of Valve

To view current state of the valve use **Valve** command.

If valve is disconnected, you may see the current cause of disconnection in the following way:

1. Go to ***Tools > Device Config > Valve***.



2. In the opened window click ***Get***.
3. In the **Output state** field actual physical state of the valve is displayed: selected check box for **connected state**, empty check box for **disconnected state.**
4. In the **Control state** field internal (logical) state of the disconnect control object is displayed: disconnected, connected.
5. In the **Control mode** field current valve operation mode is displayed.

7.7 View/Edit Settings of LoRaWAN

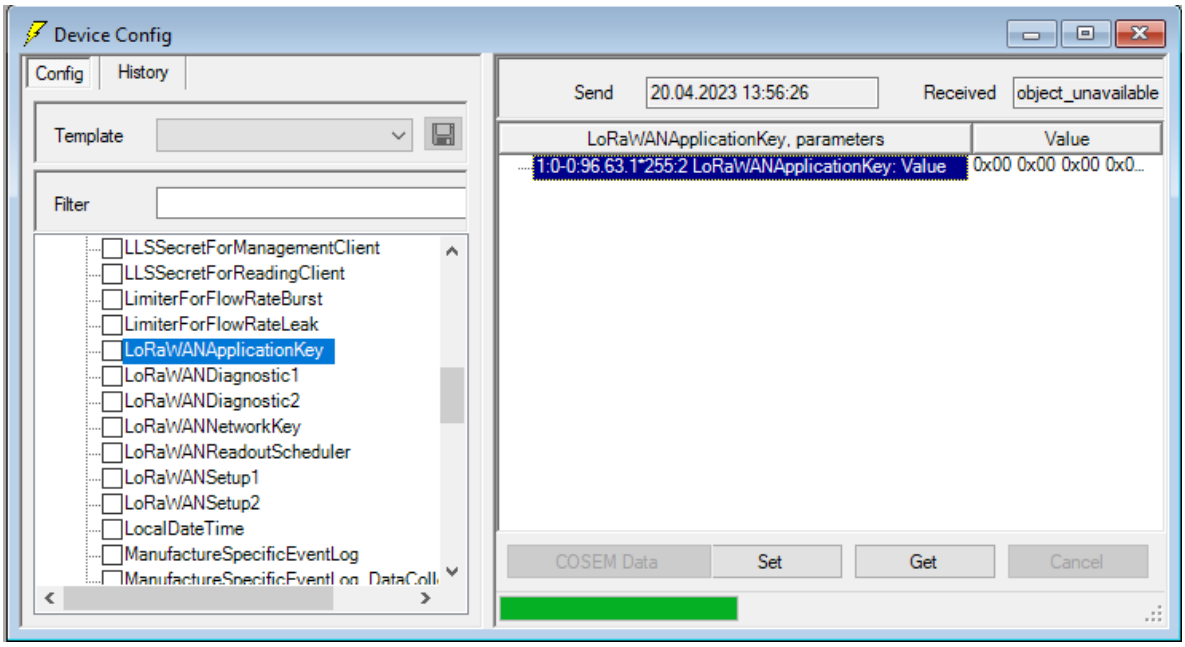
ADDAX meter provides communication via the **LoRaWAN** networking protocol.

Sections below describe some common settings, necessary for operation with it.

7.7.1 View Current Application/Network Key of LoRaWAN

Use ***LoRaWANApplicationKey/ LoRaWANNetworkKey*** option to view current application/network key of networking protocol.

1. Go to ***Tools > Device Config > LoRaWANApplicationKey*** or ***Tools > Device Config > LoRaWANNetworkKey.***
2. Click ***Get.***
3. Window, that opens, displays the following information:

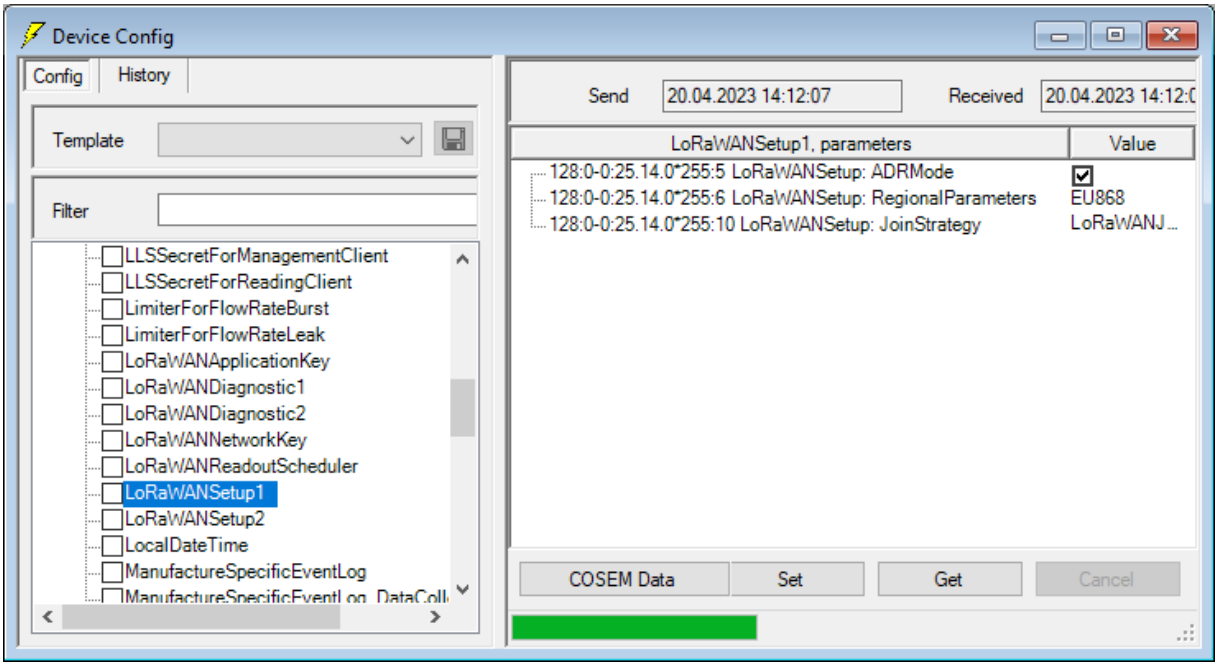


- **value** – current application/network key for LoRaWAN.

7.7.2 Edit Settings of LoRaWAN

Use **LoRaWANSetup1** option to view/edit current settings of LoRaWAN.

1. Go to ***Tools > Device Config > LoRaWANSetup1.***
2. Click ***Get.***
3. Window, that opens, displays the following information:



- **ADRMode** – is a mechanism for optimizing data rates, airtime and energy consumption in the network, it needs to be applied;
- **RegionalParameters** – frequency plan depends on regional parameters, that why it is necessary to verify identification of LoRaWAN channel plans for a given country. In some countries, more than one frequency plan may be used;
- **JoinStrategy** –meter to LoRaWAN join strategy.

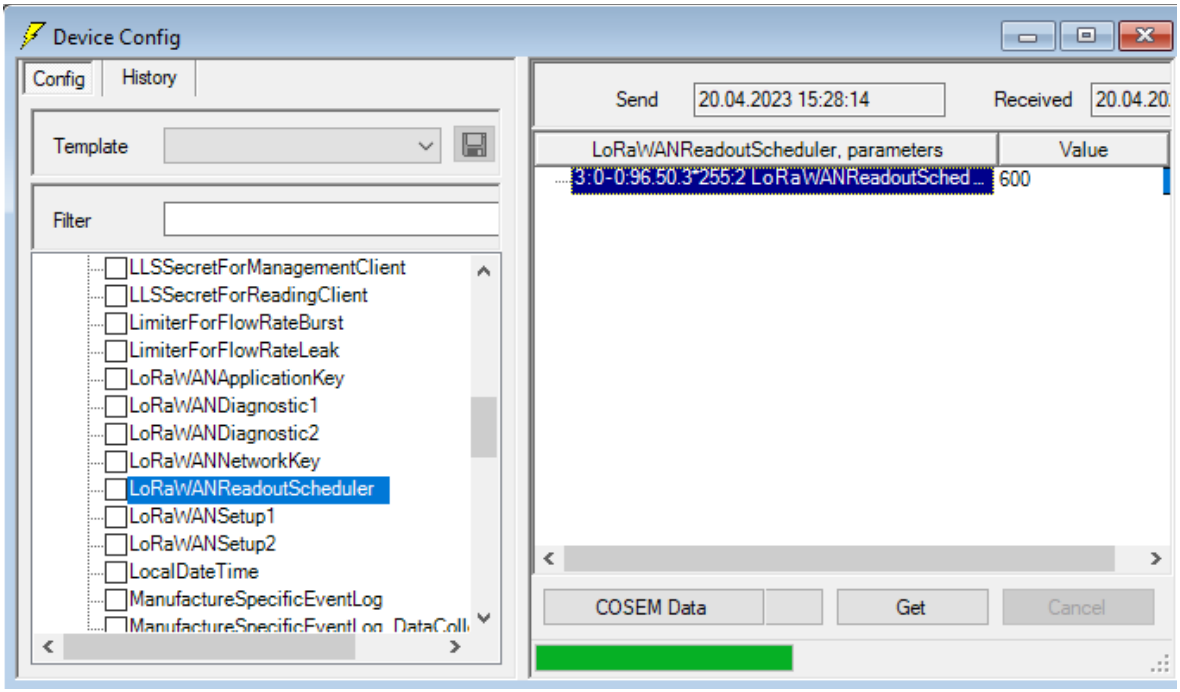
4. You may use **Direct readout** command from the ***Tools*** menu and select the same parameters to view actual values, if necessary.

See section 8.1. Request Current Data.

7.7.3 Edit LoRaWANReadoutScheduler

To edit scheduler of communication over LoRaWAN, use **LoRaWANReadoutScheduler** command.

1. Go to ***Tools > Device Config > LoRaWANReadoutScheduler***.
2. In **Value** select: value for time in seconds, maximum value is 21600 s (6 hours).
3. Click ***Set.***



7.8 View/Edit Settings of LEAK/BURST objects

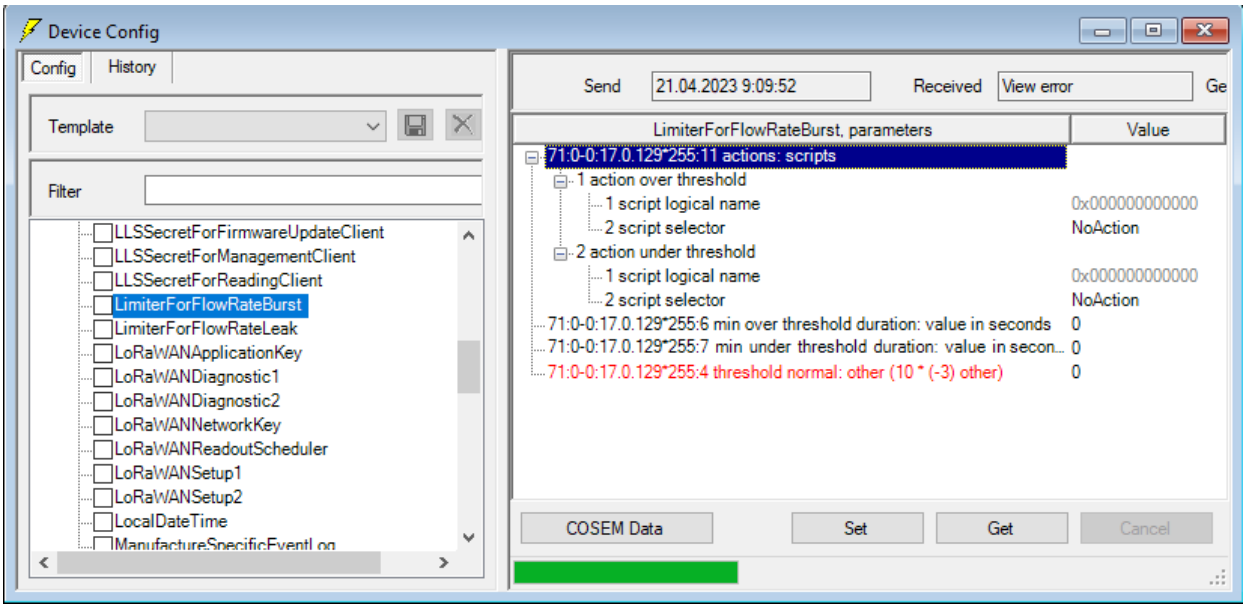
ADDAX meter provides possibility to manipulate with limiters related objects such as: leak and burst.

Sections below describe some common settings, necessary for operation with they.

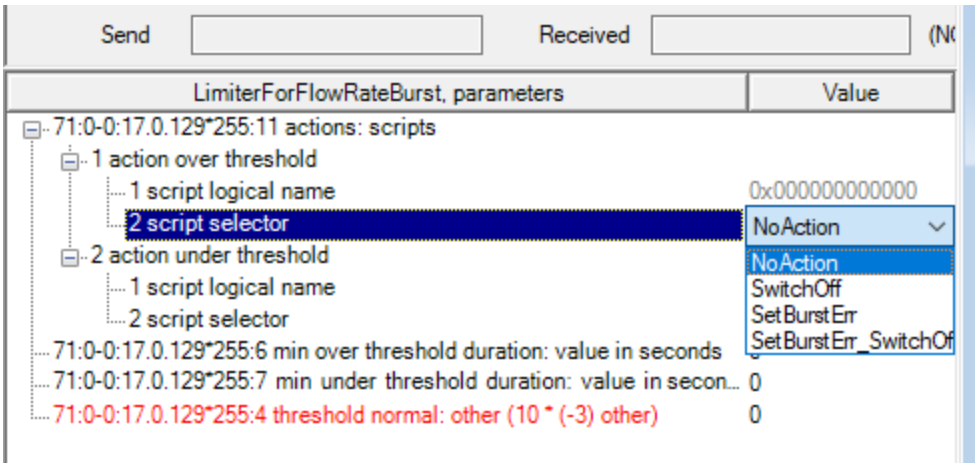
7.8.1 Edit Settings of Burst

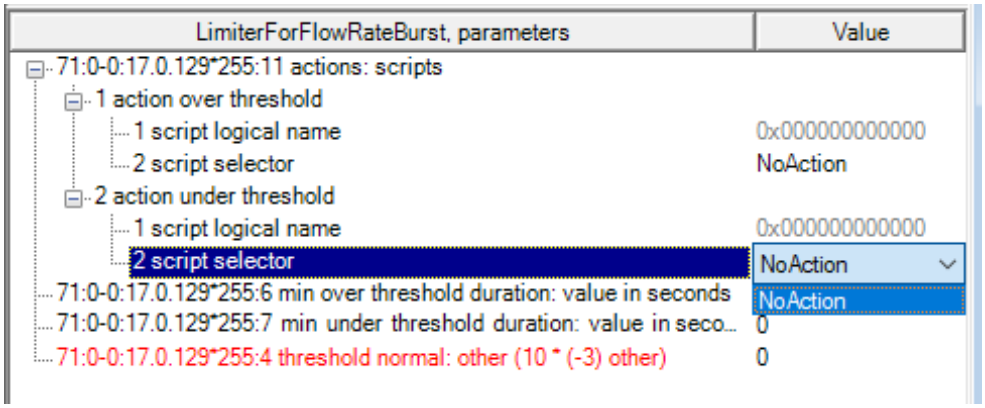
Use **LimiterForFlowRateBurst** option to view/edit current settings of Burst.

