COM200 Series
GSM/GPRS communication module

Product Manual

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MetCom Solutions GmbH website: http://www.metcoms-solutions.com

Content

1 Overview

The MCS301 supports different communication interfaces and modules:

- - On-board communication interfaces
- - Communication modules

Currently following communication modules are supported

- - Cellular communication
    - o COM200:   GSM/GPRS - 2G
    - o COM205:   UMTS - 3G
    - o COM210:   LTE - 4G

- - Ethernet communication
    - o COM300:   TCP/IP

- - Other communication
    - o COM400:   TLS   gateway adapter with encrypted communication
    - o COM410:   adapter   Gateway adapter without TLS
    - o COM420:   CL0   CL0 adapter interface module
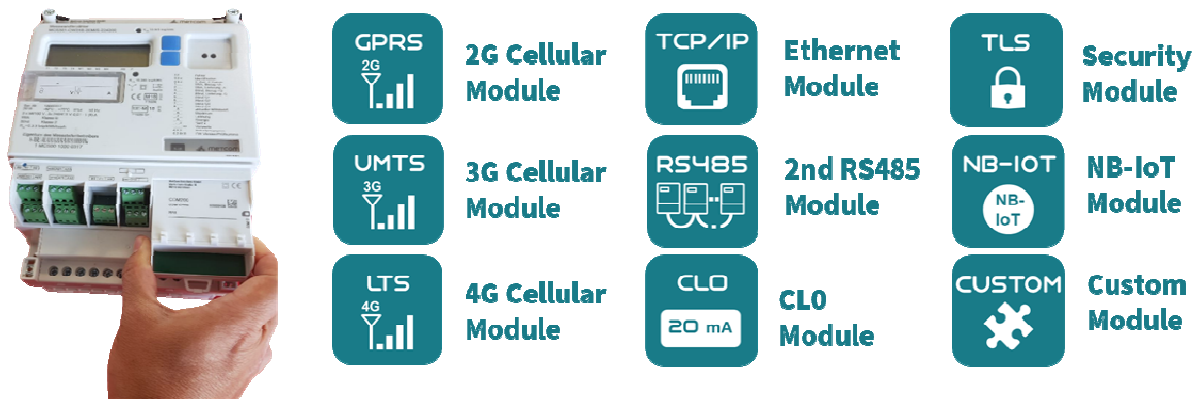   - o COM430:   RS485   RS485 adapter interface module

Figure 1:   MCS301 supported communication module

More details are described in the specific user manual of the other COM Series modules.

In particular, this document describes the COM200: GSM/GPRS - 2G Cellular   communication module

1.1 Referenced documents

Title	Version	Datum
Electricity metering – data exchange for meter reading, tariff and load control – part 21	EN 62056-21	06.2002
Electricity metering – data exchange for meter reading, tariff and load control – part 53 COSEM application layer	EN 62056-53	06.2002
Electricity metering – data exchange for meter reading, tariff and load control – part 62 Interface classes	EN 62056-62	06.2002
Electricity metering – data exchange for meter reading, tariff and load control – part 61:	EN 62056-61	06.2002
Electricity metering equipment (AC) – general requirements, test and test conditions – part 11	EN 62052-11	02.2003
Electricity metering equipment (AC) – general requirements, test and test conditions – part 21:	EN 62053-21	01.2003
Electricity metering equipment (AC) – general requirements, test and test conditions – part 22:	EN 62053-22	01.2003
Electricity metering equipment (AC) – general requirements, test and test conditions – part 23:	EN 62053-23	01.2003
Electricity metering equipment (AC) – part 1: general requirements, test and test conditions, – metering equipment (class indexes A, B and C)	EN 50470-1	09.2005
Electricity metering equipment (AC) – part 3: particular requirements – static meters for active energy (class indexes A, B and C)	EN 50470-3	09.2005
Environmental Management System	ISO14001e.pdf	10.2011
DLMS Blue Book version 1000-1 Ed. 12.1, interfaces classes, OBIS definition	Ed. 12.1	
DLMS Green Book version 1000-2 Ed. 8.1, architecture and protocols	Ed 8.1	
DLMS Yellow Book version 1000-2 Ed. 8.1, conformance & testing	Ed. 3	
IDIS Standard Package 2, Edition 2.0.pdf	Ed. 2.0	03.06.2014
IDIS-S02-004 - object model Pack2 Ed2.0.xls	V2.26	26.08.2016

