Electricity Meters IEC/MID

Communication

Landis+Gyr

E65C CU A, B, D, M, G, P, E

Overview of Communication Applications

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Version	Date	Comments
–	16.04.2002	First edition
a	13.09.2002	New types of communication units
b	05.02.2003	Type D2 without S0 instead of D1
c	07.03.2003	Review results inserted, new Landis+Gyr layout
d	19.10.2004	Extension for new types M2x, G2x, P2x and E2x
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k	07.02.2011	Cleaned up headers
m	28.03.2011	Corrected missing P31 references

About this document

Range of validity

The present overview is valid for Landis+Gyr E65C communication units (CU) used for communication purposes with Landis+Gyr meters with built-in CU (ZxD300/400xT I&C meters and ZxQ high precision meters) and meters (e.g. from other manufacturers) with CU connected via CU-ADP2 adapter.

Purpose

This introduction provides an overview of the various communication possibilities with Landis+Gyr E650 meters and helps you to find the best possible communication solution for your situation.

Target group

This document is intended for decision-makers of power supply companies that wish to communicate by remote data transmission with meters.

Content

This introduction provides answers to the following questions:

- What are the advantages offered by communication with meters?
- What form of communication makes sense in which case?
- What communication solutions are available?
- What applications are possible?
- What does a typical communication system consist of?
- How can meters which communicate via the Internet be integrated in an existing communication system?

Reference documents

Further information about Landis+Gyr E65C communication solutions can be found in the following documents:

- Technical data of communication units and CU adapter CU-ADP2
- User manuals of communication units and CU adapter CU-ADP2
- Functional description of communication units
- Detailed application notes for numerous reference applications with various communication units for different transmission media

All these documents as well as product support are available from your local Landis+Gyr distributor.

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1 Communication with meters – why?

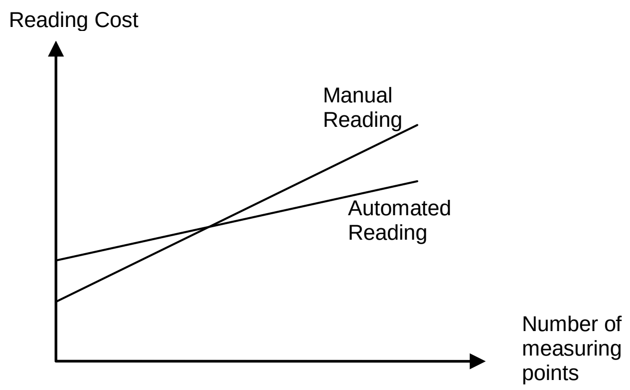
Requirements of the liberalised energy market

In liberalised energy markets, end consumers can choose their energy supplier freely. The relationships between customer, retailers, distribution network operators, control zone operators and generators are therefore more complex. New requirements have been defined for commercial processes:

- Short recording cycles for load profile data
- Transparent, self-explanatory billing
- Every metering point must be accessible at all times
- Synchronous data for all metering points (chain customers)
- Fast access to data required for forecasts

Because an end consumer might be supplied by an "outside" supplier, the energy data must be measured, recorded and transmitted daily. This is done for example to enable resident network operators to charge for the energy supplied.

This not only requires an accurate, reliable measurement, but also a high degree of automation. The cost savings through automation by employing communications technology is a very important factor.



Cost comparison between manual and automated reading

Meters can be read, reset, synchronised, checked and re-parameterised via communication devices from a central point in a convenient, quick, reliable, simple and inexpensive way.

Meter reading

Every installed meter must be read periodically by the power supplier in order to bill the customers. An increasing number of companies do this by automatic remote reading. The state of the meter and its data are transmitted directly to a central station of the company via a communication device. Since this can be done without personnel visiting the customer, the reading intervals can be shortened. It is also more economical and the savings can be invested in core functions. Billing is also simplified.

Meter resetting

At the end of every billing period the meters must be reset. This can be conveniently performed from the central station by remote reading.

Meter synchronizing

It is essential that the meter's system time is accurate (tariff control, display of load profiles and events). For every remote reading the time-base of the internal meter clock is precisely synchronised with the central station time.

Meter check	Remote meter checks can be performed by the power supply company to discover damages, functional failures or tampering. Usually, these checks are combined with the meter reading. If the maintenance interval gets too long, the electric company can suffer considerable losses if these events are not detected. Regular remote reading via a communication device helps to find failures quickly and to ensure all meters are fully operational.
Operating test	A meter's correct operation and whether it or the installation has been tampered with can be checked at any time. This is primarily done with the help of the meter's event logs.
Re-parameterizing	Modern electronic meters can be parameterised, i.e. functions, switching tables, tariffs, etc. can be modified by parameter changes. This is also possible – if legally permissible – from the central station of the electric company via a communication unit.