1. Go to ***Tools > Device Config*** **> LimiterForFlowRateBurst.**
2. Click ***Get.***
3. Window, that opens, displays the following information:



- **Action: over threshold and under threshold –** usually „**Burst**" situations require higher Threshold and lower Duration over/under Threshold in order to avoid dramatical damages. Different variants of actions you can see further:



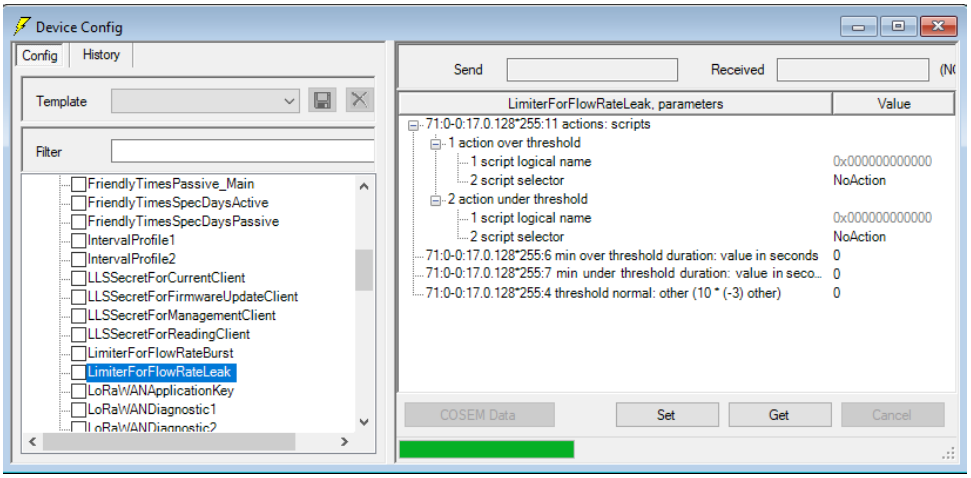


- **Min over threshold duration, value in seconds** – represents time interval for flowrate exceeding the Burst threshold after which a "**Burst On**" event is registered;
- **Min under threshold duration, value in seconds** – represents time interval for flowrate under the Burst threshold after which a "**Burst Off**" event is registered, while "**Burst On**" event has been already detected and registered previously;
- **Threshold normal** – threshold for Burst event which represents Limiter for Flowrate (liters/hour).

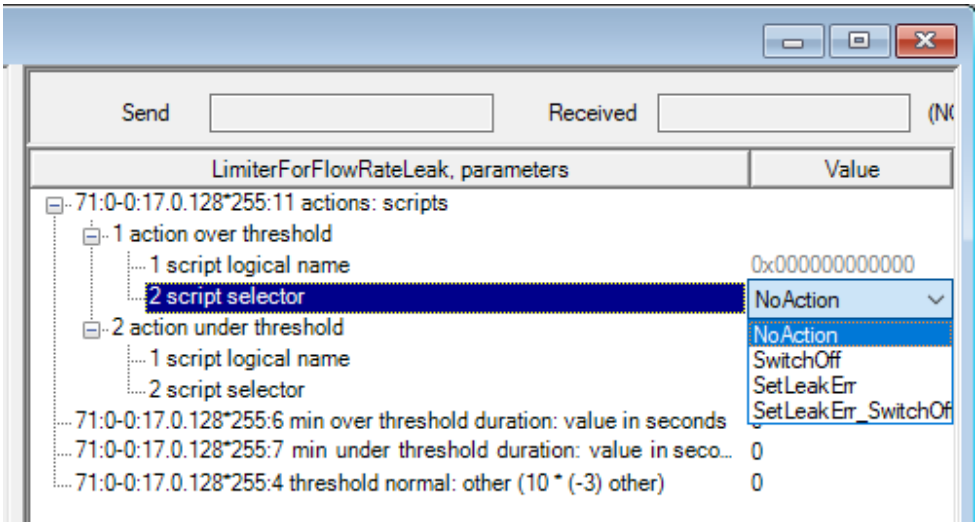
7.8.2 Edit Settings of Leak

Use **LimiterForFlowRateLeak** option to view/edit current settings of Leak.

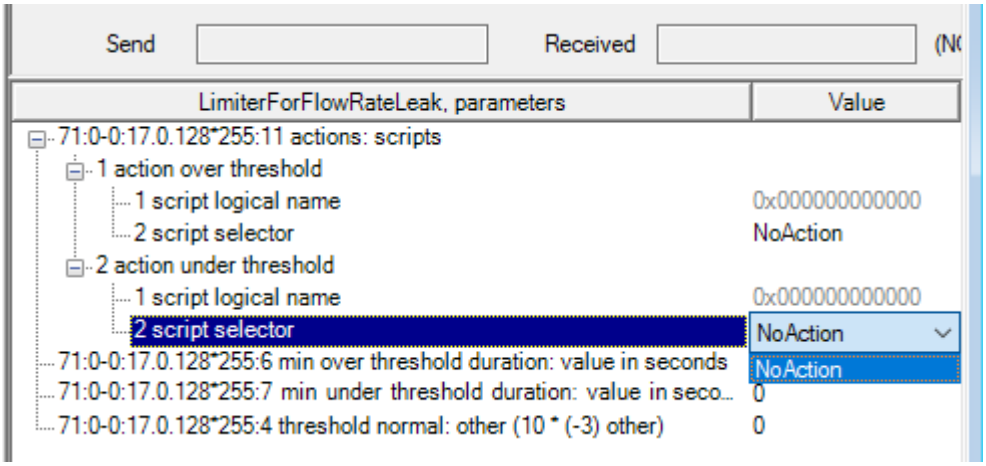
4. Go to ***Tools > Device Config*** **> LimiterForFlowRateLeak.**
5. Click ***Get.***
6. Window, that opens, displays the following information:



- **Action: over threshold and under threshold –** usually „**Leak**" situations require lower Threshold and higher Duration over/under Threshold in order to avoid "**false**" alarms due to water consumption specifics. Different variants of actions you can see further:



- **Min over threshold duration, value in seconds** – Represents time interval for flowrate exceeding the Leak threshold after which a "**Leak On**" event is registered;



- **Min under threshold duration, value in seconds** – Represents time interval for flowrate under the Leak threshold after which a "**Leak Off**" event is registered, while "**Leak On**" event has been already detected and registered previously;
- **Threshold normal** – threshold for Leak event which represents Limiter for Flowrate (liters/hour).

8. Current Data Reading

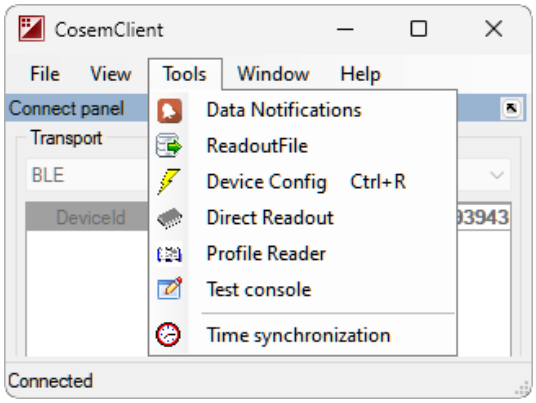
COSEM Client provides **Direct readout** plugin for current data reading and managing respective reports.

For example: you may export a file with the current data in the **.xls* or **.pdf* formats or print the report itself.

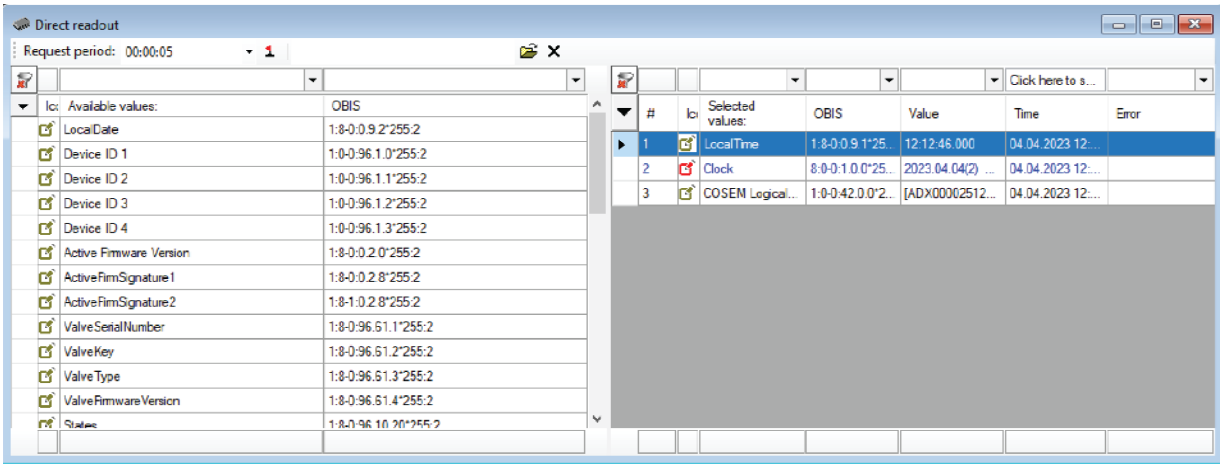
8.1 Request Current Data

Direct readout command gives possibility to read meter actual data. Periodicity of data request may be configured from 1 second up to 30 minutes. COSEM Client may request a single parameter or a group of parameters with the periodicity set.

1. Run ***Cosem Client > Tools > Direct Readout***.



2. In the open **CosemClient – [Device Readout]** window in **Request period** field select periodicity of data request (instantly or up to 30 minutes).



3. In the left navigation window list of **Available values** opens. Different COSEM objects are marked with the symbols of different colours:

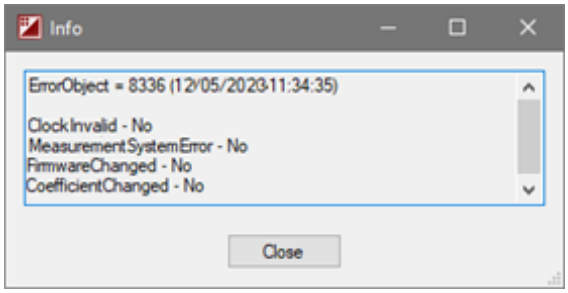
   - *blue* – register
   - *green* – extended register
   - *red* – clock
   - *khaki* – data.

4. To view current data for a value, drag-n-drop it to the right window or double-click it. To remove a parameter from this table, drag-n-drop it to the left window or double-click it.

5. In the right window table with current data for selected parameters will be displayed. Data may be high lightened with different colours:

   - *black* – actual data (data was requested according to Request period, but remained the same)
   - *blue* – changed data (data was requested according to Request period and was updated)
   - *red* – error.

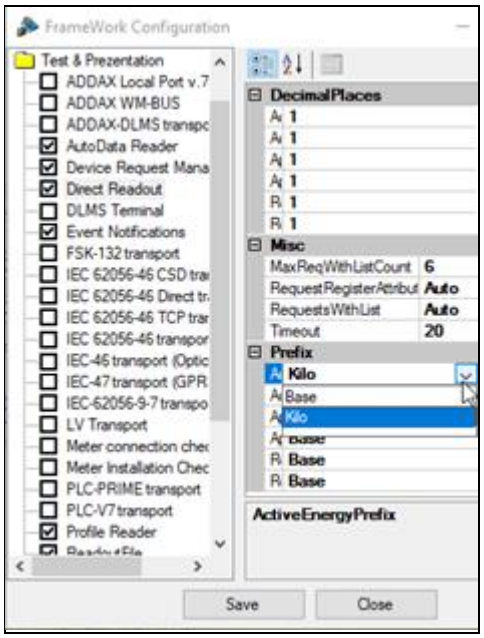
6. Additional info can be viewed for the certain values (**Alarm Filter**, **AMRProfileStatusForIntervalProfile1, AMRProfileStatusForIntervalProfile2, States**) selected from the **Available values:** list. For this click one of the certain value in the right list and then click the **Flag** button .



Flow rate and volume values can be displayed in base measuring units (m^3/h, l).

To change the measuring unit type, configure **PlgCfg** as follows:

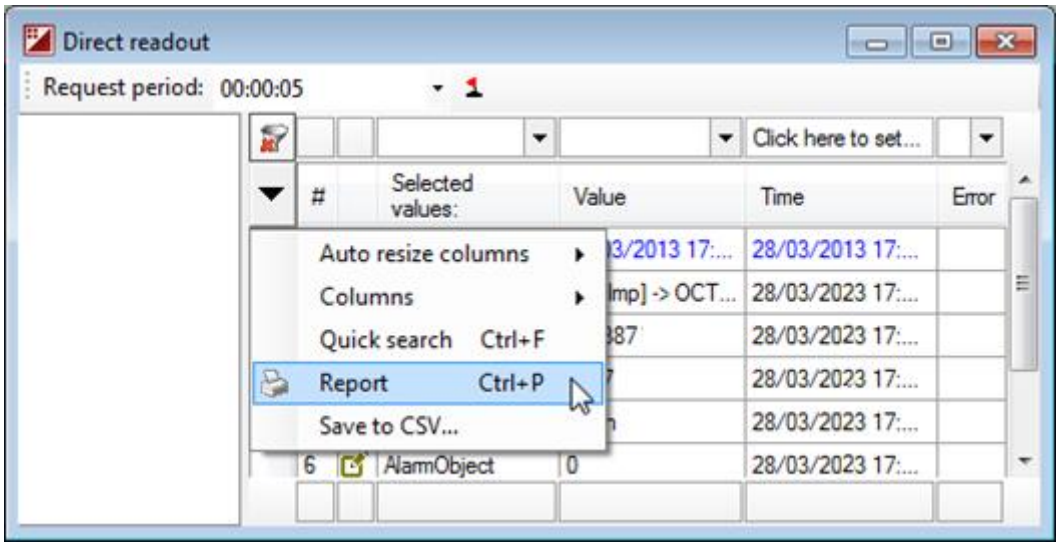
1. Launch ***PlgCfg*** file from the folder you installed COSEM software.
2. Click ***Show Config…***.
3. Open **Test & Presentation** folder.
4. From the opened tree select **Direct Readout.**



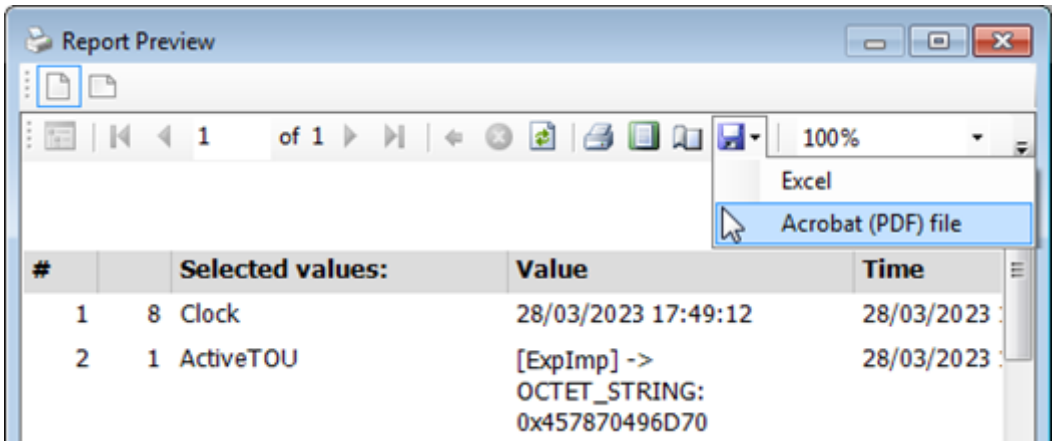
5. In the right-hand window select needed parameter and set the measuring units (Base or Kilo) using drop-down arrow.
6. Save the configuration and exit ***PlgCfg***.
7. Now you can launch COSEM Client and read the parameters in selected format.

8.2 Export Reports on Current Data

1. Repeat steps 1-4 from the section 8.1 Request Current Data.
2. In the upper left corner of the table with the data click and select **Report.**



3. A window opens with the standard commands for report export and printing:



-  - print;
-  - print layout;
-  - page setup;
-  - export.