1.2 Definitions and Abbreviations

Abbreviation	Explanation
HES	Head-End-System for remote meter reading
HHU	Hand Held Unit for local meter reading
FW	Firmware
SW	Software
HW	Hardware
LCD	Liquid Cristal Display
OBIS	Object Identification System
PQ	Power Quality
GSM	Global System for Mobile Communications
GPRS	General Packet Radio Service (2G)
UMTS	Universal Mobile Telecommunications System (3G)
LTE	Long Term Evolution (4G)
APN	Access Point Network
IMEI	International Mobile Equipment Identity
LLS	Low level security, (Password)
HLS	High level security, (Key exchange)
TOU	Time of use
Push	Send data from meter
Pull	Grab data form meter
TLS	Transport Layer Security
SMS	Short Message Service
FTP	File Transfer Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
IP	Internet Protocol
SPI	Serial Peripheral Interface

2 Safety and maintenance information

2.1   Responsibilities

The owner of the communication module is responsible to assure that all authorized persons who work with the meter read and understand the relevant sections of the User manual that explains the installation, maintenance and safe handling with the module.

The installation personnel must possess the required electrical knowledge and skills and must be authorized by the utility to perform the installation procedure.

The personnel must strictly follow the safety regulations and operating instructions, written in the individual chapters of the Product Manual.

The owner of the module is responsible specially for the protection of the persons, for prevention of material damage and for training of personnel.

2.2   Safety instructions

The following safety regulations must be observed:

- During the communication module installation, the user should be careful not to get in contact with live parts is dangerous to life.

- Local safety regulations must be observed. Installation of the module must be performed exclusively by technically qualified and suitably trained personnel.

- Modules which have been dropped must not be installed, even if no damage is apparent. They must be returned for testing to the service and repair department responsible (or the manufacturer). Internal damage can result in functional disorders or short-circuits.

- The module must on no account be cleaned with running water or with high pressure devices. Penetrating water can cause short-circuits.

2.3   Maintenance

No maintenance is required during the communication module life-time. The implemented communication technique, built-in components and manufacturing procedures ensure high long-term stability.

- In case the service of the module is needed, the requirements from the module installation procedure must be observed and followed.

- Cleaning of the module is allowed only with a soft dry cloth. Cleaning is forbidden in the region of terminal cover, where cables are connected to the meter. Cleaning can be performed only by the personnel responsible for maintenance.
  CAUTION: Never clean soiled modules under running water or with high pressure devices. Penetrating water can cause short circuits. A damp cleaning cloth is enough to remove normal dirt such as dust.

- The quality of seals must be regularly checked.
  DANGER: Breaking the seals and removing the terminal cover or meter cover will lead to potential hazards because there are live electrical parts inside.

- After the end of the meter's lifetime, the communication module should be treated according to the Waste Electric and Electronic (WEEE) Directive!

2.4   Disposal

The components used in the COM200 series modules are largely recyclable according to the requirements of the environmental management standard ISO14001. Specialized disposal and recycling companies are responsible for material separation, disposal and recycling. The following table identifies the components and their treatment at the end of the life cycle.

Components	Waste collection and disposal
Circuit boards	Electronic waste disposal according to local regulations
LED's	Special waste: Dispose of according to local regulations.
Metal parts	Recyclable material: Collect separately in metal containers.
Plastic parts	To be recycle separately. If necessary, Of waste incineration.
Batteries	Prior to disposal of unused or used Li-Batteries, safety precautions must be taken against short circuits. Batteries can leak or ignite. Do not dispose of used or defective lithium batteries in the household waste but observe the local waste and environmental regulations.

3 Mechanical design

For Smart Metering or C&I applications the communication module will fit under the terminal cover of the MCS301 meter.

3.1 Module concept

Figure 2: MCS301 with communication modules

The interface between meter and communication module provides the following feature set:

- Exchangeable communication modules

- Plug ´n´ Play Installation: The module is connected and powered from the meter. No extra cables or actions are needed to complete the physical installation of the module.

- SPI interface between meter and communication module for local customized applications.

- Transparent communication, using the DLMS/COSEM protocol of the meter for Local or Remote FW Meter or Module upgrade

3.2 Module housing

The communication module is placed in a separate module housing. Below variant are supported:

Figure 3: COM200 with internal antenna

Figure 4: COM200 prepared for external antenna connector SMA or FME type

Figure 5: COM200 with sealable cover (Option)

4 Functionality

4.1 Data Exchange support

The COM200 module is based on IP network and SMS services. The DLMS protocol is used for data exchange between electricity meters and HES. The HES acts as DLMS client and the E-meter as DLMS server. The following communication services are provided:

- GPRS
- CSD/SMS (Wake-up)

Two operating modes can be used:

- Pull mode
- Push mode

The "Pull" mode is initiated by the HES. It is used for collecting data from meters or sending commands to meters and consumer's interface. The "Pull" is using following DLMS services:

- OPEN
- RELEASE
- GET or SET
- Action

The "Push" mode is initiated by the meter to send critical information such as Alarms and so on to the HES. The DATA-NOTIFICATION service of DLMS is used in this mode. Following table shows the DLMS services in Pull and Push modes for IP-based or SMS communication.