2 Communication devices – but which?

The communication devices used should be reliable, inexpensive, easy to install and maintain, and above all highly flexible. They should support various forms of communication and technologies depending on local availability and the current state of the art. For example, GSM communication units do not make sense in regions with poor coverage.

Forms of communication

Various kinds of communication devices are available for the remote transmission of data between meters and the power supplier's central station.

- via permanently installed connections, bus systems, etc.
- via the public telephone network: PSTN modems
- via the public mobile telephone network: GSM/GPRS modems
- via transmit and receive devices by radio
- and others such as ISDN, TCP/IP, Bluetooth, PLC, etc.

Often it makes sense to combine different kinds of communication devices in order to achieve 100% meter reading service in a region. For example, a permanently installed local bus connection between several meters of a building combined with a telephone connection from one meter to the central station enables a very cost effective solution.

Meters have a very long service life, but communication technologies change at an ever increasing rate. What is considered the most modern transmission technology today might become outdated tomorrow. Communication solutions therefore have to be flexible. A technology upgrade should be possible without changing the interfaces.

Technologies

Since the communication devices become outdated much faster than the meters, the current technologies can change many times during the life of a meter.

The communication technologies available and used today such as PSTN analogue, PSTN digital (ISDN), GSM, HSCSD, GPRS, TCP/IP, ADSL, etc. will be complemented in the future by UMTS and other technologies.

With the use of Landis+Gyr meters with exchangeable internal or external communication units (see section 3) innovative advances of this kind will not put today's investments at risk. As soon as a new technology gains a foothold in the marketplace, communication units based on newer technology will be offered by Landis+Gyr.

Communication protocols

New communication protocols are also required to take full advantage of the capabilities of the new technologies.

The technologies available so far (PSTN, GSM) have been devised for the transmission of voice (point-to-point links). New technologies such as GPRS or UTMS are optimized for digital data transmission. The meters can be permanently online. In addition, the cost of the transmission is based on data volume as opposed to the call duration. This produces the requirement that the protocol should only transmit data when absolutely required.

Another property of packet based communication is that the delay to deliver packets can vary widely from packet to packet. This introduces the requirement that the protocol must be insensitive to network delays.

Previous experience has shown that significant communication problems can arise with a GSM to GSM connection with the IEC 62056-21 protocol depending on the network provider. These problems show up as a large number of repetitions to read a metering point as well as lost of access of the metering point.

The dlms protocol has been developed to be suitable for use in modern networks. This has the major advantage over the IEC 62056-21 protocol in that the scaling is also transmitted with the metered value and the unit.

New protocols must also comply with the requirements resulting from higher transmission speeds.

2.1 Choice of the most suitable transmission medium

Every communication solution has specific technology-based advantages and disadvantages compared with other solutions. With some, the initial expenditure is high and operation less expensive. With others exactly the opposite is the case. Some are optimum in certain cases and entirely unsuitable in other situations. The following list shows the characteristics of various solutions.

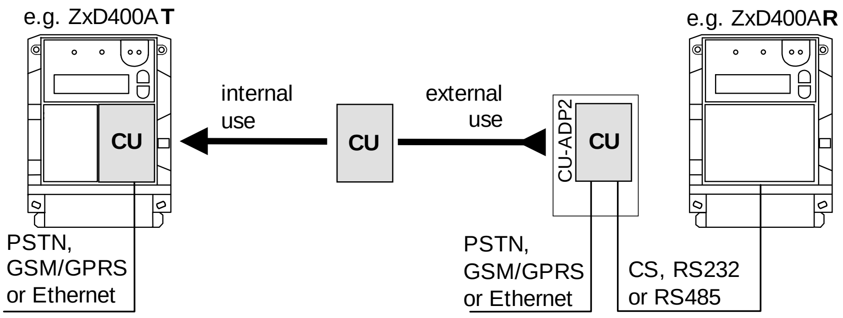
Transmission medium	Characteristics (+ advantages / – disadvantages)
Dedicated lines	+ high transmission rate + high operating reliability and availability + independent of third parties (e.g. network operators) – High installation costs – Installation must be maintained by power supply company
Telephone network	+ Telephone connections are usually present in buildings or are provided by telephone companies + Secure, reliable connection – Installation costs for lines to meter location – With shared lines, additional access, time-windows, costs must be settled – Telephone subscription costs / tariffs must be paid
Mobile telephone network using GSM CSD service	+ Low installation costs + Conceptually similar to telephone network – Dependent on mobile network provider with respect to reliability, availability, reception, future tariff development, etc. – Basic fees (SIM card) and subscription costs incurred