4. Click necessary file format and indicate the path to export it on the local computer or a computer from the local network.

9. Event Monitoring

Event logs contain all the events generated by the meter itself or by its environment. Every event has a unique code to identify the action, which has triggered it. Every event is assigned to one event log (event filter) and is only stored there.

ADDAX water meters support **session mode** of events messaging.

- **session mode** – events are registered in the proper Event Log and can be viewed by requesting the proper profile. To view events from the event logs **Profile Reader** plugin is provided within the COSEM Client application.

  See section 9.1. View Data on Events in Session Mode.

In the context of this document support of session mode may be demonstrated using COSEM Client as the Master Station and by establishing communication with meter over Bluetooth channel (using Bluetooth Adapter).

See section 2.1. Communication via Bluetooth Nano USB Adapter (Bluetooth Adapter).

To view reports on events specified filters should be set first and relevant mode of events messaging should be selected.

For more details about ADDAX meter events handling, see References 1.

The **timing of sending** critical alarm messages depends on the **communication channels** and **settings** used.

For example:

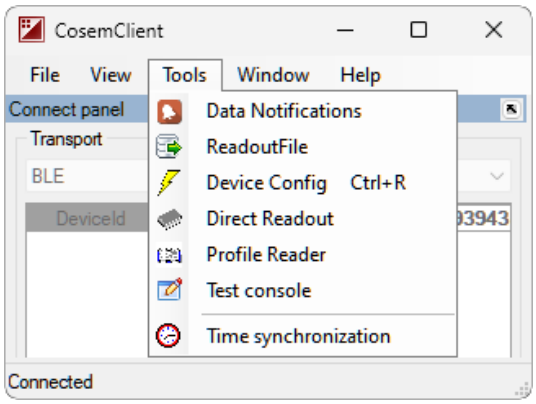
- communication channel **BLE** – by request.
- communication channel **LoRaWAN** – immediately.
- communication channel **wM-Bus** – every 20 seconds (session by schedule).
- communication channel **NB-IoT** – every 60 seconds.

9.1 View Data on Events in Session Mode

COSEM Client provides **Profile Reader** plugin for event logs and event profile monitoring in session mode and managing respective reports.

For example: you may export a file with the event log in the **.xls* or **.pdf* formats or print the report itself.

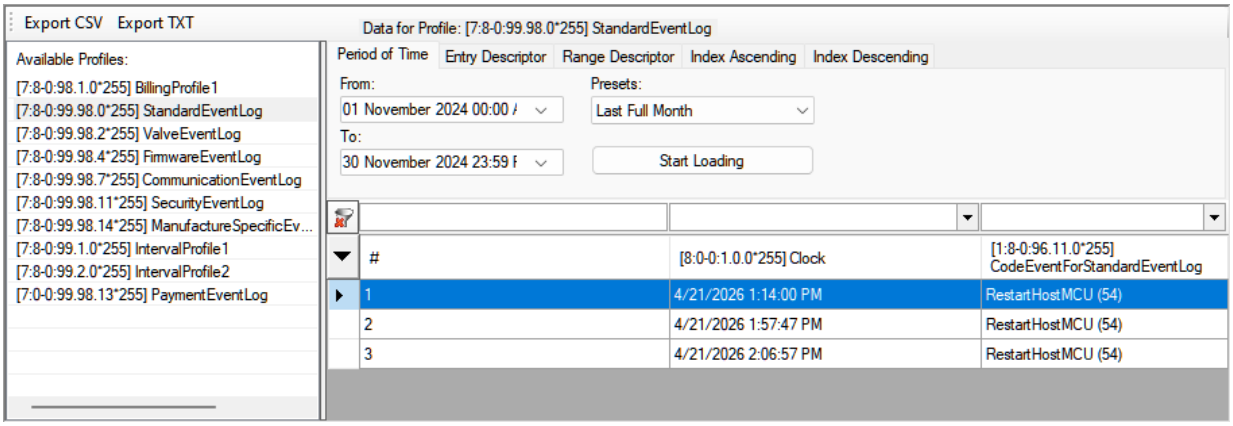
1. Run ***Tools > Profile Reader.***



2. **Profile Reader** window opens. It displays list of all meter profiles, including event logs and event profile in the left part.

   See section 7.4. Manage Events and Alarms for description of the event logs.

3. Click necessary profile. Wait until request process completes and event log removes its **Working** status.



4. The right part of the window displays the last 3 events from the requested event log. Event data contains timestamp and description of the event itself and its code. Additionally, other meter parameters may be displayed in the report, if they were selected previously to be captured on respective event.

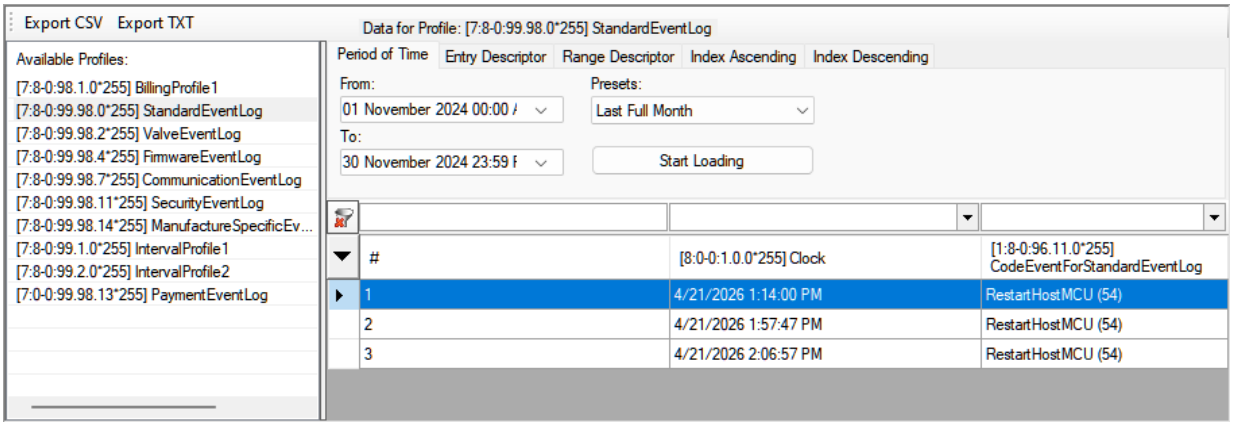
   See section 7.4.1. Select Registers to Be Captured on Events.

5. Use **Period of Time** tab if it is necessary to read data from a list of predefined time presets.

   For example: *Last Full Month* or *Last Full Week*.

   In the **Presets** field select necessary time interval or enter a period within 2 dates in the **From** and **To** fields.

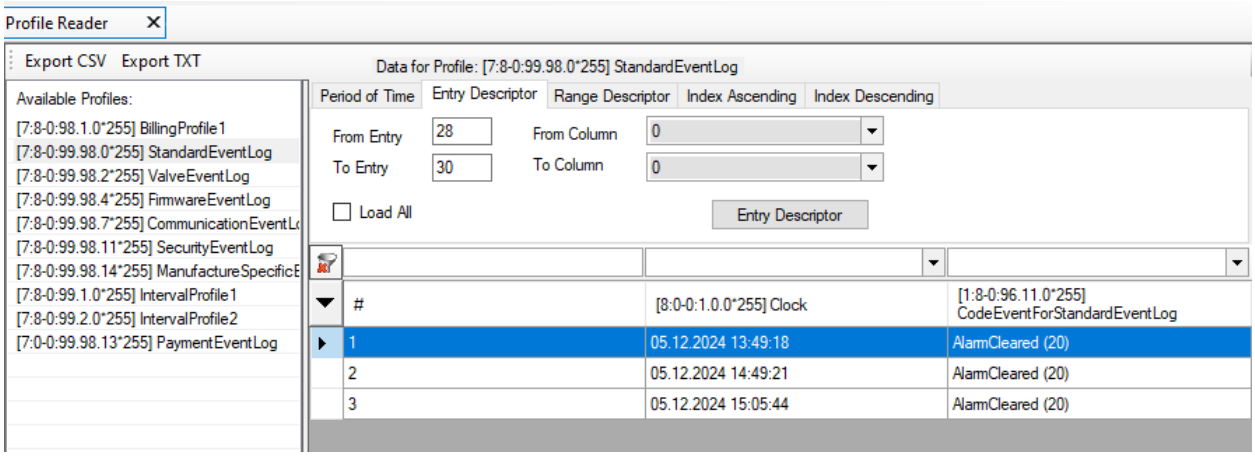
   Click ***Start Loading.***



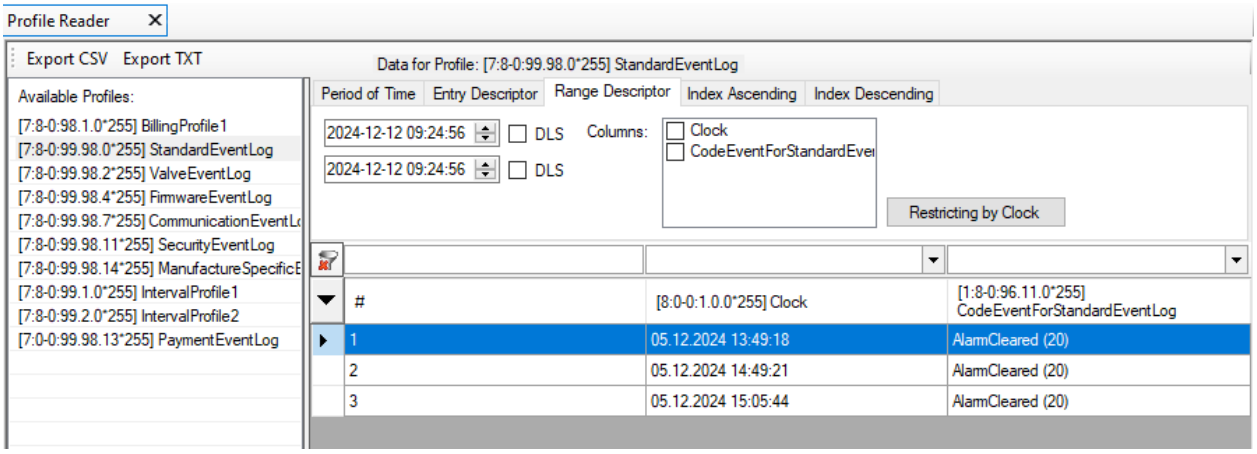
6. Use **Entry Descriptor** bookmark if it is necessary to change default number and type of event entries to display.

   In the **From Entry** and **To Entry** fields change entries numbers and/or in **From Column** and **To Column** fields select necessary columns.

   Click ***Entry Descriptor***. Or select **Load all** and click ***Start Loading*** to load the full list of events.



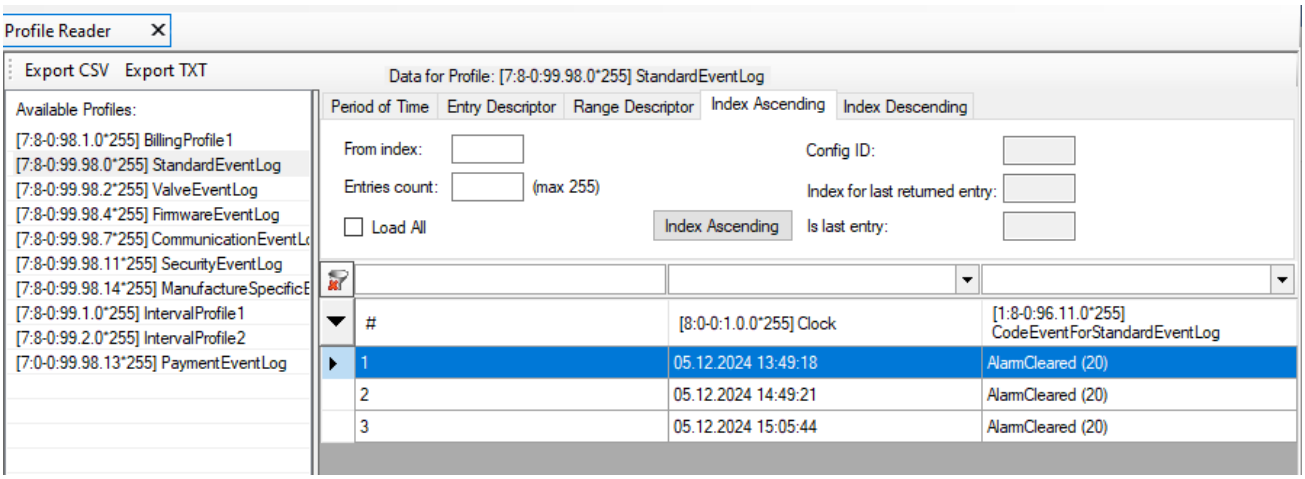
7. Use **Range Descriptor** bookmark, if necessary, to sort events by time and type. In its left part indicate time interval to display events, and/or in **Columns** field enter columns to display.



8. Use **Index Ascending** or **Index Descending** tabs if it is necessary to get all data stored in meter event log profiles.

   Select **Load All** and click ***Index Ascending*** or ***Index Descending*** for this.

   Use filters **From index** or **Entries count** to get specified range of entries.



9.2 Export Reports on Events

Order to export reports on events includes standard operations for file export.

1. Repeat steps from the section 9.1. View Data on Events in Session Mode.
2. Follow operations, described in steps 2-4 section 8.2 Export Reports on Current Data.

10. Interval Data Request

COSEM Client provides **Profile Reader** plugin for interval data requesting and managing respective reports.

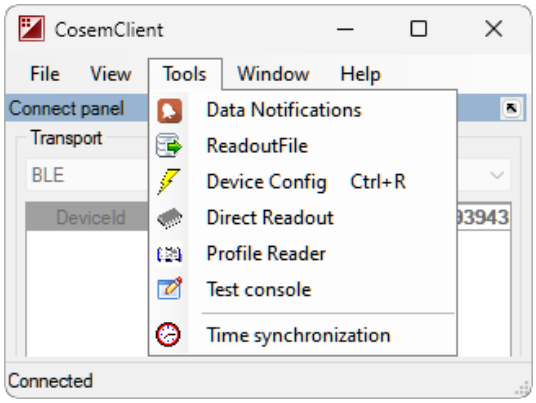
For example: you may export a file with the interval data in the **.xls* or **.pdf* formats or print the report itself.

10.1 Request Interval Data

Use **Profile Reader** command to request interval data from respective interval profiles, to which meter is subscribed.

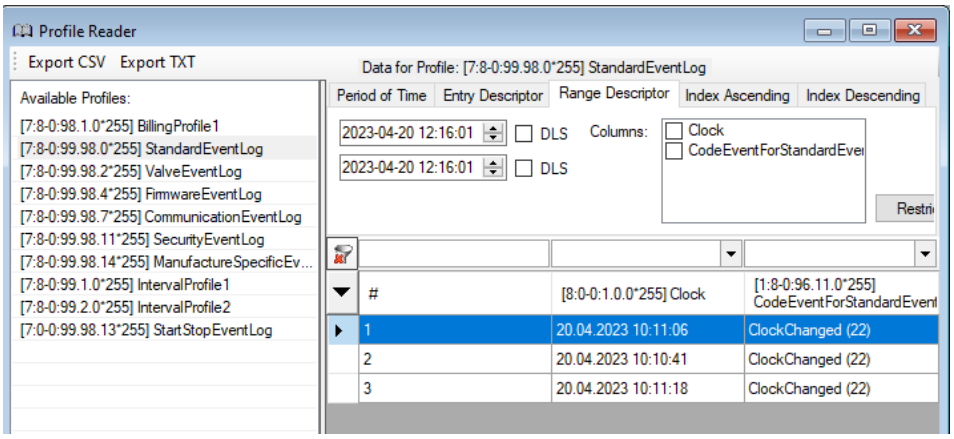
See section 7.3.1. Set Interval and Billing Profiles.