Operating Mode	DLMS Services	
	IP Communication	**SMS Communication**
Pull	GET, SET, ACTION (Confirmed)	SET, ACTION (Unconfirmed)
Push	DATA-NOTIFICATION (Unconfirmed)	DATA-NOTIFICATION (Unconfirmed)

4.2 Communication protocols

Using the COM200 module the MCS301 meter can be readout using:

- DLMS/COSEM protocol
- EN62056-21 protocol

Up to 3 sockets are supported. 2 sockets can be used in parallel

- Socket 1: address: Default 4059 (for DLMS/COSEM communication) or
  address: Default 4000 (for EN62056-21 communication)
- Socket 2: address: Default 4059 (for DLMS/COSEM communication)
- Socket 3: address: Default 4060 (for DLMS/COSEM communication)

4.3   Push Support

4.3.1 General

The pushing process is done by using three main groups of COSEM objects as follows:

- Triggering Objects
- Script Table
- Push Set-up

Below figure depict the COSEM objects are involved in Pushing process and their relationship:
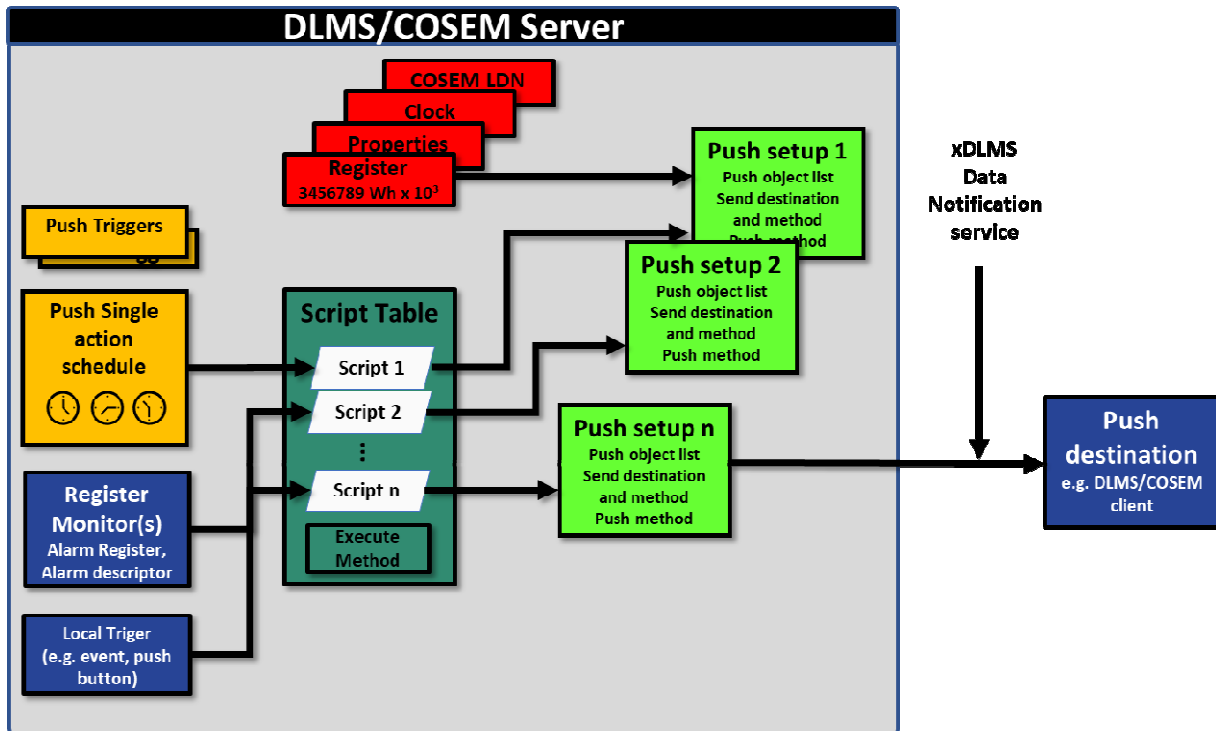
Figure 4: Pushing Process

As shown in above figure, the meter can be woken up by a trigger (internally or externally) to connect to network and exchange data with Central System. This is called Triggering Process. The following COSEM objects are considered to provide triggering:

- Push action scheduler – Interval_1
- Push action scheduler – Interval_2
- Push action scheduler – Interval_3
- Alarm Monitor 1
- Alarm Monitor 2
- Auto Answer (SMS)

A trigger calls a script in Push Script Table (0-0:10.0.108.255) and the called script invokes the "Push" method of relevant "Push Setup" objects. At the end, the "Push" method of "Push Setup" object sends the specified message/data to the Central System.