Transmission medium	Characteristics (+ advantages / – disadvantages)
Mobile telephone network using GPRS service	+ Low installation costs + Permanently online (continuous monitoring) + Reduced installation and maintenance costs (less modem equipment at central station) + Shorter acquisition times since multiple meters can be read simultaneously + Operating cost is data volume dependent – Dependence on Internet provider and IT department of utility with respect to reliability, availability, reception, future tariff development, etc. – Dependent on mobile network provider (GPRS provider) with respect to reliability, availability, reception, future tariff development, etc. – Dependent on mobile network provider with respect to reliability, availability, reception, future tariff development, etc. – Basic fees (GPRS SIM card) and subscription costs incurred

3 Solutions with Landis+Gyr communication units

With the new generations of Landis+Gyr meters, Landis+Gyr AG has developed highly flexible product families, which are ideally suited for a wide range of communication technologies. These Landis+Gyr meters feature various communication interfaces for remote meter reading (CS, S0, RS232, RS485, M-Bus, PSTN modem, GSM modem, GPRS modem, Ethernet etc.).

The communication units (CU) are inserted under the front door of the meters provided for this purpose, or used externally in a CU adapter CU-ADP2 for all other meters.



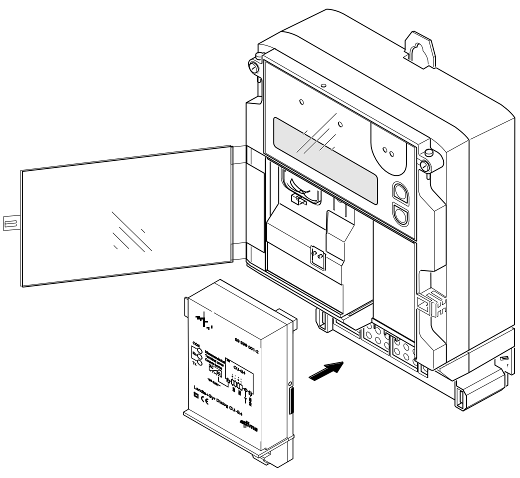
In both cases, the communication unit is secured by a utility seal. It can be fitted and removed at any time in the field without breaking the calibration seal. No special communications knowledge is required of the installation personnel to install or remove pre-parameterised communication units.

The insertion of a SIM card in GSM or GPRS communication units is easy as the communication unit does not have to be opened (there is a special compartment for this purpose).

Communication units fitted in the meter

A communication unit can be inserted in Landis+Gyr E650 ZxD300/400xT I&C meters and in Landis+Gyr E850 ZxQ grid meters. The meters do not have to be reparametrised if a Landis+Gyr communication unit is installed or retrofitted.

The integration in the meter makes external auxiliary units such as power supplies and protocol converters largely unnecessary. As the communication units are easily exchangeable, the communication technology can be adapted at any time to the requirements of the relevant measuring point. The future use of new forms of communication can be quickly implemented with new versions of communication units.

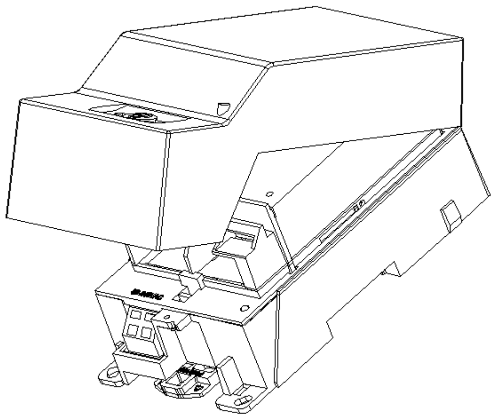


Fitting of a communication unit in a Landis+Gyr meter

External communication units

Communication units cannot be inserted in Landis+Gyr ZxD300/400xR, ZMD100AR meters and in older Landis+Gyr meter types (e.g. ZxB) or in meters from other manufacturers.

For these meters, communication units of the second and third generation can be used externally with a CU adapter CU-ADP2 (communication units of the first generation cannot be operated in a CU adapter). For this, the meter needs to have an RS232, RS485 or CS interface, via which the communication unit can be connected. The power supply for the external communication unit is provided by the CU adapter.

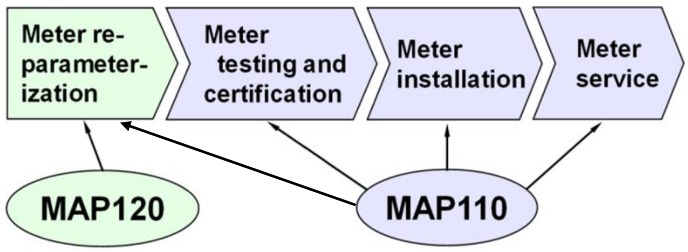


Fitting of communication unit in a CU adapter CU-ADP2

The CU adapter can either be installed on a special terminal cover available for Landis+Gyr meters or used as an external, stand-alone unit.

3.1 MAP Software tools

Two software tools are available for the parameterisation of and communication with meters and communication units: MAP110 and MAP120.