1. Run ***Tools > Profile Reader.***



2. **Profile Reader** window opens. It displays list of all meter interval profiles in the left part.
3. Click the profile to get its interval data. Wait until request process completes and profile changes its **Working** status.
4. The right part of the window displays the last 3 interval data from the requested profile with a timestamp.
5. Use **Period of Time, Entry Descriptor, Range Descriptor, Index Ascending** and/or **Index Descending** tabs for easy view of interval data.

   See section 9.1. View Data on Events in Session Mode.



10.2 Export Reports on Interval Data

Order to export reports on interval profiles includes standard operations for file export.

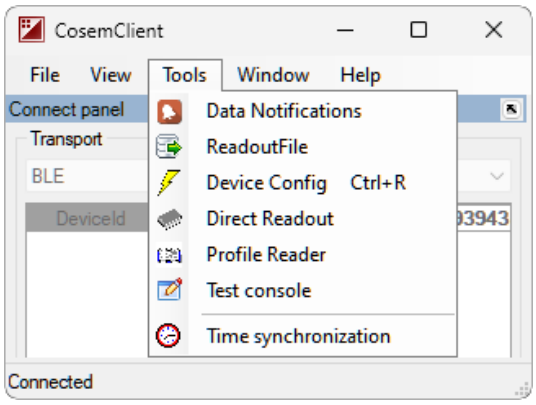
1. Repeat steps 1-4 from the section 10.1 Request Interval Data.
2. Follow the operations, described in the steps 2-4 from the section 8.2 Export Reports on Current Data.

11. Read and Save Data on Meter Profiles and Configuration

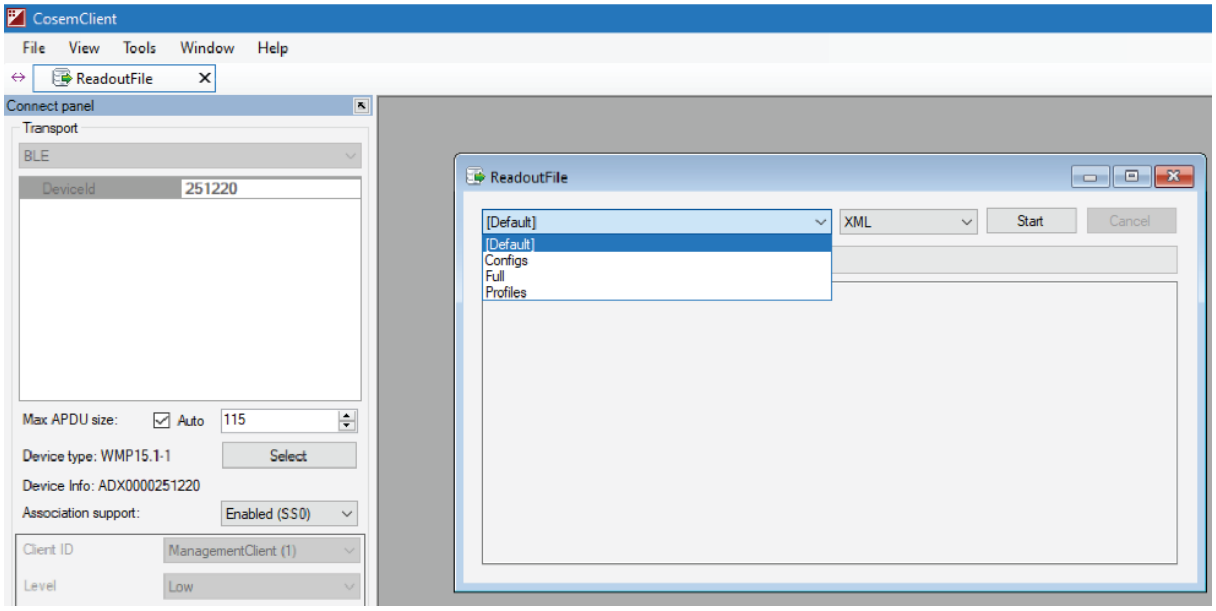
ReadoutFile module gives possibility to retrieve the meter data on events, profiles and configuration, as selected. Obtained data is automatically saved in the default or specified file in a specified format.

11.1. To read the data

1. Run ***Cosem Client > Tools > ReadoutFile***.



2. Select the data type to be requested from the **(Default)** drop-down list:



3. Select the data file format from the **XML** drop-down list.
4. Click **Start**, to start report retrieval.
5. In the open window enter the file name and indicate the place on the PC, the data file to be saved. Click **Start** to launch the data requesting process or click **Cancel**, to cancel the process.
6. If **Start** was clicked in the previous step, then the process will be launched. To cancel already started process , click **Cancel**.

Depending on the result of the data retrieval process, the following text messages are displayed in the field of the **ReadoutFile** window to inform a user:

- **User cancelled** – if in the step 6, **Cancel** was clicked.
- **Finished** – if report exporting was finished with success.
- **Disconnected** – if after clicking **Save** in the step 6, the connection was interrupted.

Each data file type contains DLMS/COSEM descriptions of requested data (class_id, logical name, attribute_id) and responses received from meter.

The structure of the exported XML, CSV and TXT files is described below:

11.2. XML structure

Note that the full XML file structure is described by XML schema defined in the P3.2.xsd file.

Following important XML tags are described below:

- **MeterAccess** - Root tag
- **MeterReferenceList / MeterReference** - LDN of requested meter
- **CosemAccessList** – contains a list of CosemAccess elements
  - ✓ **CosemAccess** - CosemAccess elements provide generic access to DLMS/COSEM services in the meters. With CosemAccessDescriptor the required service is defined and CosemAccessResult provides the results of the service invocation (see below).
    - **CosemAccessDescriptor / GetAccessDescriptor -** DLMS/COSEM service GET is supported with GetAccessDescriptor. CosemAttributeDescriptor is used to define attributes (classId, InstanceId and attributeId) of the COSEM object instance that is accessed.
    - **CosemAccessResult** – CosemAccessResult contains the **MeterID** (LDN of the meter) and **Activated** (timestamp of received result from the meter) attributes, and provides results of the service invocation. Each activation of CosemAccess provides a separate result.
      - **GetAccessResult / Data** - Contains XML formatted DLMS/COSEM result, received from the meter. The **Ошибка! Источник ссылки не найден.** file contains description for all DLMS/COSEM data types
      - **GetAccessResult / DataAccessResult** - If meter responds with an error instead of results, this tag will contain DLMS/COSEM access result codes. Full list of result codes can be found in “9.5 Abstract syntax of ACSE and COSEM APDUs” section of “Green Book” document).

11.3. CSV structure

First three lines contains following information:

- **Meter** - meter identifier (for example, barcode)
- **LDN** – meter LDN
- **Type** - meter type

After that the file contains a table with results having the following columns:

- **Attribute** - Defines attributes of the COSEM object instance that is accessed in format class_id:logical_name:attribute_id
- **Time** - Timestamp of received result from the meter
- **Result** -Success or error description.
  Note that in case of error, the Hex and Value columns are empty
- **Hex** - The DLMS/COSEM meter result encoded in **A-XDR** and formatted as hex bytes
- **Value** - The DLMS/COSEM meter result showed in readable format

11.4. TXT structure

First three lines contains following information:

- **Meter** - identifier (for example, barcode)
- **LDN** – meter LDN
- **Type** - meter type

After that the file contains DLMS/COSEM meter results in human readable format. Each result contains several lines:

- **Attribute** - attribute of the COSEM object instance that is accessed in format class_id:logical_name:attribute_id
- **Time** - Timestamp of received result from the meter
- **Value** - The DLMS/COSEM meter result showed in readable format or error description
- New line separator

12. Prepare ADR Water Meters for Interaction over NB-IoT Channel

This section contains a description of how to work with the **plugins**:

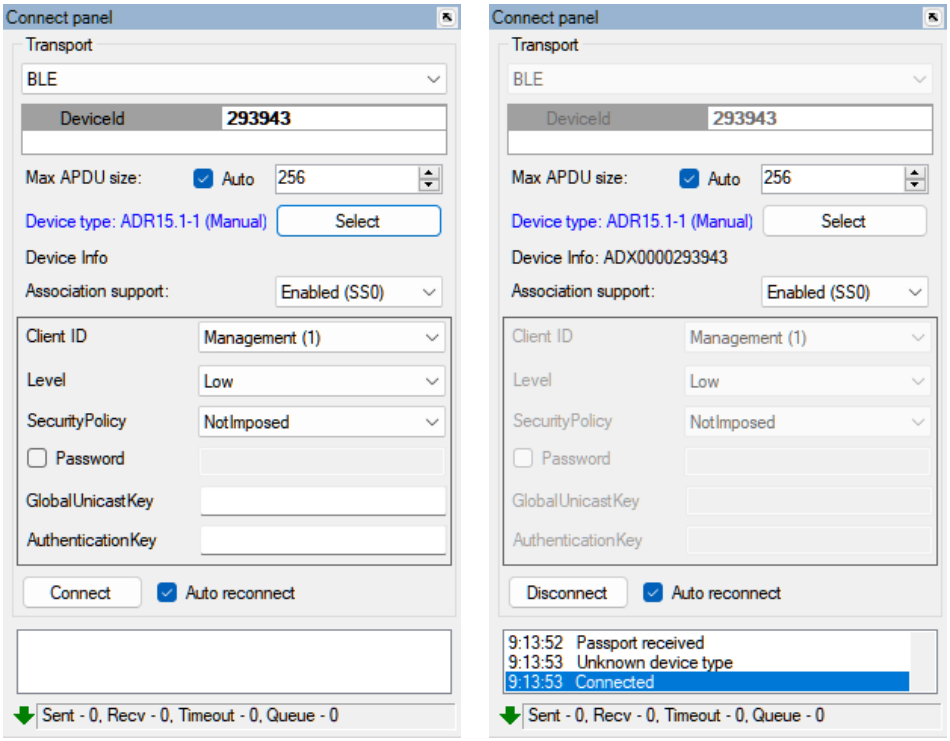
- **BLE Transport**,
- **IP Profile**,
- **Data Notification**.

12.1 Configure Specific Local Client Parameters

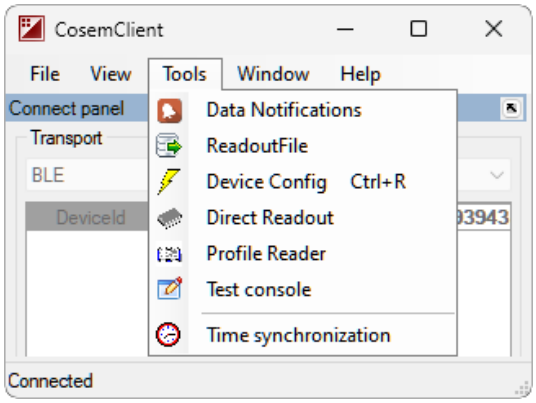
12.1.1 Establish Local Connection to Meter over BLE Channel

Using the BLE transport plug-in, perform the following steps:

1. Select the **BLE transport**.
2. Set the meter serial address in the **DeviceId** field.
3. Select the **Client ID**: `Management (1)`.
4. Select the **Level**: `Low`.
5. **If security is enabled:**
   - Set **Level** to `High`.
   - Set **Security Policy** to `AuthenticatedEncryption`.
   - Enter the corresponding keys.
6. Press the **Connect** button.

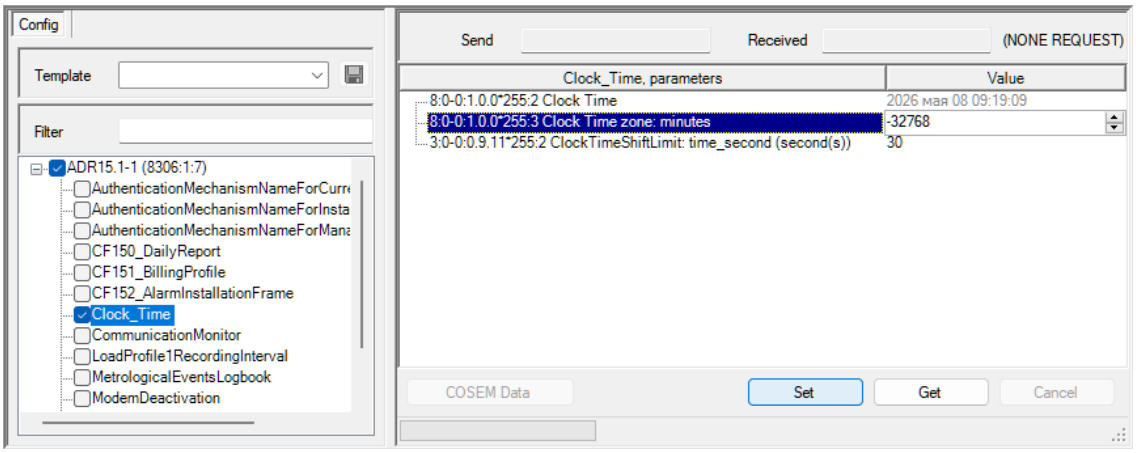


7. Open the **"Device Config"** plug-in.



12.1.2 Set local time zone and synchronizing time

Configure the local time zone via the `ClockTime` object: set the time zone using `8:0-0:1.0.0255:3`, set the current time using `8:0-0:1.0.0.255:2`.



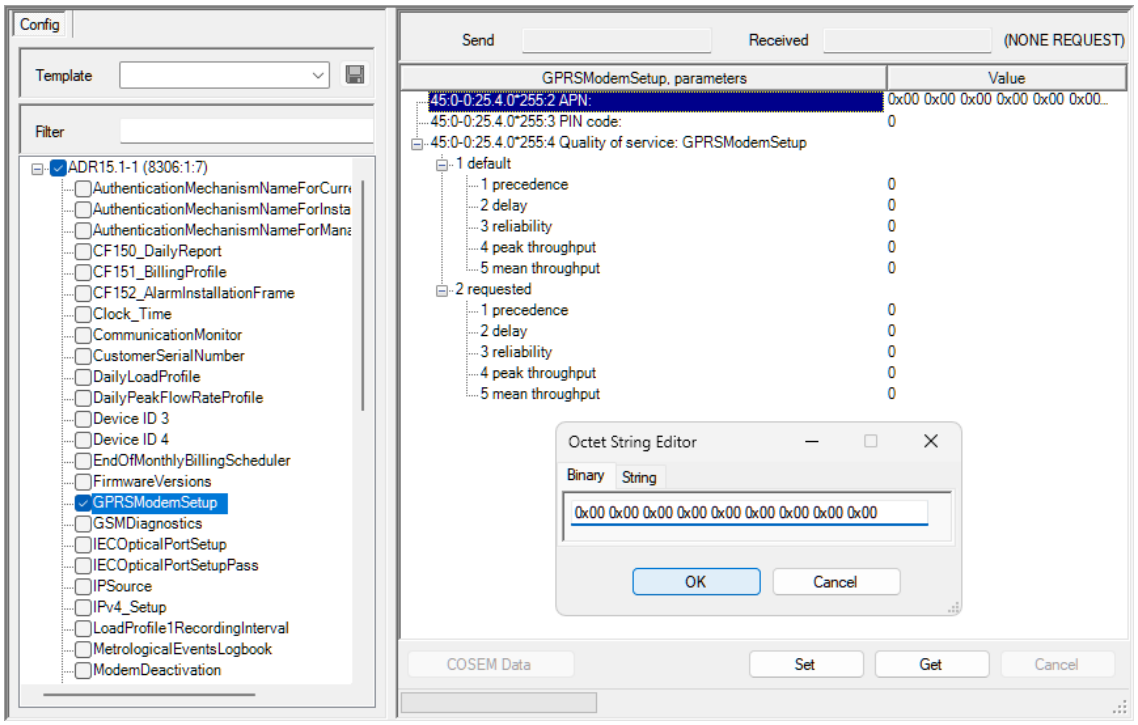
Time synchronization can be performed using the "Time Synchronization" plug-in.