4.3.2 Push Triggering

4.3.2.1   Push Triggering by Scheduler

3 different schedules can be used for triggering the making GPRS connection and pushing message to the HES. They are as follows:

- Push action scheduler – Interval_1

- Push action scheduler – Interval_2

- Push action scheduler – Interval_3

The "Push action scheduler – Interval_x" is intended to trigger making connection with the CS (Central System) at the specific time or regular fashion to activate the PDP context and establish new GPRS session. This will be done to establish connection with the CS (Central System) at some specific time points.

4.3.2.2   Push Triggering by Installation

The Push setup – On installation (0-7:25.9.0*255) is used to inform to the HES that meter is installed to the system using a combination of the meter buttons activating the Meter´s LCD option "CELL_ConnECt" under the R-button menu:

After the activation of the Push triggering by installation will be confirmed with the text "donE" in the LCD:
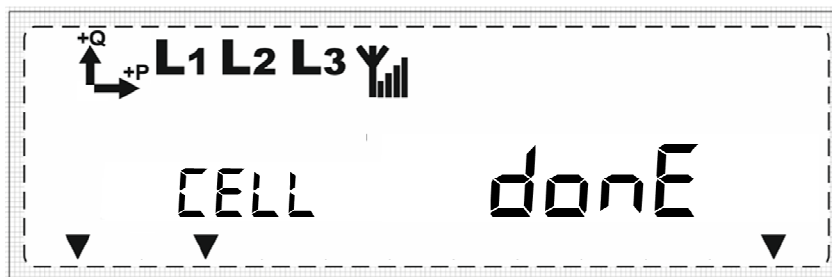
4.3.2.3   Push Triggering by Alarm

If an Alarm happens, the GPRS connection can be established and the Alarm Descriptor will be sent to the CS (Central System). The COSEM objects "Alarm Monitor 1" and "Alarm Monitor 2" are used to handle triggering by Alarm.

If an Alarm happens, these objects call a fourth script in "Push Script Table" object (9,0-0:10.0.108.255) and the called script invokes the "Push" method of "Push Setup-Alarm" object (40, 0-4:25.9.0.255).

4.3.2.4   Push Triggering by GPRS Connection Detection

The Push on GPRS Connection Detection (Connectivity) is triggered each time a new network connection is established. A new network connection may be caused internally (e.g. reconnection in mode 101 -always ON mode-, starting a new connection window in mode 102 and 103) or externally by sending a wake-up signal to the meter in mode 104 –wake-up by trigger- or 103 -CSD Call or SMS-.

The CSD and SMS (as external triggering) is handled by "Auto Answer" COSEM object (28, 0-0:2.2.0.255). The listening window is always active in case of external triggering mechanism is used. The device answers (receives) only (message from) to the calling numbers that are specified in "list_of_allowed_callers" attribute of mentioned COSEM object. The capacity of the array of attribute of "list_of_allowed_callers" is up to 5. Each entry may contain wild cards.

4.3.3 Push data format

The data format of the pushed data is configurable:

- Using EN62056-21 data format

- Using DLMS/COSEM data format

- Up to 45 objects can be pushed with one single action

4.3.4 Push Methods

4.3.4.1   Push method using UDP

With the UDP Push method predefined data can be send <u>without any confirmation</u> to a predefined Server.

Parameters for the UDP push are

- Server

- Port number

4.3.4.2   Push method using FTP

With the FTP Push method predefined data can be send to a predefined Server. Parameters for the FTP push are

- Server

- Port number

- User name and password

- File name and path

- timeout

4.3.4.3   Push method using TCP

With the TCP Push method predefined data can be send to a predefined Server using a TCP connection. Parameters for the TCP push are

- Server
- Port number

4.3.4.4   Push method using SMS

With the SMS Push method predefined data can be send to a predefined phone number using the SMS service. Parameters for the SMS push are

- phone number

4.3.4.5   Push method using Email service

With the Email Push method predefined data can be send to a predefined Email address using the Email service. Parameters for the Email push are