Application of MAP software tools

- The **MAP110** Service Tool covers all the following applications normally required for meter installation and in the service sector:
  - Billing data readout
  - Readout and export of profiles (load profile, stored values and event log)
  - TOU (Time of Use) readout and modification
  - Billing period reset
  - Register and profile resets
  - Setting of certain parameter ranges such as primary data, time, etc.

  - Communication input settings
  - Communication settings for Landis+Gyr communication units readout and modification
  - GSM installation aid for Landis+Gyr communication units (field strength indicators, telephone number information, PIN-code handling)
  - Test SMS message transmission
  - Analysis and diagnostic functions
- Landis+Gyr **MAP120** is designed to read and modify parameters of Landis+Gyr meters and communication units.

Since these software tools support both meters and communication units, there are no further costs for additional parameterization and service tools for these communication units.

3.2 Versions of communication units

The following versions of communication units (CU) of the 1st and 2nd generation are available in various basic versions:

- Communication units CU-Ax (1st generation) with RS232, CS and S0 interfaces
- Communication units CU-Bx (1st generation) with RS485, RS232 and S0 interfaces
- Communication units CU-Dx (1st generation) with M-Bus interface
- Communication units CU-E2x (2nd generation) with Ethernet interface, CS interface and RS485 interface
- Communication units CU-G3x (3rd generation) with GSM modem, CS interface and RS232 or RS485 interface
- Communication units CU-M2x (2nd generation) with PSTN modem (V.34b), CS interface and RS232 or RS485 interface
- Communication units CU-P3x (3rd generation) with GSM/GPRS modem, CS interface and RS232 or RS485 interface

The relevant version is designated with a number inserted instead of "x" (e.g. CU-A1, CU-B2, CU-M22).

Communication units of the 2nd and 3rd generation can be recognised by the 2 or 3 inserted after the basic version letter (e.g. CU-M20, CU-P32).

Each version is fitted with the number of interfaces required for the relevant purpose of application. The customer only purchases what is actually currently required.

Specific customer data, such as note of ownership, customer designations and bar codes, can be provided on the face plate of the communication units to simplify the logistics.

CU-Type	2 S0	CS passive	CS+ active/ passive	RS232	RS485	PSTN Modem	GSM Modem	GSM/ GPRS Modem	M-Bus*)	Ethernet
A4		X								
A5				X						
B1	X			X	X					
B2					X					
B4				X	X					
D2									X	
M20						X				
M22			X		X	X				
G30							X			
G31			X	X			X			
G32			X		X		X			
P30								X		
P31			X	X				X		
P32			X		X			X		
E20										X
E22			X		X					X

*) Only the physical M-Bus layer, but not the M-Bus protocol, is used with the M-Bus interface.

3.3 Interfaces

The interfaces listed are standardised according to the specifications below and are primarily used for the fields of application described:

3.3.1 S0 interface

The S0 interface is standardised to IEC 62053-31 or DIN 43864. The pulse inputs serve to receive external pulses (e.g. from other meters with transmit contacts for fixed valency pulses) for processing in the meter.

3.3.2 CS interface

The serial bi-directional CS interface is standardised to IEC 62056-21 or DIN 66258. It supports both the communication protocol to IEC 62056-21 and communication according to dlms and can be operated both actively and passively. Limitation: the CS interface in communication units of the 1st generation can only be passive.

3.3.3 RS232 interface

The RS232 (or EIA232) interface is an asymmetrical, serial, asynchronous, bi-directional interface according to DIN 66259. With this interface, an external modem or a computer can be connected.

The RS232 interface of the communication units of the 1st generation is available in 2 different versions:

- As a **basic version** without control lines for the connection of an external modem with sufficient intelligence of its own or
- as an **extended version** with control lines for the connection of a transparent external modem.

The use of the extended version with control lines has the following advantages:

- Application of commercially available modems facilitated.
- Maximum possible baud rate can be used without danger of buffer overflow.
- Limiting of maximum connection and idle time possible.
- Optimum behaviour with poor connections. Support of time-windows.

Communication units of the 2nd and 3rd generation contain exclusively RS232 interfaces without control lines.

3.3.4 RS485 interface

The serial bi-directional RS485(or EIA485) interface is standardised to ISO-8482. It is basically intended for the connection of several meters (up to 31) via a master to a communication path (multiple connections).

3.3.5 PSTN modem

The PSTN modem (PSTN = Public Switched Telephone Network) is approved according to TBR21. It is a standard modem for the remote transmission of data via the analogue telephone line of the public telecommunications fixed network. It is licensed throughout Europe by decision 98/482/Ec of the council as an output device for the public telecommunications fixed network. The PSTN modem can be used for V22b or V34b transmission standards.

3.3.6 GSM modem

The GSM modem (GSM = Global System for Mobile Communication) is approved according to various standards such as ETS 300 607-1, EN 301 419-1 etc. It is a radio modem for the remote transmission of data via the public mobile telephone network. The GSM modem uses the 900 MHz and 1800 MHz GSM frequency bands.