12.1.3 Configure APN

Configure the APN using the appropriate operator profile via the `GPRSModemSetup` object:

`45:0-0:25.4.0*255:2`

- **Attribute type:** `octet-string`
- **Maximum length:** 30 symbols



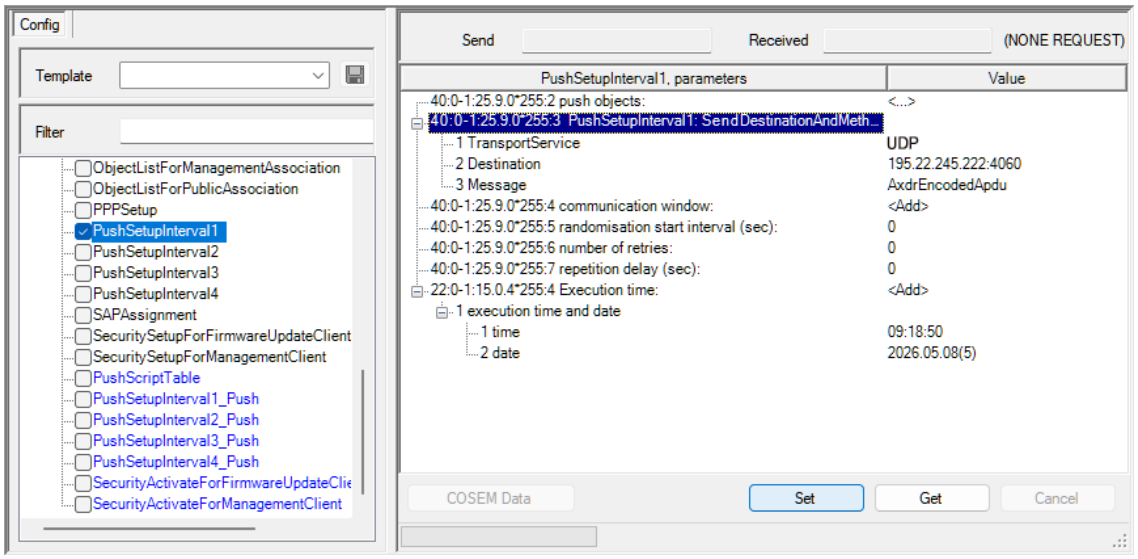
12.1.4 Configure Data Notification Destination Address

Configure the address for sending Data Notifications via the `PushSetupInterval1` object:

`40:0-1:25.9.0*255:3`

Set the **SendDestinationAndMethod** attribute as follows:

1. Set **TransportService** to `UDP`.
2. Set **Destination** in the format `IPv4:port`, (for example: `195.22.245.222:4060`).
3. Set **Message** to `AxdrEncodedApdu`.

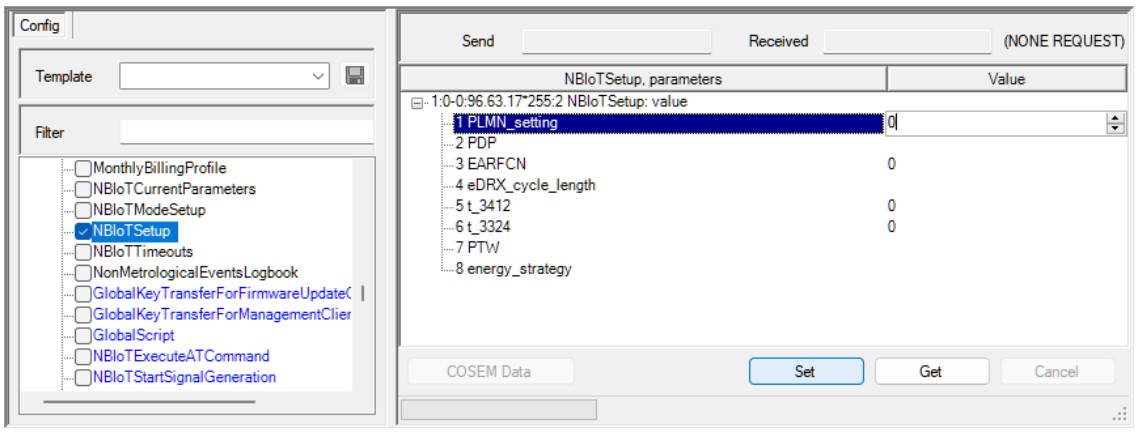


12.1.5 Configure NB-IoT Specific Parameters

Configure the NB-IoT specific parameters via the `NBIoTSetup` object:

`1:0-0:96.63.17*255:2`

Parameter	Value
PLMN_setting:	`0` (any) or a specific operator PLMN (range **0**-**20201**)
Other parameters:	Leave default values



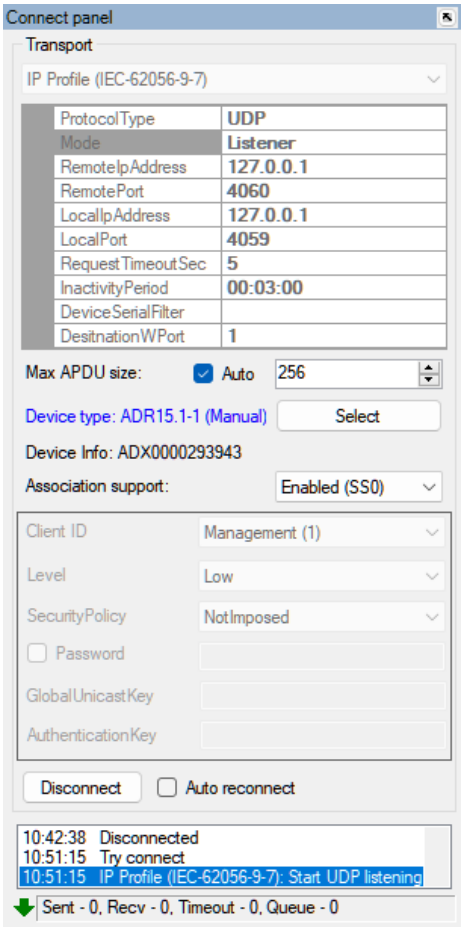
12.2 Prepare Server Side for Receiving Data Notifications over NB-IoT Channel

12.2.1 Connect to the Meter via NB-IoT

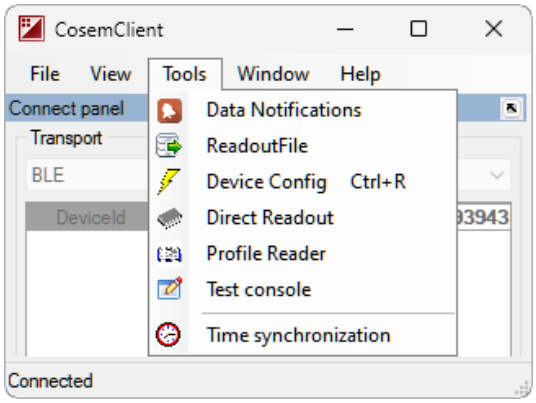
Start the COSEM Client application on the server whose address was configured (see step: 12.1.4 Configure Data Notification Destination Address).

Perform the following steps to connect to the meter via NB-IoT:

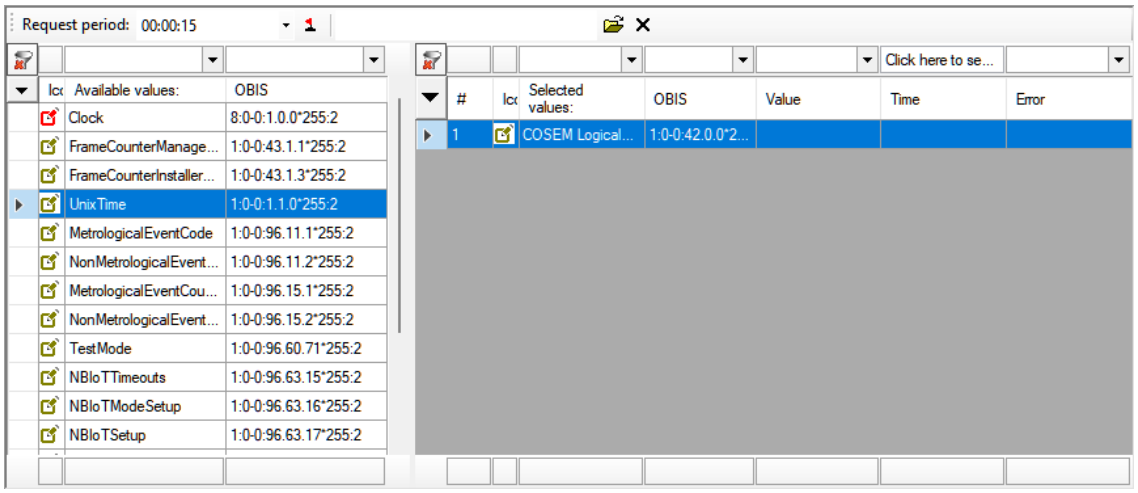
1. Select the **IP Profile (IEC-62056-9-7)** transport.
   - Select the protocol type: `UDP`.
   - Set **Mode** to `Listener`.
   - Set **RemoteIpAddress** to the meter address.
2. Select the **Client ID**: `Management (1)`.
3. Select the **Level**: `Low`.
4. **If security is enabled:**
   - Set **Level** to `High`.
   - Set **Security Policy** to `AuthenticatedEncryption`.
   - Enter the corresponding keys.
5. Press the **Connect** button and wait for a packet from the meter.
   Once received, COSEM Client will start the AA (Application Association) opening procedure.



6. To disable auto-closing of the connection from the meter side due to the inactivity timeout:
   - Open the **Direct Readout** plugin.



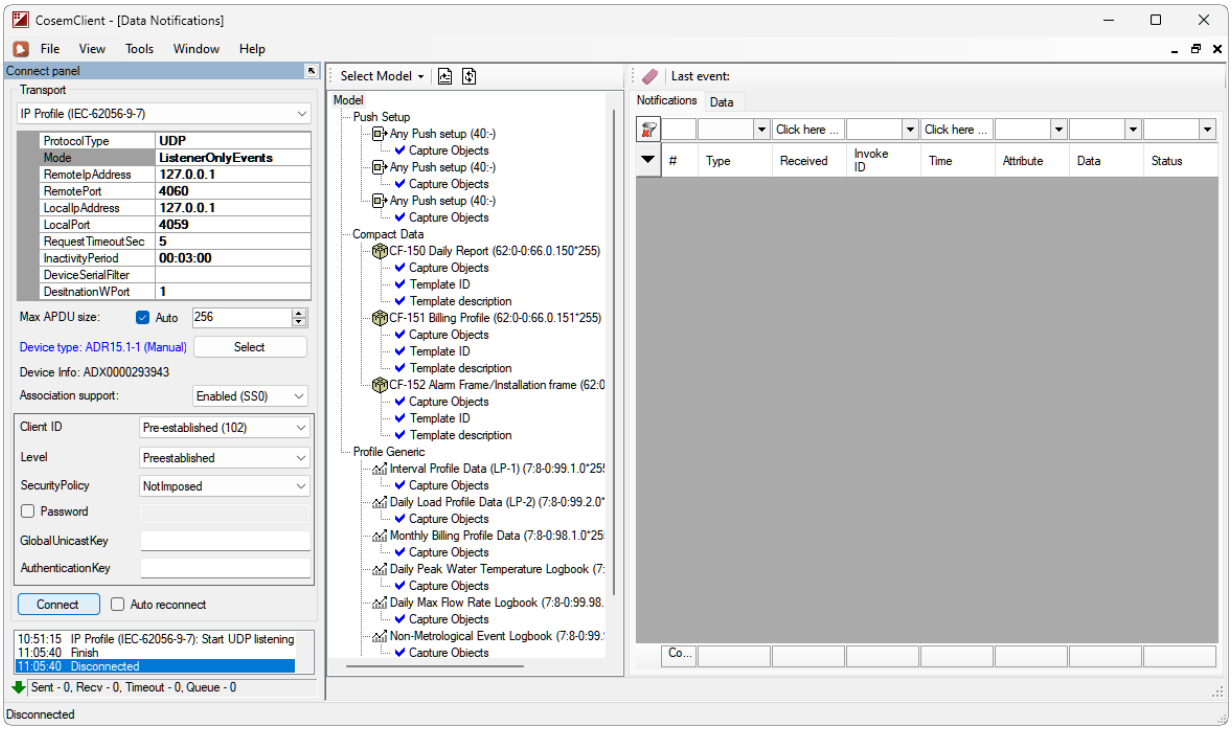
   - Select any object (for example, `COSEM Logical Device Name`).
   - Set the period to `00:00:15`.



12.2.2 Test “Compact Frame” Functionality Received via NB-IoT

To test only the “Compact Frame” functionality received via NB-IoT, perform the following steps:

1. Open the **Data Notifications** plugin.
   - Select model (examples: **AQUA_UNI**, **TAQA**) from the upper-left **“Select model”** menu.
   - Use the **Notifications** tab to view notifications.
   - Use the **Data** tab to view the notification body.
2. Select the **IP Profile (IEC-62056-9-7)** transport.
   - Select the protocol type: `UDP`.
   - Set **Mode** to `ListenerOnlyEvents`.
3. Select the **Client ID**: `Pre-established (102)`.
4. Select the **Level**: `Preestablished`.
5. **If security is enabled:**
   - Set **Security Policy** to `AuthenticatedEncryption`.
   - Enter the corresponding keys.
6. Press the **Connect** button and wait for a compact frame.



12.3 Check NB-IoT Network Interaction

12.3.1 Trigger Data Notification Push

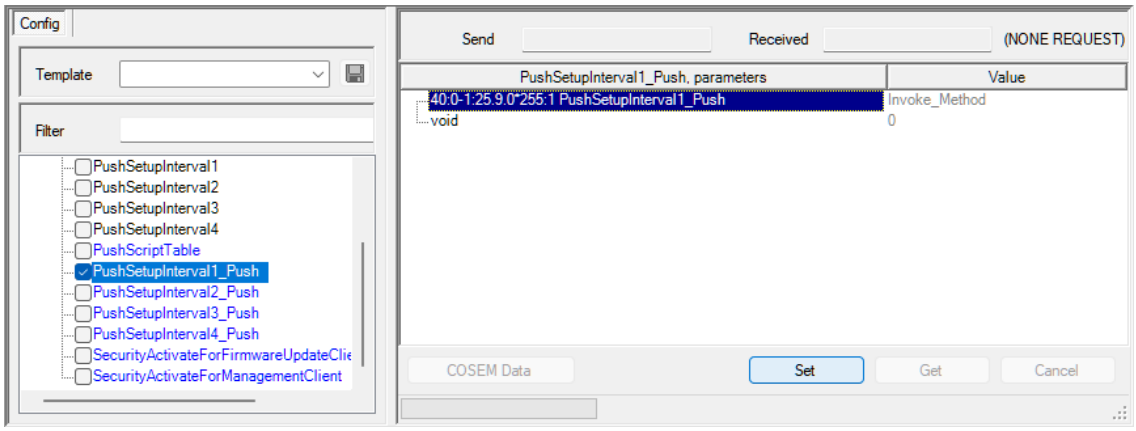
Execute the action method on the `PushSetupInterval1_Push` object:

`40:0-1:25.9.0*255:1`

- **Parameter:** `0`

Expected behavior:

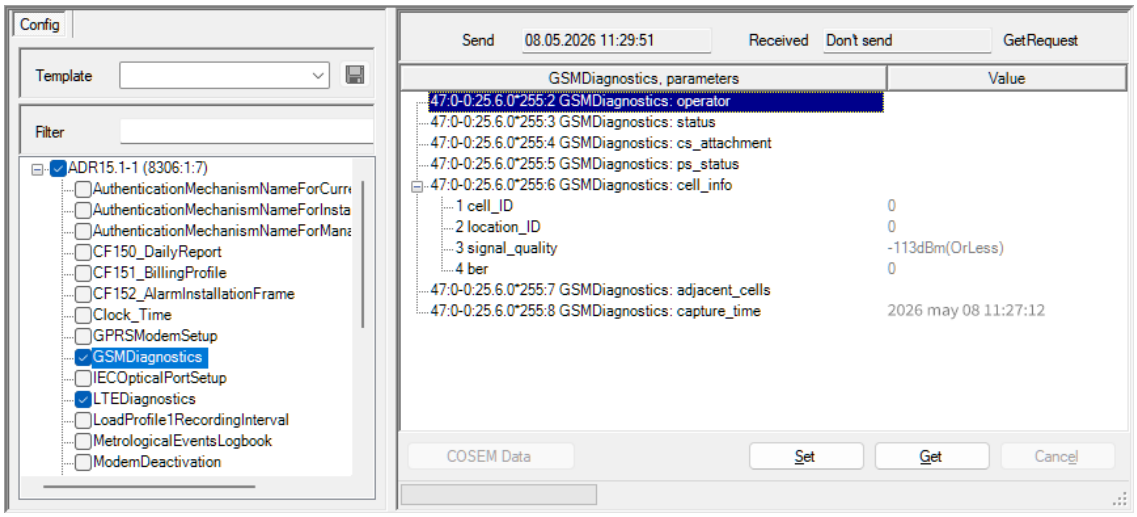
- The channel will perform a network attach procedure.
- After a successful attach, it will send a Data Notification immediately to the configured address.