- Server
- Port number
- Email address of transmitter
- Email address of receiver
- Reference
- User name and password
- Usage of SSL (yes/no)

4.4   NTP synchronization

With the COM200 the time & date of the meter can be synchronized by an external NTP server. The synchronization take place:

- After power up of the meter
- At a configurable time, after the communication module is restarted

5 HW Variants

5.1 Antenna connection
The COM200 module can support 2 different antenna solutions

- **Internal antenna solution**

In that application the antenna is located under the module enclosure

- **External antenna solution**

5.2 Dual/Quad Band
The COM200 module is available for the following frequencies:

- COM200-D: Dual Band version
  900 / 18000 MHz

- COM200-Q: Quad Band version
  900 / 1800 MHz and
  850 / 1900 MHz

5.3 Support of RS485 interface
The COM200 with external antenna provides an additional RS485 interface, which can be used to read other meters connected to the Bus.

6 Installation

6.1 Module installation

The module installation can be done following these steps even when the meter is powered:

1. Remove the meter terminal cover
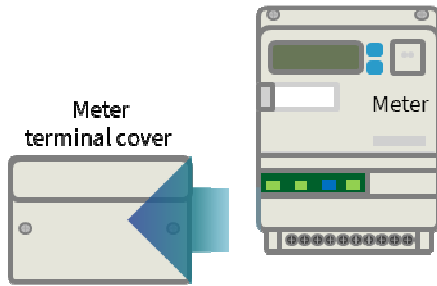
2. Plug out the old communication module
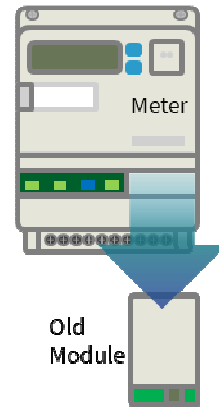
3. Insert the Sim card to the communication Module
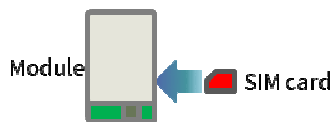
4. Connect the external antenna (If available)
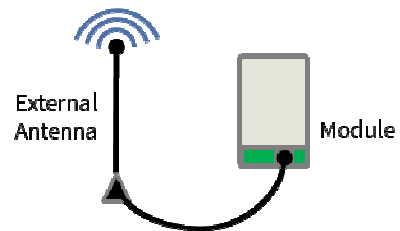
5. Plug in the new communication module
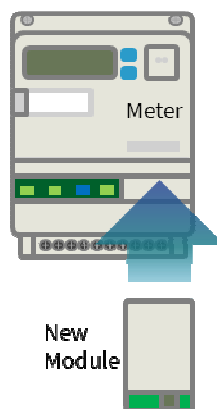
6. Close the meter terminal cover
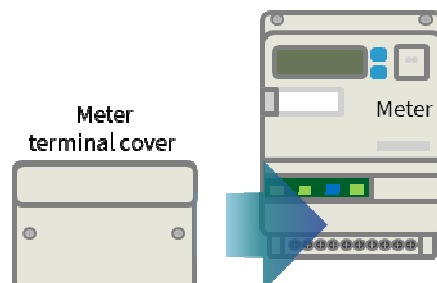
6.2   Signal strength & provider check

The GSM/GPRS signal strength can be checked during the installation process using s specific icon on the meter LCD.
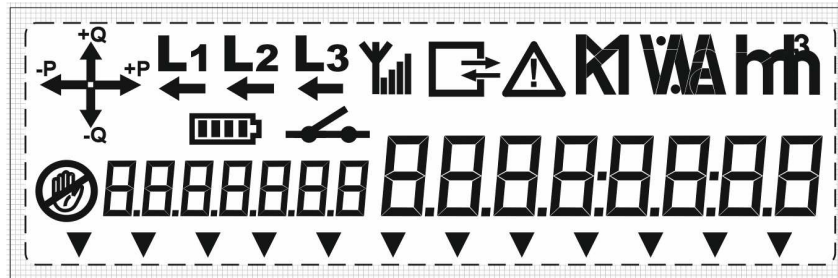
GSM/GPRS signal strength indication

Up to 4 signal strength symbols are used on the LCD to check a good reception:

Bar(s):	1	2	3	4
Signal strength range:	-95 … -86 dB	-85 … -76 dB	-75 … -65 dB	>-65 dB
Icon in LCD:				