3.3.7 GPRS modem

The GPRS modem (GPRS = General Packet Radio Service) uses the GSM network for data transmission, but sends and receives the data in packets. The packet-oriented data transmission permits tariff control according to data volumes transmitted instead of connection time, so that the GPRS modem can be permanently online. GPRS is designed to support TCP/IP (Transmission Control Protocol) protocol over a wireless network.

3.3.8 M-Bus interface

The serial M-Bus interface is standardised to EN 1434-3. It is intended for the connection of up to 250 devices (electricity, water, gas or heat meters) via a repeater (level converter) to a communication path in order to read out the meter data or perform service functions. The use of the M-Bus physical layers (the M-Bus protocol is not used) has, in comparison with the customary use of a RS485 bus, the advantage that an already existing M-Bus infrastructure can be used, i.e. no new cabling is necessary.

3.3.9 Ethernet interface

The Ethernet interface is standardised to IEEE 802.3. This is a standard for data transmission in packet form in LAN networks (Local Area Network). The Ethernet interface permits connection to the LAN by means of the transmission control protocol TCP/IP (Transmission Control Protocol/ Internet Protocol). The maximum transmission speed is 10 Mbps.

3.4 Protocols

All communication units support the meter communication protocols dlms and IEC 62056-21, in which two versions can be parameterised:

- The first version is only suitable for communication according to IEC 62056-21.
- The second version is suitable both for communication according to IEC 62056-21 and also to dlms.

The Landis+Gyr MAP Service Tools permit communication with meters of the ZxD and ZxQ series, both according to IEC 62056-21 as well as dlms.

3.4.1 dlms

While readout according to IEC 62056-21 uses a pre-determined list, readout according to dlms (device language message specification) permits individual configuration of the values to be read by the electric company. The electric company can therefore systematically access specific values and ignore values not required. Remote re-parameterization is also possible with the dlms protocol. The specific advantage of dlms over the IEC 62056-21 protocol is the fact that, in addition to the metered value and unit, the scaling is also transmitted. The dlms protocol is extremely secure for the future, i.e. also ideally suited for future communication applications. With dlms, the HDLC protocol is used for the link layer according to the OSI layer model.

dlms is more than a protocol. It is an **object-oriented system description**, in which every object (e.g. a meter status) has a distinctive name in the form of the OBIS index (e.g. 1.8.1 for energy status active energy tariff 1) and is specified exactly with respect to value and format. Every object is transferred by the transmitter of the transmission layer (physical layer according to OSI layer model) for transport via any desired transport medium, e.g. the public telephone network, and received as object in the same form by the recipient.

3.4.2 IEC 62056-21

A read-out according to IEC 62056-21 supplies a list with the values and in the sequence determined by parameterization. It does not allow individual or additional values to be read out. The communication speed is limited to 19'200 bps. Remote parameterization is not possible with the IEC protocol.

3.4.3 IPT DIN and IPT L+G

The IP-Telemetry Protocol is used for logon-purposes and to transmit telemetry data via IP-networks (GPRS, LAN). It is optimised in such a way that only few control data are added to the user data. It enables the use of dynamically assigned IP-addresses. First, the IP-telemetry-client establishes a TCP/IP-connection with the IP-telemetry-master. Next the IP-telemetry-client logs on to the IP-telemetry-master with using the user name and password. If the login is successful, data can be exchanged in coded form (dlms or IEC protocol).

The two protocols IPT DIN (according to E DIN 43863-4) and IPT Landis+Gyr (Landis+Gyr proprietory iMEGA protocol) are supported.

Once the communication is established, the meter data is transferred using either the dlms or the IEC protocol.

IPT-specific parameterisation includes the following:

- User name
- Password
- Device identifier
- Redirection parameter, whether to store the new IP address permanently or not.
- Current remote IP address
- Current remote TCP port
- Login status

3.5 Meter operation

Operating reliability

All communication units withstand the same environmental influences as the Landis+Gyr meters (temperature behaviour, electromagnetic compatibility, insulation and impulse voltage strength, protection class).

Connections

A receptacle is provided in the Landis+Gyr E650 ZxD300/400xT industrial and commercial meters and in the Landis+Gyr E850 ZxQ high precision meters for all communication units. Connection to the meter is provided via connections at the back of the receptacle. The interfaces of the communication units can be connected quickly and easily with spring-loaded terminals or with RJ12 or RJ45 plug connections.

Multiple connections

In addition to single connections between meter and central station (point-to-point connections) multiple connections (multi-drop) can also be provided from a central station to several meters with a single modem.

Up to 31 additional slave communication units can be connected to one master communication unit via RS485 interfaces. Further details of the permissible distances can be found in the relevant technical data.