12.3.2 Check NB-IoT Network Status

Read the following attributes of the **GSM diagnostics** object:

OBIS Code	Attribute
`47:0-0:25.6.0.255:2`	GSM diagnostics: operator
`47:0-0:25.6.0.255:3`	GSM diagnostics: status
`47:0-0:25.6.0.255:4`	GSM diagnostics: cs_attachment
`47:0-0:25.6.0.255:5`	GSM diagnostics: ps_status

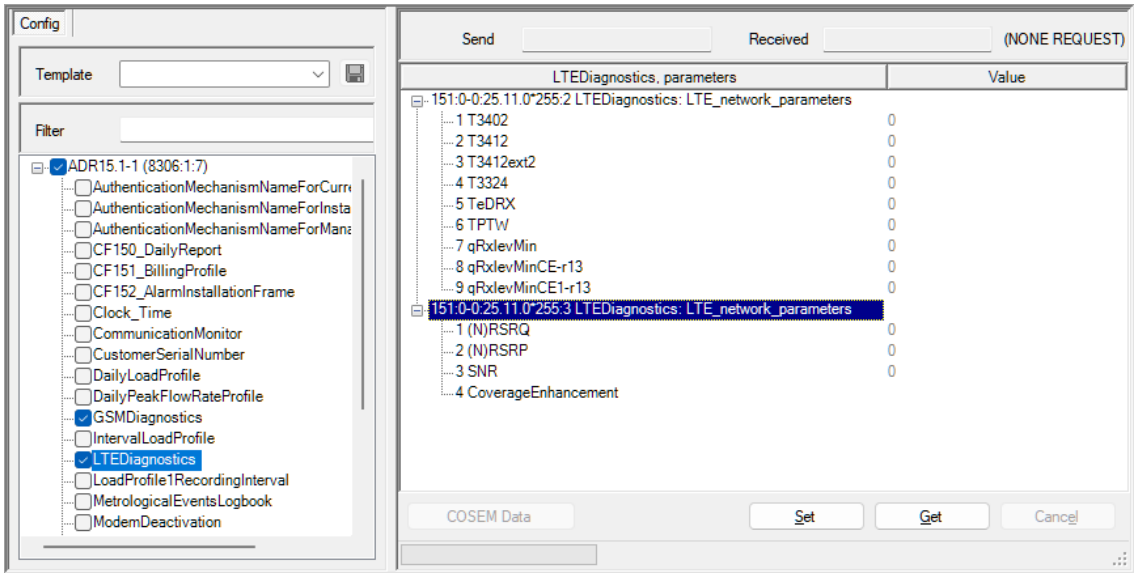


The parameter values depend on the selected telecom operator.

12.3.3 Check Connection Physical Parameters

Read the following attributes:

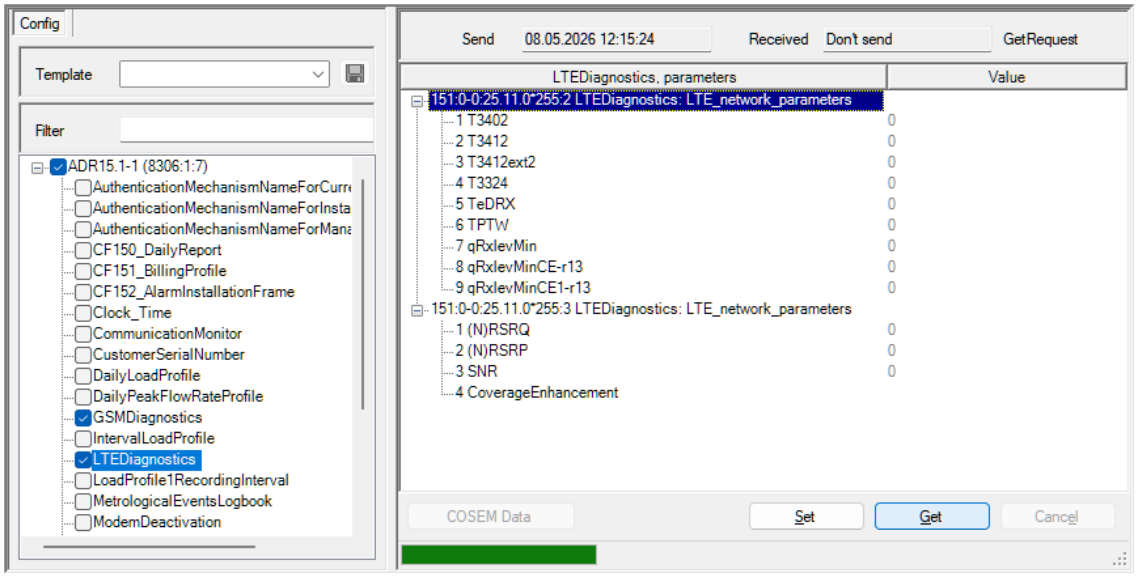
OBIS Code	Attribute
47:0-0:25.6.0.255:6	GSM diagnostics: cell_info (see: section 12.3.2)
151:0-0:25.11.0*255:3	LTEDiagnostics: LTE_network_parameters

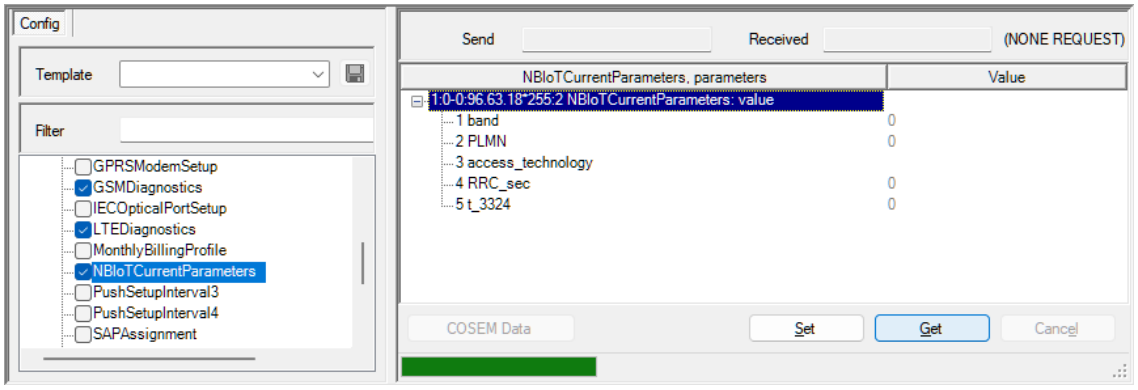


12.3.4 Check Specific NB-IoT Network Current Parameters

Read the following attributes:

Command	OBIS Code	Attribute
Get	151:0-0:25.11.0*255:2	LTEDiagnostics: LTE_network_parameters
Get	1:0-0:96.63.18*255:2	NBIoTCurrentParameters: value





13. Using Compact Frame

This section contains a description of how to work with the **Compact Frame**.

The **Compact Frame** is a mode of accessing the meter for data collection.

Features:

- **Compact Frames** are sent only in **encrypted** form.
- The **general-glo-ciphering** header contains a unique device **System Title**, which acts as an **ID**.

Compact Frame setup includes:

- selecting a default format (template);
- adding fields (OBIS code from the Data Model).

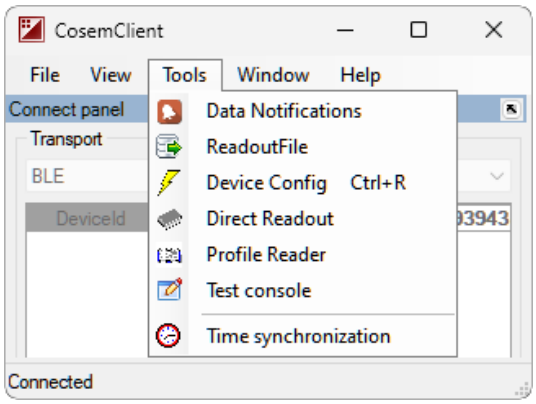
The **Data Notifications** and **Device Configuration** plugins must be enabled and configured in **PlgCfg**.
Editing the **values** of the Compact Frame (**CF**) parameters "**capture_objects**" and "**data_index**" is implemented in COSEMClient_1.0.0.360_sp32 (**sp32**) and higher.

13.1. Reading the current Compact Frame settings and saving them to a template.

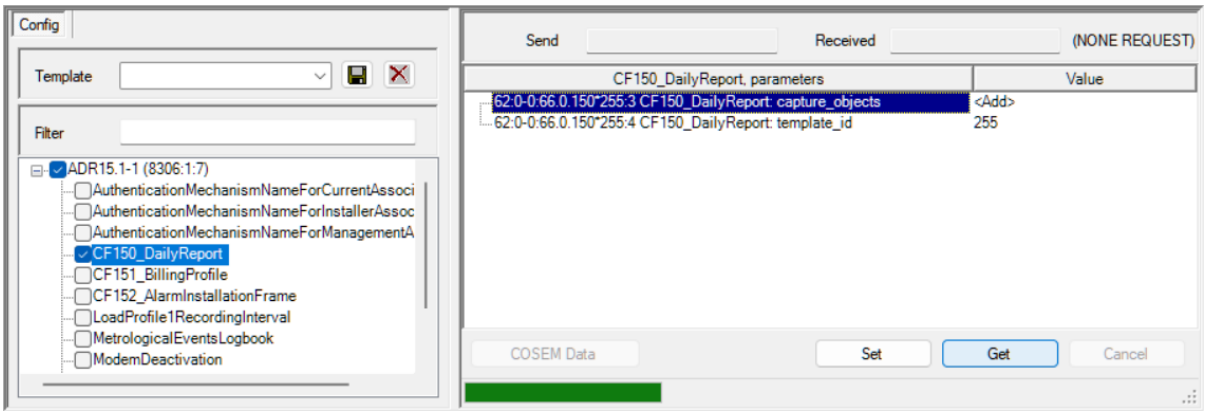
13.1.1. Read CF configuration.

By using **Device Config**, read the actual compact data configuration from the meter. For example, **CF*xxx*_DailyReport**.

Go to **Tools** > **Device Config**.



Select parameter (example: **CF*xxx*_DailyReport**) from list of parameters in the **Config** window.



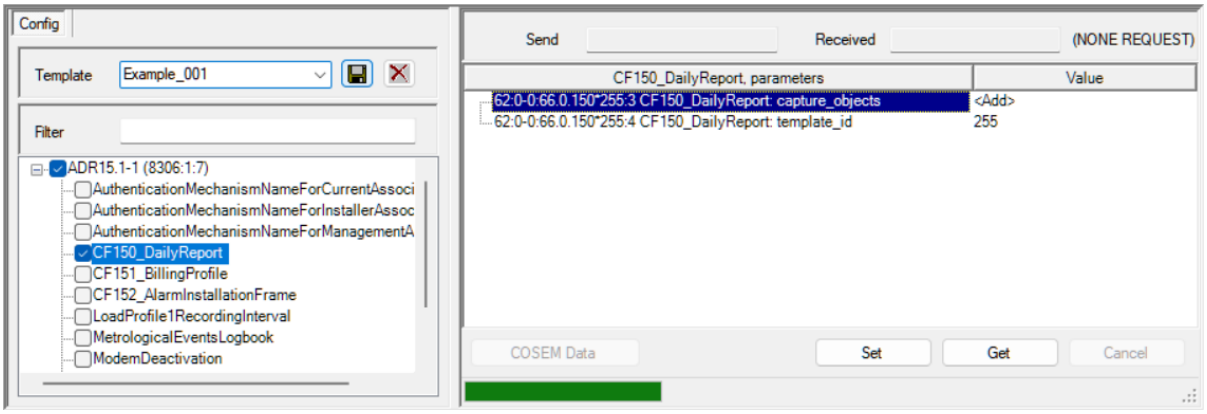
Tap **Get** button.

13.1.2. Save CF configuration template.

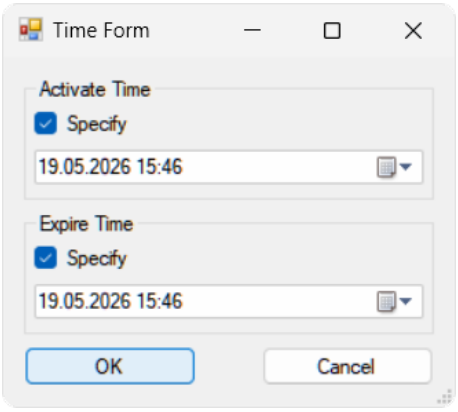
 - **SAVE** button.

Save the actual configuration as a template.

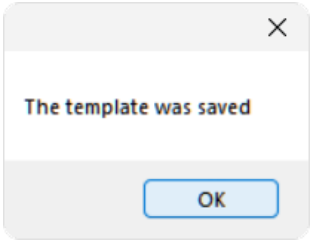
Go to **Template** field.
Select **<none>**.
Write template **name** (example: **Example_001**).



Tap **Save** button.
Fill out the **Time Form**.



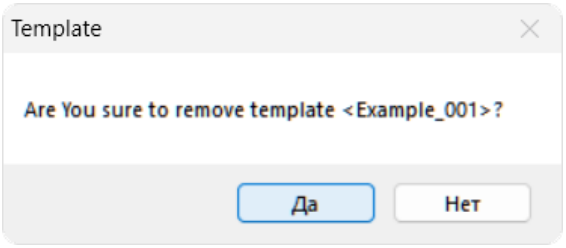
Tap **OK** button.
Finally, a **system message** will appear.



13.1.3. Delete CF configuration template

 - **DELETE** button.

Go to **Template** field.
Select template **name** (example: **Example_001**).
Tap **DELETE** button.