Additionally, the signal strength of the communication module can be seen on the LCD under the OBIS identifier**: 131.3.0**
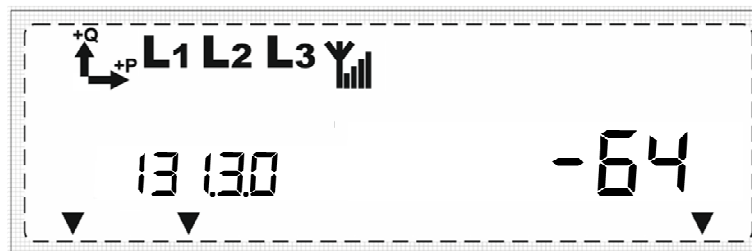
Provider indication

Additionally, the provider of the GSM/GPRS communication can be seen on the LCD under the OBIS identifier: **25.6.0**

7 FW Upgrade

The COM200 provides a FW update through any of the supported interfaces of the MCS301 meter by using the configuration tool Blue²Link.

7.1   Firmware Image transfer of the communication module

Using this Plugin to download the application Firmware to the module. Below step by step procedure:
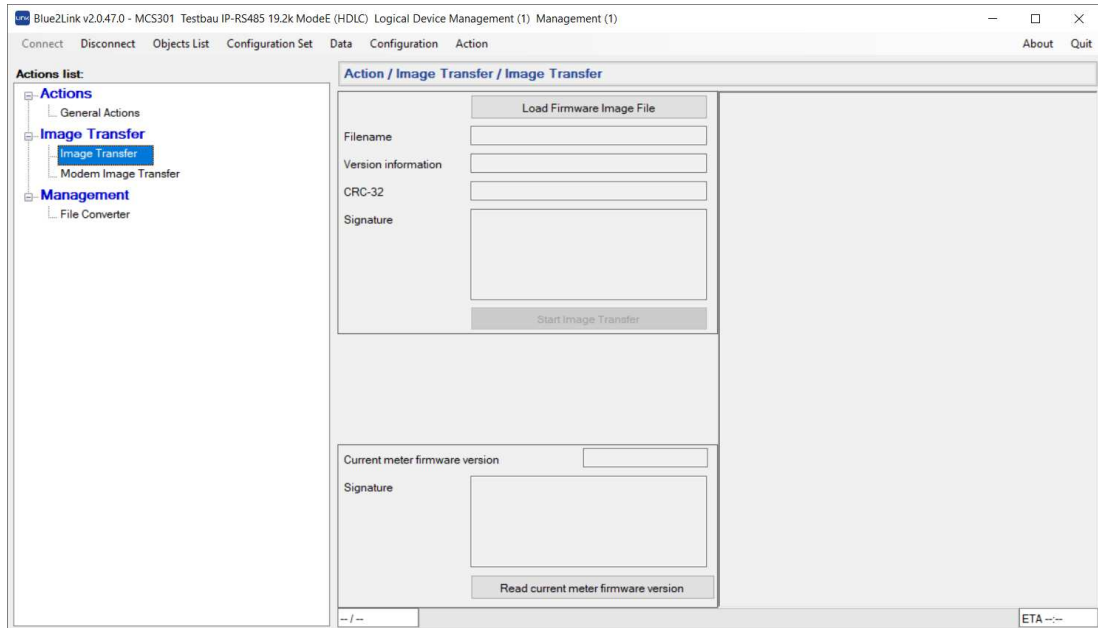
- Load a Firmware image file and download to the module
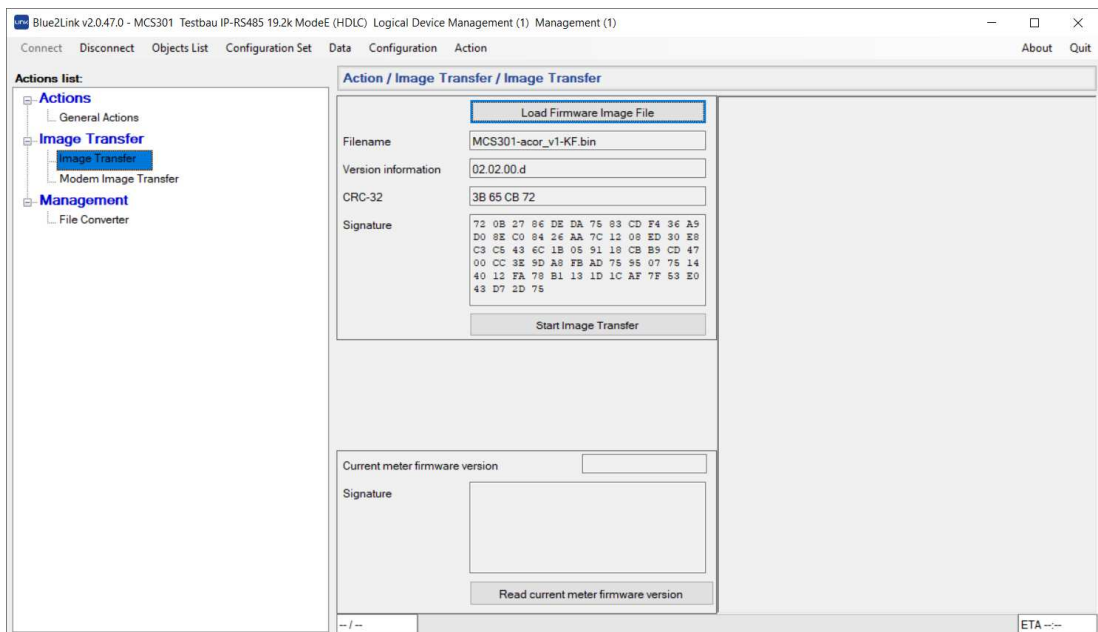
- Pressing "Start Image Transfer" the Image File will be transferred to the module. A progress bar and an estimated download time in minutes and seconds (ETA) will be shown in the lower part of the window.
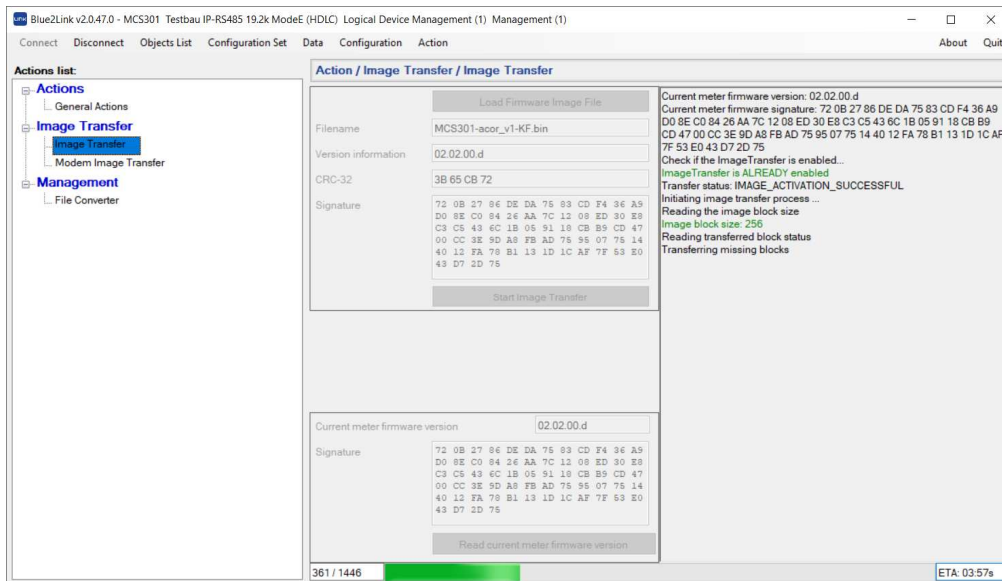
7.2 Firmware activation