Up to 4 meters can be interconnected via CS interfaces (CS interfaces are available above all as sole interface in older meter generations such as the Landis+Gyr meters of the ZxB series or in older tariff units. These units can also be incorporated in new communication solutions via the CS interface.)

Up to 250 devices (electricity, water, gas or heat meters) can be connected via M-Bus interfaces and a repeater to a communication path. For further details on the permissible distances see the relevant technical data.

Multi-master operation

Several masters can also be used in a RS-485 multi-connection configuration. The bus may not include more than 32 meters. (i.e. a maximum of 30 slaves may be used with 2 masters).

The data acquisition of each meter on the bus can be made by either master. Simultaneous communication via both masters is not possible. The redundancy increases the availability.

4 IP-based metering options

4.1 Introduction

The mobile communication market and the Internet-related technologies are highly dynamic. The expectations of the impact of these two areas are great. During the coming years, not only new services and applications will develop, but also entirely new business sectors will emerge.

Satisfaction of these expectations, however, has not been without its problems in practice. Transmission in the wireless medium is marked by low bandwidths, longer delay times, by a basically lower reliability and high security requirements. Technologies such as TCP/IP (Transmission Control Protocol/Internet Protocol) and Internet applications must be suitably adapted to the situation.

New roles and responsibilities

A typical meter remote recording project with TCP/IP and Internet technology is based on the following components: meter, communication unit, GPRS provider, Internet provider, IT department and central station.

The project management and general system responsibility must be clearly designated by the customer or by the local distribution organisation, since a large number of parties is involved.

New possibilities

A wireless connection (GPRS) or a connection via LAN (Ethernet Local Area Network) to the Internet is conveniently possible with TCP/IP. Existing infrastructures such as central stations, LAN, meters, etc. can continue in use. The installation and maintenance costs are reduced, however, since for example no further central station modems are required.

Parallel data acquisition results in shorter acquisition times. In addition, with TCP/IP the meters can be permanently connected to the central station to permit continuous monitoring of the meters. Nevertheless the communication costs with GPRS are significantly lower than with normal GSM.

Worldwide Internet access and lower communication costs (there are also no roaming costs for connections abroad) make new applications possible, e.g. worldwide energy data providers.

4.2 Addressing

4.2.1 Addressing in the Internet

Addressing in the Internet is based on so-called IP addresses. A monthly fee must be paid for a fixed IP address. Since there are more Internet users than IP addresses, dynamic IP addresses are used, i.e. the user (e.g. a meter) is only assigned the IP address from the Internet provider for the period of use. It is different every time, but there is no user fee for the IP address.

Every meter must be assigned a specific identification number for communication via the Internet, so that the same form of drive can be used in the central station as for a physical modem (standard AT commands via COM port). This identification number can be considered a virtual telephone number.

A body is required for Internet metering, which manages the dynamic IP addresses and identification numbers for all meters registered (mapping function). Landis+Gyr provides the product ***iMEGA*** (**Me**tering **Ga**teway) for this purpose, which is connected to the Internet via a fixed, public IP address. No data are stored on the iMEGA server.

Virtual COM port drivers are used in the central station for communication with the meters instead of physical modems. These communicate (also several simultaneously) with TCP/IP via the Internet with the iMEGA server.

IPT

On IP-networks, the IPT protocol can be used for the transmission of telemetry data. It is optimised in such a way that only few control data are added to the user data. It enables the use of dynamically assigned IP-addresses. See also section 3.4.3 "IPT DIN and IPT L+G".

Communication structure

Communication for a remote meter readout with GPRS modem or Ethernet interface via the Internet is developed as follows:

1. The GPRS modem or Ethernet interface in the meter reports to the Internet provider.
2. The Internet provider assigns the meter a dynamic IP address.
3. The GPRS modem or Ethernet interface in the meter reports to the iMEGA server via the Internet and informs it of its assigned dynamic address and its parameterised identification number.
4. The central station starts to read the meter via the virtual COM port driver and the Internet. The iMEGA server routes the connection to the desired meter based on the identification number received by the central station.
5. The central station can read out the meter data via the Internet.

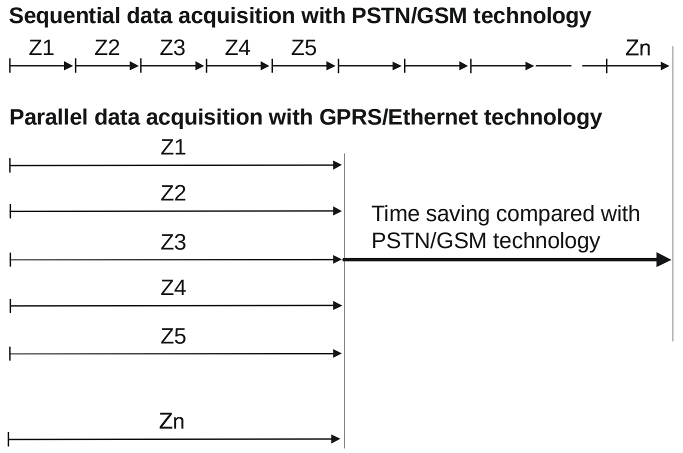
4.2.2 Addressing in the LAN

Addressing in the LAN is likewise based on IP addresses. Every meter connected to the LAN via an Ethernet interface receives a fixed IP address from the utility, in addition to the above-mentioned clear identification number, which are both parameterised in the meter.