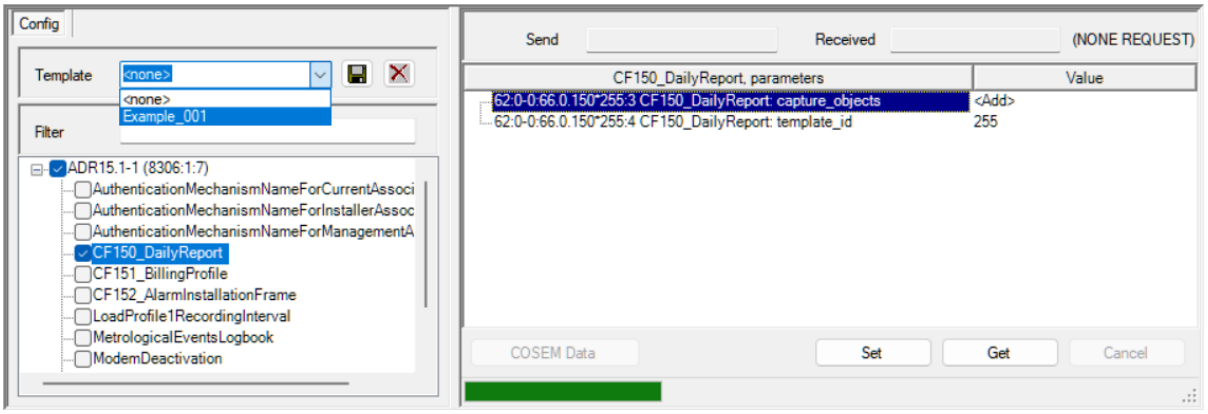


See section 7.5. Configuration Templates for details.

13.2. Applying a template.

If the configuration needs to be restored, select the configuration **template** saved in the previous step (13.1.2. Save CF configuration template.) and apply it to the meter.

Go to **Template** field.
Tap **arrow** button.

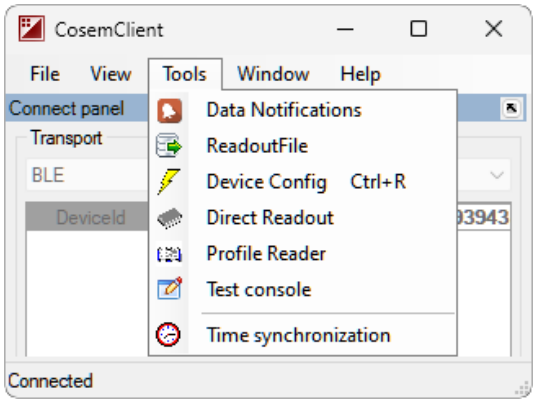


Tap template (example: **Example_001**).

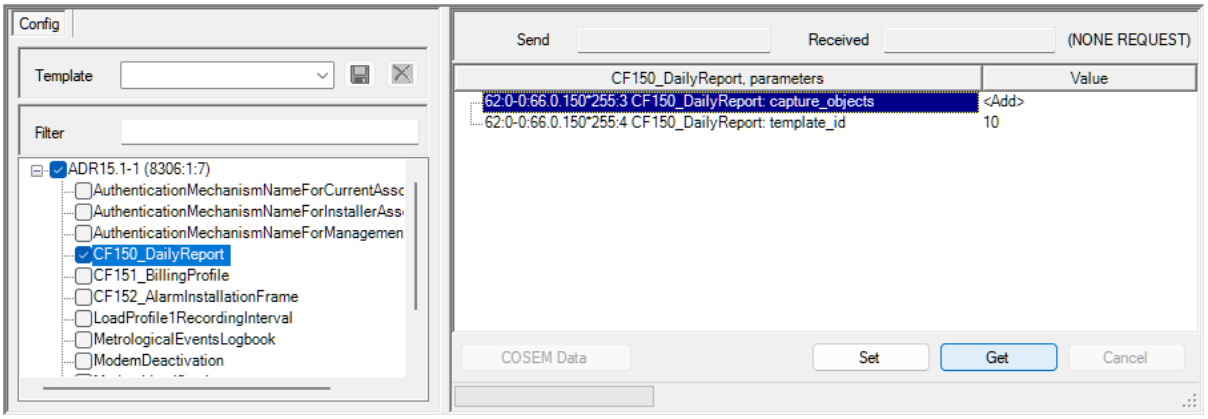
13.3. Reconfiguring Compact Frame.

By using **Device Config**, read the actual compact data configuration or use an existing template.

Go to **Tools** > **Device config**.



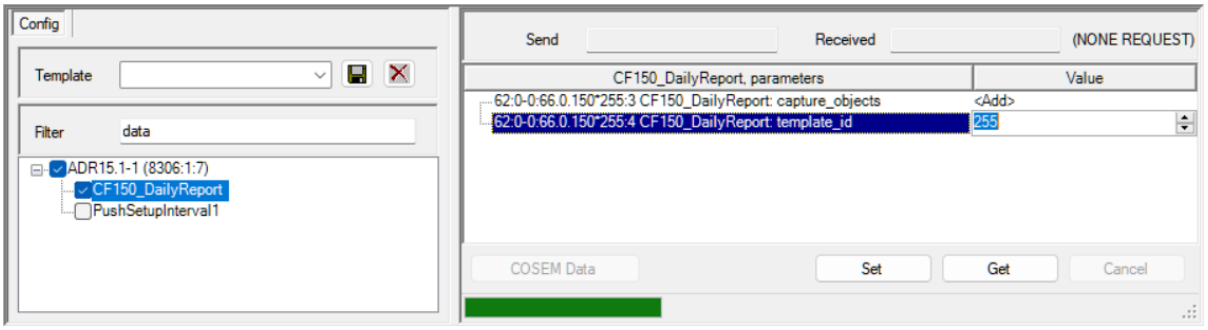
Change the **CF*xxx*_DailyReport: capture_objects** (<Add>) according to your needs.



Apply the configuration to the meter by clicking the **Set** button.

Note on CF*xxx*_DailyReport: **template_id**:

The **template_id** must be unique for each **compact frame**, so that the data center can identify how to parse the received data.



The range of **template_id** values is: **0** - **255**.

Note on **data_index**:

In **Device Config**, the **value** must be entered as a **decimal** number.

- **0x** - means that the number is in **hexadecimal** format.
  The **data_index** field (**Value**) must be configured as follows:
- **0** - if the entire **attribute** is required;
- **0x0xxx** - if an **element** of a structure or **array** is required;
  (where **xxx** is the element number).
- **0x10xx** - if the last **N records** from the **profile** are required,
  (where **xx** is the number of records. In this case, all columns are included.);
- **0x1yxx** - if the last **N records** from the **profile** are required with a column **limit**,
  (where **y** is the number of **columns** and **xx** is the number of **records**).

14. Running Scripts via Test Script Console

The **Test Script Console** plugin allows execution of predefined command sequences (scripts) on the meter — including **AT-command** sequences sent to the **NB-IoT module** of the water meter.

Before running scripts, make sure that the **Test Script Console** plugin has been **activated** (see section 3.2.4 Enable Test Script Console).

14.1. Process description

Scripts execute **the same sequence** of AT commands that are executed in **NB-IoT** network.

To send **AT Commands** to the **communication module** from **scripts**, a **BLE** connection is used instead of the **NB-IoT** connection.

Step-by-step instructions for working with scripts are below.

14.1.1. Using scripts.

Scripts are applied based on the **NB-IoT channel state**:

- Initial module **initialization**.

  init.cs – the module activation procedure is performed (execution time ~ 11 sec.).

  Used when the meter is restarted or after the communication module is completely disabled.

  Example: Idle, TestMode, HardwareError.

- **Connecting** to the network.

  connect.cs – the network connection procedure is performed (execution time ~ 21 sec.)..

  If a connection **already exists**, script execution **stops**.

- **Sending** a DN message.

  send.cs – the procedure for sending a constant (test) message is performed (execution time ~ 3 sec.).

  If a connection is **not established**, script execution **stops**.

Note.

To test **the client's connection**, you need to configure the following **parameters**:

- **Band** (Example: Band - 20);
- **PLMN** (Example: PLMN - Vodafone Italy);
- **APN** (Example: APN for 1nce).

14.1.2. Sleep state.

To save battery power, **at the end of each script execution**, the meter's communication module is put into a state of:

- **normal sleep** - if the device **fails to connect** to the NB-IoT network.
- **PSM deep sleep** - if the device **connects** to the NB-IoT network.

Additional consumption:

- **normal sleep**: +5 uA,
- **PSM deep sleep**: +0.8 uA.

14.1.3. Firmware requirement.

You must use a water meter firmware version (FW) higher than **v8101g** to correctly execute the **send.cs** script.

There is a limitation in v8101g. The maximum command size for the MC to send a UDP message is **500 bytes**.

14.1.4. Test Console Menu.

The Test Console **menu** elements.

New	Open	Save	Start	Stop	Clear output	Help

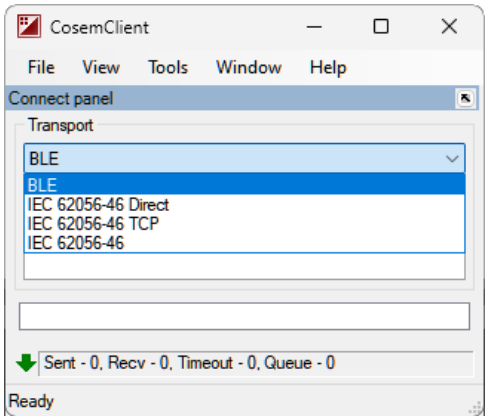
The buttons intended for:

- **New** – script (commands) manual insert mode;
- **Open** – script (commands) template (*.cs) insert mode;
- **Save** – save script to the file (template);
- **Start** – run (continue) script execution;
- **Stop** – stop script execution;
- **Clear output** – erase execution report table;
- **Help** – quick add script lines.

14.2. Establish connection

14.2.1. Select the communication interface.

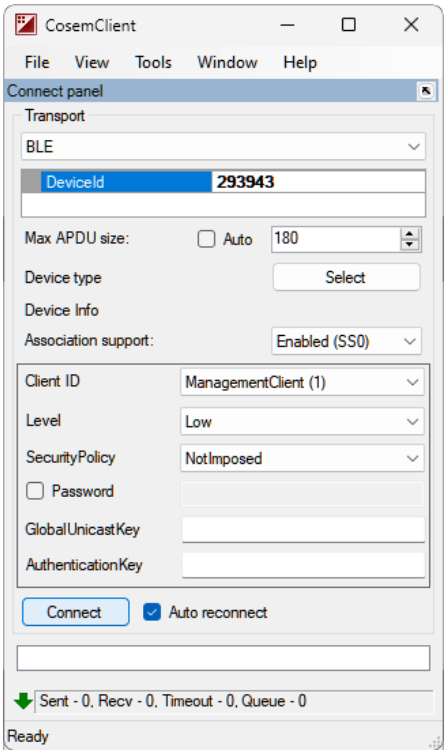
In the list of communication plugins select **BLE** as the transport to the water meter.



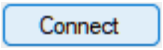
14.2.2. Enter the serial number.

In the **Connect** panel, enter the factory **serial number** of the water meter in the **DeviceId** field.

Example: **293943** - the factory **serial number** of the water meter (from nameplate).



Click **Connect** Icon.



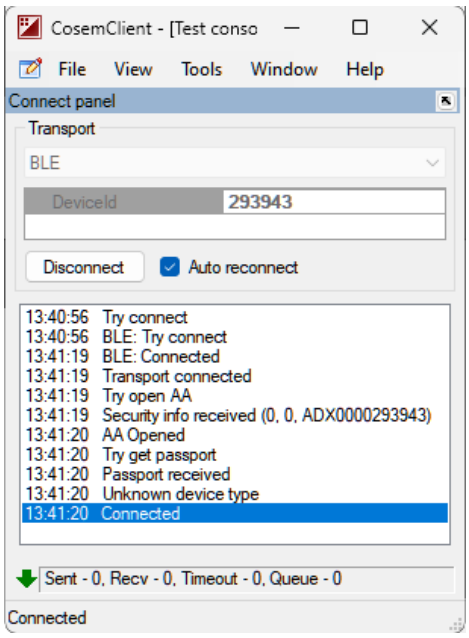
- **Connect** icon (button).

14.2.3. Establishes the connection.

Wait until COSEM Client establishes the **connection** with the selected water meter.

The **status** window shall display:

- interface link established,
- association opened,
- passport read,
- active link to the water meter.



14.3. Load script

14.3.1. Open the Test Script Console plugin.

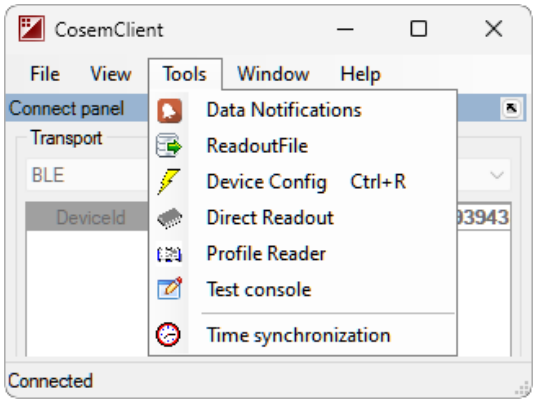
These scripts are designed to **test** the operating modes of the water meter's communication module (modem) over a remote **NB-IoT** (WAN) channel.

To perform **tests**, the COSEMClient program connects to the water meter over a local **BLE** (LAN) channel.

During the **tests**, **scripts** with **AT Commands** are run for the water meter's **communication module** (modem).

The COSEMClient program **displays** the progress and results of the test scripts AT Commands executions.

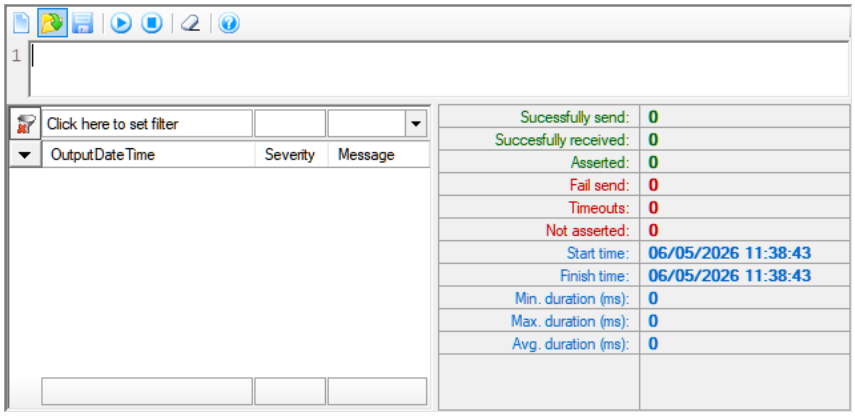
In the main menu select **Tools → Test Console**.



14.3.2. Open the script set folder.

In the upper part of the **Test Console** panel click the **Open** icon.

 - **Open** icon (button).

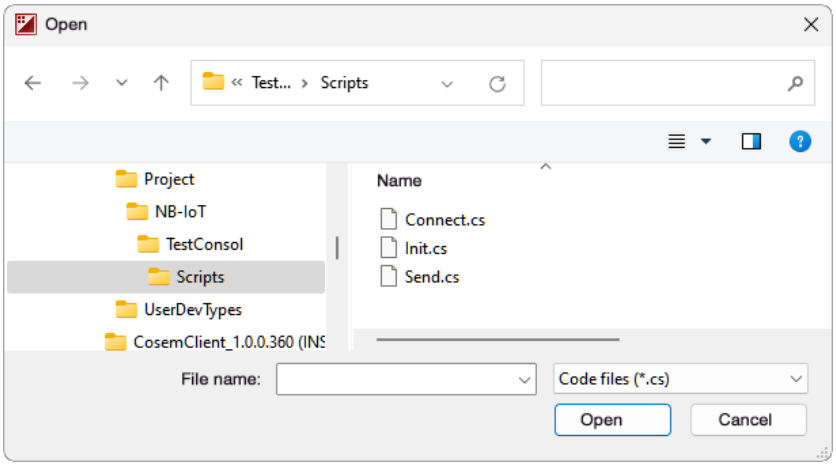


The **Open** file window will open.