After the firmware download is complete 2 options will be shown for activating the firmware:

- Select "Activate firmware NOW" and press "Activate image NOW" to activate it immediately in the meter
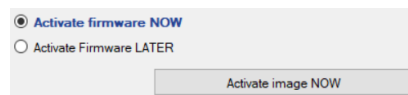
- Select "Activate firmware LATER" and select the date and time for the delayed activation and press "Activate image LATER"
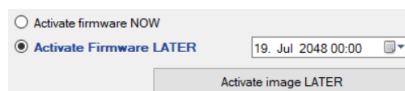
- Afterwards read current application firmware version and signature of the module
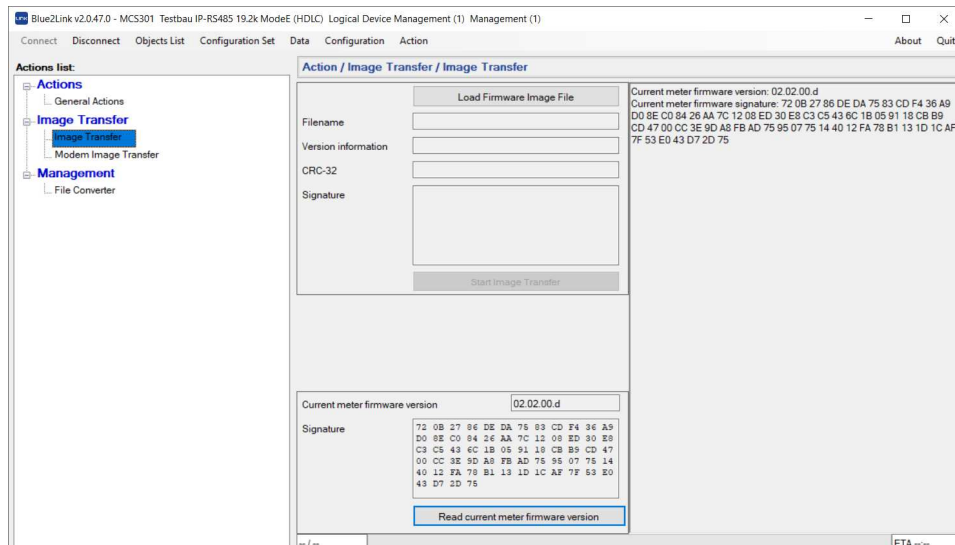
8 Module Configuration Tool