Since fixed IP addresses are used, no iMEGA server is required.

4.3 Data acquisition times

Although data acquisition for a single meter with GPRS modem or Ethernet interface takes longer compared with a meter with PSTN or GSM modem, the total data acquisition time can be significantly reduced with GPRS or Ethernet for several meters from a given number of meters compared with PSTN and GSM, since parallel data acquisition is possible.



4.4 Costs

There are basically three options using mobile phone technology for meter reading.

- GSM using CSD (circuit switched data) service
- GPRS using fixed IP address
- GPRS using dynamic IP address

4.4.1 GSM costs

GSM costs are determined by the *connection time* and set-up of the connection.

For GSM technology, the central server needs a separate phone line for every meter to be read in parallel. Roughly, the number of phone lines and modems scale with the number of meters. The more data is to be read out in a certain period, the more lines and modems are required.

4.4.2 GPRS costs

In contrast to GSM, GPRS charges are typically based on the *data quantity transferred*.

There may also be an additional charge to logon to the network and a charge to stay online. Some network providers may try to disconnect inactive devices from the network. This is prevented in Landis+Gyr CUs with the help of an Alive function that generates some extraneous traffic to stay on the network.

GPRS fixed IP address

The fixed IP address generates additional costs compared to dynamic IP. As this is an additional service, network providers charge for the management of fixed IP addresses. For GPRS technology, the central station needs an internet connection to read a number of meters.

GPRS dynamic IP address

The use of dynamic IP addresses reduces costs since fixed IP tariffs are typically higher than dynamic IP tariffs. The management of dynamic addresses requires an iMega server. This server creates costs (hardware, software, administration, support) and needs to be maintained. Dynamic addresses can be used by other users of the network during the day since meters can generally be read during the night. For GPRS technology, the central station needs an internet connection to read a number of meters.

4.5 Security

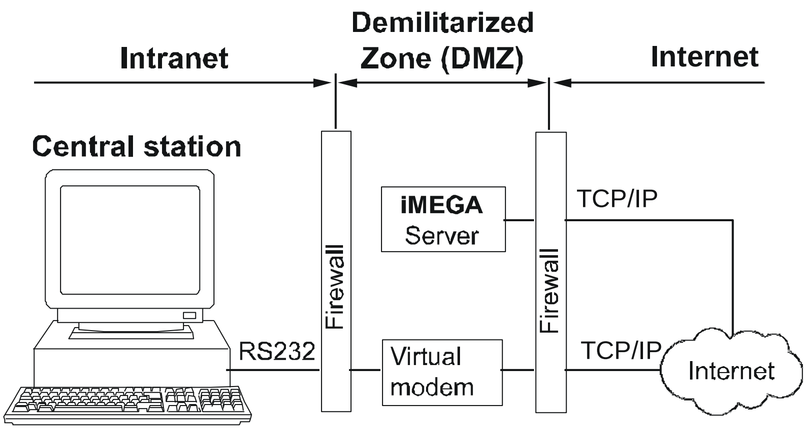
High security requirements must be satisfied when the Internet is used as a communication channel for remote meter reading.

APN

Access Point Name is the unique name used to identify a GPRS bearer service in the GSM network. The APN defines the type of service that is provided in the packet data connection. The APN can be used to provide additional security by creating a separate IP address space that is private to this APN that is hard coded to the SIM card. This provides two security mechanisms. First, a user outside of this private network cannot address the meter since the address space is private. Second, the data traffic can be secured and be routed directly from the GSM network without traversing any unsecured routing point in the internet.

Security at the central station

In accordance with current IT security standards, a DMZ (Demilitarised Zone) with two firewalls is available for protection against unauthorised access to the central station. The first firewall protects the central station and iMEGA server against unauthorised access from the Internet, the second firewall against access from the Intranet.



Landis+Gyr recommends installing the iMEGA server (router) in the DMZ to manage the dynamic IP addresses and identification numbers of the meters concerned.

Security at the meter

Security at the meter is described below based on several threatening situations:

- **Unauthorised access to meters**
  The communication units contain a firewall to prevents this.
- **Unauthorised changes to parameters or software in the meter**
  The meters have a comprehensive software security system to prevent this.
- **Virus attack on meter**
  Since no standard operating system is used on the meter side and the program code is stored in a ROM, no virus attacks are possible.