14.3.3. Select the required script.

Go to the scripts folder **folder**.

Select the required **script** from the list of files. Example: **Init.cs** – initialization checker script file.



Scripts set folder contents:

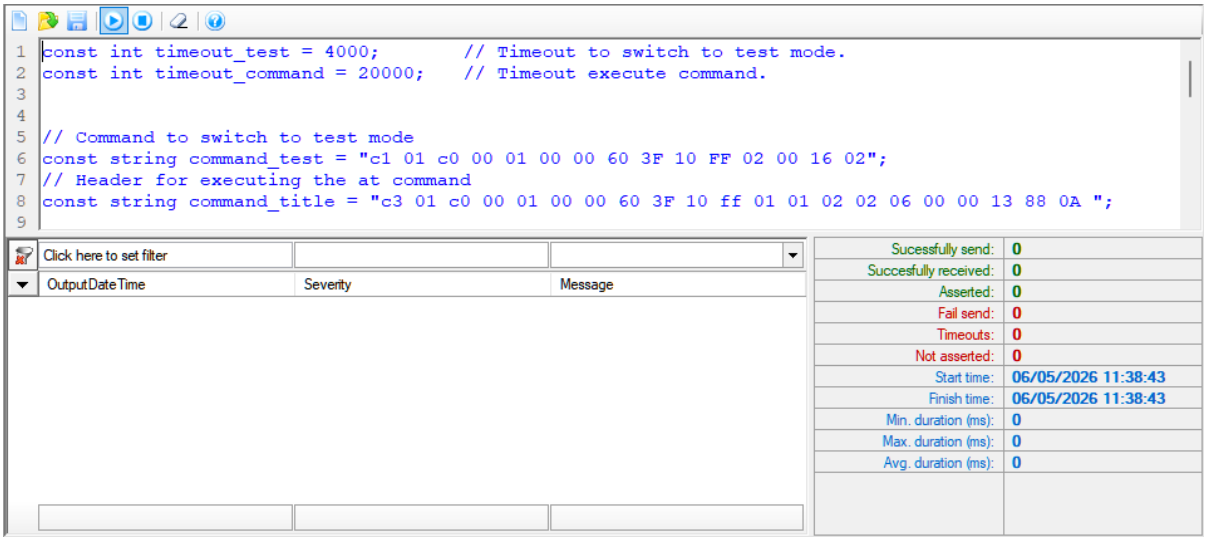
- **connect.cs** – connection test.
- **init.cs** – initialization test.
- **send.cs** – send message test.

14.4. Run script

14.4.1. Start the selected script.

In the upper part of the **Test Console** panel click the **Start** icon.

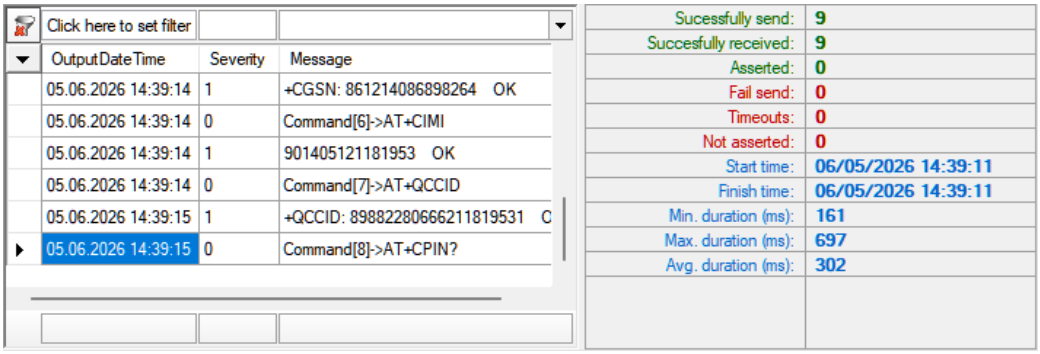
 - **Start** icon (button).



The script execution **report table** will begin filling.

14.4.2. Observe script execution.

The **command-by-command progress** is shown in the lower part of the **Test Console** panel.



Click here to set filter

OutputDateTime	Severity	Message
05.06.2026 14:39:14	1	+CGSN: 861214086898264 OK
05.06.2026 14:39:14	0	Command[6]->AT+CIMI
05.06.2026 14:39:14	1	901405121181953 OK
05.06.2026 14:39:14	0	Command[7]->AT+QCCID
05.06.2026 14:39:15	1	+QCCID: 89882280666211819531 C
05.06.2026 14:39:15	0	Command[8]->AT+CPIN?

Sucessfully send:	9
Succesfully received:	9
Asserted:	0
Fail send:	0
Timeouts:	0
Not asserted:	0
Start time:	06/05/2026 14:39:11
Finish time:	06/05/2026 14:39:11
Min. duration (ms):	161
Max. duration (ms):	697
Avg. duration (ms):	302

Execution flow table

Execution flow table columns description.

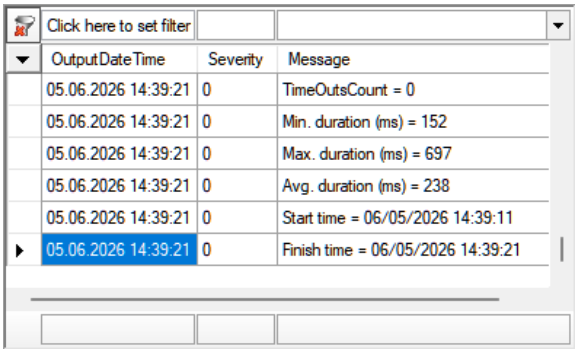
- **OutputDateTime** – displays the timestamp of the action's execution.
- **Severity** – indicates the impact level.
- **Message** – describes the action, command, or result.

14.5. Script report

14.5.1. Analyse the execution report.

Once the script has **completed**, the execution **results** are **displayed** in the lower-right area of the **Test Console** panel:

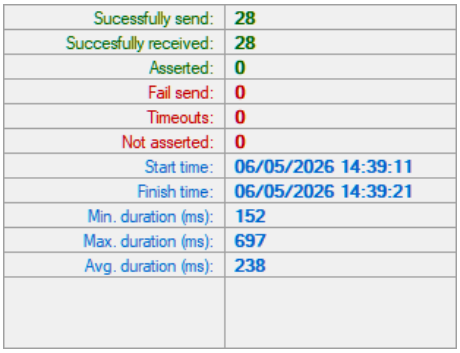
- number of successfully executed commands;
- number of responses received;
- number of execution failures;
- total script execution time.



Click here to set filter

OutputDateTime	Severity	Message
05.06.2026 14:39:21	0	TimeOutsCount = 0
05.06.2026 14:39:21	0	Min. duration (ms) = 152
05.06.2026 14:39:21	0	Max. duration (ms) = 697
05.06.2026 14:39:21	0	Avg. duration (ms) = 238
05.06.2026 14:39:21	0	Start time = 06/05/2026 14:39:11
05.06.2026 14:39:21	0	Finish time = 06/05/2026 14:39:21

Report table (left side)



Sucessfully send:	28
Succesfully received:	28
Asserted:	0
Fail send:	0
Timeouts:	0
Not asserted:	0
Start time:	06/05/2026 14:39:11
Finish time:	06/05/2026 14:39:21
Min. duration (ms):	152
Max. duration (ms):	697
Avg. duration (ms):	238

Summary table (right side)

Report table columns description.

- **OutputDateTime** – displays the timestamp of the action's execution.
- **Severity** – indicates the impact level.
- **Message** – describes the action, command, or result.

Summary table columns description.

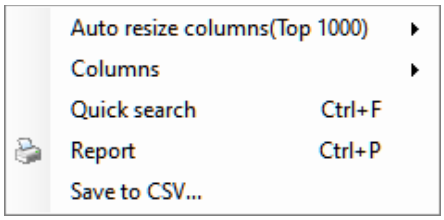
- **OutputDateTime** – displays the timestamp of the action's execution.
- **Severity** – indicates the impact level.
- **Message** – the summary results of actions or commands.

14.5.2. View/Save the script report.

1. A drop-down **menu** is provided for working with report table.

 - click the **drop-down menu button** to open the menu.

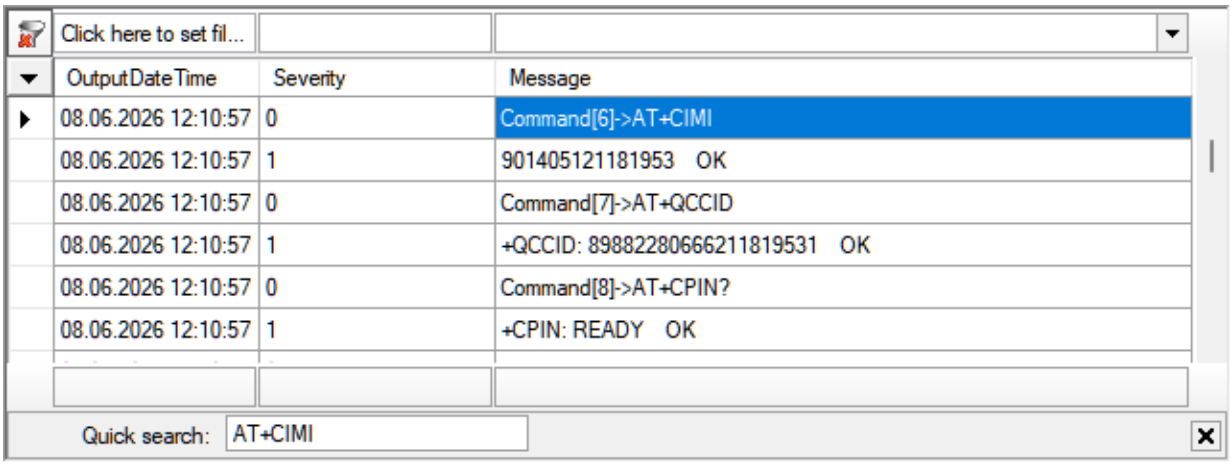
The menu consists of:



Auto resize columns (Top 1000) – resize columns by criteria.
Columns – enable/disable columns visibility.
Quick search – find date (command) in the report.
Report – report in a spreadsheet format, view/print/save.
Save to CSV… - save report to file.

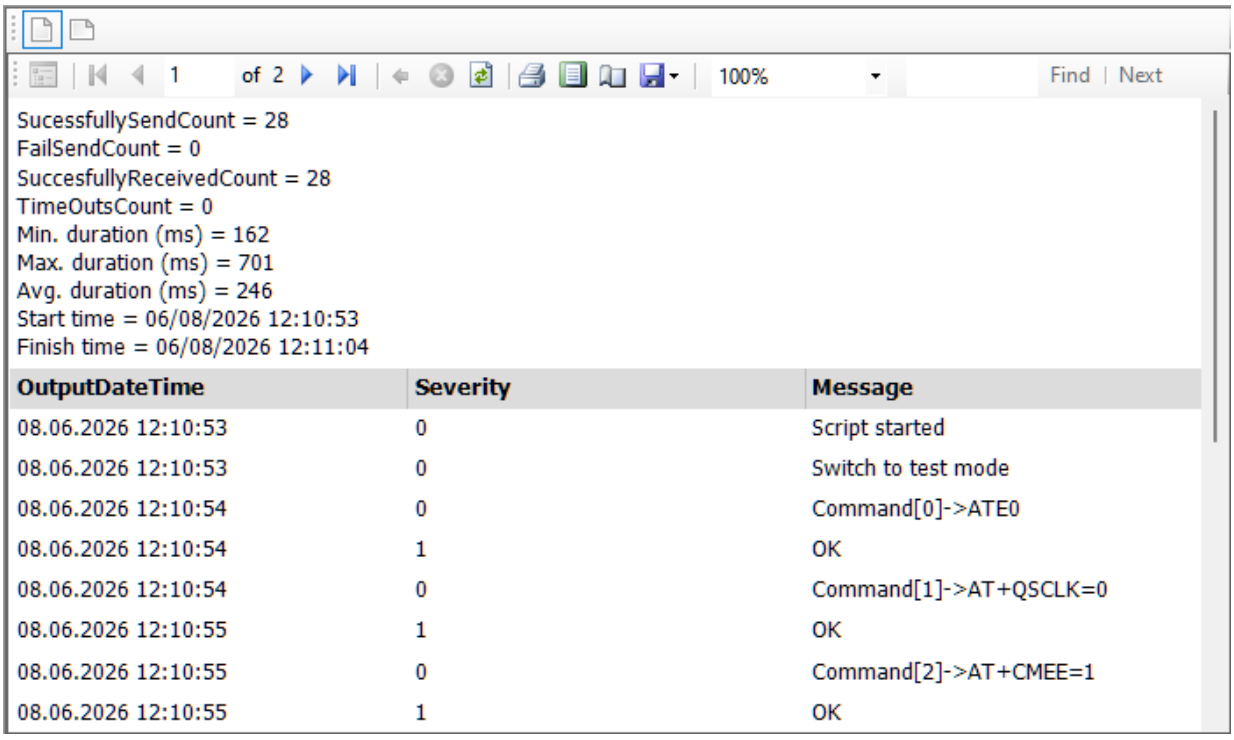
2. Click the **Quick search** menu button to search for a command.

- Enter the command in the window that opens at the bottom of the table (example: **AT+CIMI**).



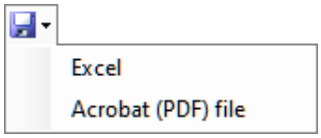
- The searched command will be **highlighted** in the table.

3. Click **Report** to view the report data in a spreadsheet format.



- A page-by-page view of the report will open.

4. Click **Save (diskette icon)** to save the report for future use.



- Select output file format.
- Select a destination folder for the file.

Now you can open the report in Excel or Acrobat program.

Annex A1. Meter Interfaces

A4.1. Local communication interfaces

The meter may have one of the following communication interfaces or both simultaneously: NFC (Near Field Communication), BLE (Bluetooth Low Energy).

A4.1.1. BLE

BLE communication protocol stack is based on Smart Bluetooth (Bluetooth Low Energy) specification v.5.0 (with 4.0 backward compatibility) and uses IEC 62056-5-3 (DLMS/COSEM) as application layer protocol.

The protocol stack looks like following:

Application layer	DLMS/COSEM
	IEC 62056-5-3
Convergence sublayer	IEC 62056-47
Data Link layer	Proprietary GATT
Physical layer	LL + LE Phy 2.4 GHz

DLMS/COSEM is used as application layer protocol. This means all application data is modeled as COSEM objects and is transmitted in DLMS formatted messages.

For details see “ADR Project. DLMS/COSEM Profile” and “ADR Project. DLMS/COSEM Events, Alarms”.

A4.2. LPWAN interfaces

Meter may have dual-mode LoRaWAN + unidirectional wM-Bus RF interface and/or NB-IoT interface to transmit measurement data to data acquisition systems.

A4.2.1. NB-IoT

The protocol stack looks like following:

Application layer	DLMS/COSEM
	IEC 62056-5-3
Transport layer	Wrapper IEC 62056-9-7;
	UDP
Network layer	IPv4
Physical layer	LTE Rel.14 (Cat. NB2)
	B3, B8, B20 frequency bands

DLMS/COSEM is used as application layer protocol. This means all application data is modeled as COSEM objects and is transmitted in DLMS formatted messages.

For details see “ADR Project. DLMS/COSEM Profile” and “ADR Project. DLMS/COSEM Events, Alarms”.

References

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2. COSEM Client. Installation manual.
3. Technical description for Flow control valve.
4. Technical description of Water Meters.
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10. Flow Control Valve. Technical description.
11. Water Meters. Technical description.

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