The communication module COM200 can be configured using the remotely or by using the optical interface of the meter in combination with the configuration tool Blue²Link.

8.1 Module settings

Below module settings are supported

- Pin Code of the SIM card
- APN address
- Username
- Password
- Daily reset time
- Socket definitions

8.2   Module status readings

Below status information can be readout from the communication module

- Operator
- Registration status
- Cell information
    - o Cell ID
    - o Location ID
    - o Signal quality in dBm
    - o Bit error rate
    - o Mobile country code

- Adjacent cells info
- IMEI = Serial Number of the Cellular Module

8.3   Push setup Settings

Below module Push settings that are supported

- Push Setup – Targets
    - o TCP, UDP
    - o SMS
    - o Email
    - o FTP
- Push Setup – Lists
    - o List – On configuration
    - o List – On connectivity
    - o List – Clock triggered A
    - o List – Clock triggered B
    - o List – Clock triggered C
- Push setup – Trigger
    - o Scheduler list A
    - o Scheduler list B
    - o Scheduler list C

9   Type key

COM200 - _ _ _ _ _ - _ _ _ _ _ -_
```
        | |   | | | | | | | |
        D |   | | | | | | | |
        Q |   | | | | | | | |
          |   | | | | | | | |
          I   | | | | | | | |
          E   | | | | | | | |
              | | | | | | | |
              0 | | | | | | |
              S | | | | | | |
              - - - - - - - -
```

Frequency range:
    Dual band (900/1800MHz)
    Quad band (900/1800MHz and 850/1900MHz)
Antenna type
    internal antenna with U.FL connector
    external antenna with FMA connector
Interface
    without RS485 interface
    with RS485 interface
Reserved for future use

10 Technical data

Housing	Connection type	Plug 'n' Play Module, which fit in the MCS301 meter
	Dimensions	109 x 62 x 24mm
	Material	Polycarbonate (Lexan), partly glass-fiber reinforced, flame-retardant, self-extinguishing plastic, recyclable
	Environmental conditions	MID M1
Frequency		50 or 60 Hz ±5%
Power supply	Type	Supported from the meter
	self-consumption	< 2 W, 20-40V

Communication module	Cellular	GSM/GPRS:
		    Telit GL865 Dual Band (900/1800 MHz)
		    Telit GL865 Quad (900/1800MHz and 850/1900 MHz)

	SIM card	Mini SIM card
Interface	Meter interface	SPI interface
User interface	Configuration	Optical or electrical interface using the meter tool Blue2Link tool
Temperature / Environmental influences	Operation/storage temp.	- 25°C ... +70°C / - 40°C ... +85°C
	Humidity	95% rel. humidity, non-condensing
	Ingress protection	IP20
	Insulation Class	Class II to IEC 62052-11 ▢
Electromagnetic Compatibility	Surge withstand 1.2/50 μs	6 kV, Rsource = 40 Ω, optional 12kV
	Insulation strength	4 kVrms, 50 Hz, 1 min.
	Environmental conditions	MID E2
Protocol		DLMS/COSEM EN62056-21
Security	Watchdog	Restart Modem in a fixed time every day
Functionality	Sockets	Up to 3 Sockets addresses for parallel communication through: EN62056-21 or DLMS/COSEM communication protocols
	Push mode	Push to FTP server, SMS or Email Different Trigger events, like scheduler or alarm
	Signal quality	Signal strength, Provider, etc.
Antenna connection	Internal	Connector type: U.FL
	External	Connector type: SMA (Female) or FME (Male)
Frequency bands	Dual band	900 / 1800 MHz
	Quad Band	850 / 1900 MHz
Weight		0,1 kg