- **Data fraud**
  Protection against data fraud (e.g. access with an illegally acquired password to simulate legitimation) is not currently provided, but could be made possible with the introduction of an authentication solution with a Crypto chip to ISO/IEC 7816.

Increasing the security

Security can be further increased by using VPN (Virtual Private Network) or with own private networks.

5 Application examples

Key to symbols used

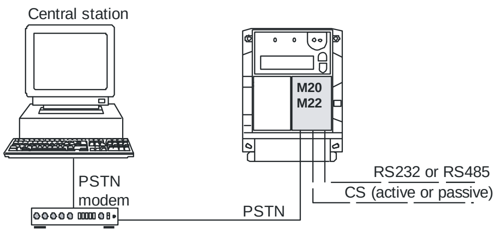
Data channel for local applications

Pulse inputs (S0 interfaces)

In what follows, PSTN is only one of several possible options
In the following examples, the PSTN modem can be replaced by other technologies such as GSM CSD, GSM GPRS or Ethernet.

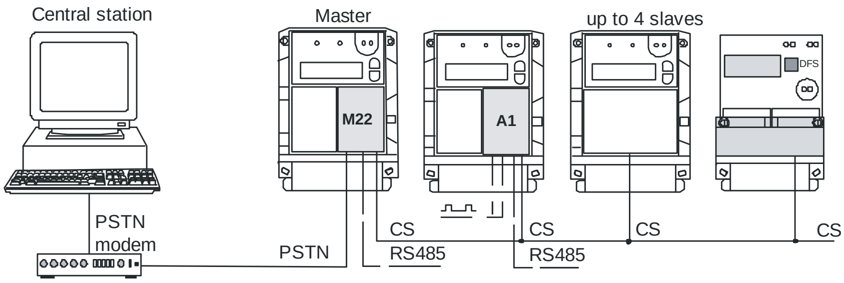
Communication via fixed network

Use of a communication unit CU-M20 or CU-M22. A built-in PSTN modem (telephone modem) permits a direct connection to the fixed network line. Communication with the central station is made via the PSTN modem. An existing RS485 or CS interface can be used to connect further meters, an existing RS232 interface for local applications (see following examples).



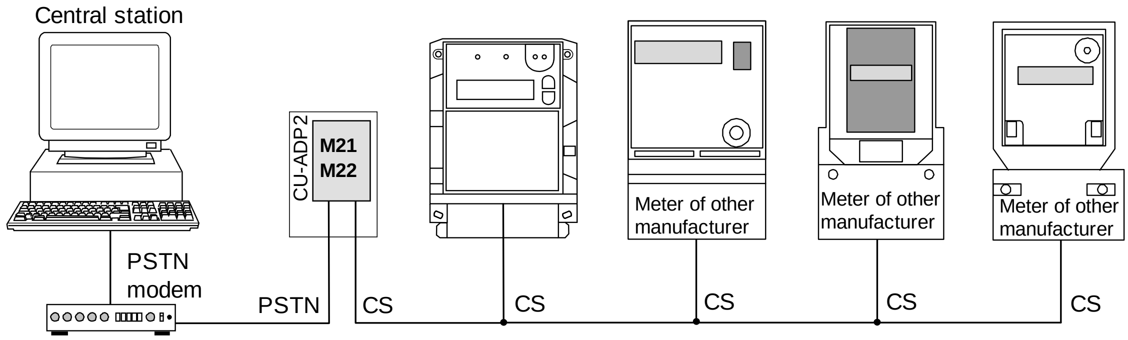
Multiple readout via fixed network and CS interfaces

Use of a communication unit CU-M22. Communication with the central station is made via the PSTN modem, communication with the meters concerned via CS. The active CS interface of the communication unit CU-M22 supplies the current loop.



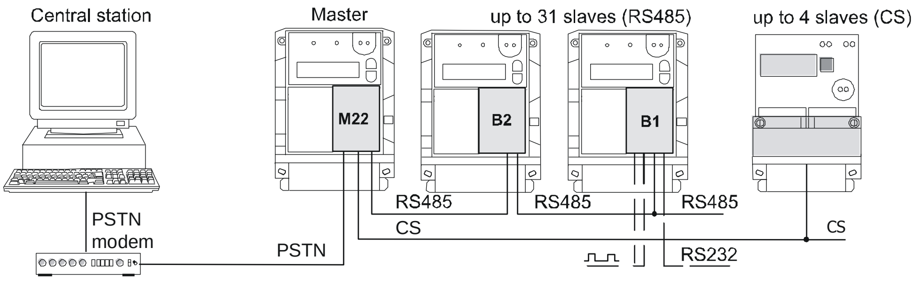
Multiple readout via fixed network and CS interfaces (with CU adapter)

Use of an external communication unit CU-M22 in a CU adapter CU-ADP2. Communication with the central station is made via the PSTN modem, communication with the meters concerned via CS. The active CS interface of the communication unit CU-M22 supplies the current loop.



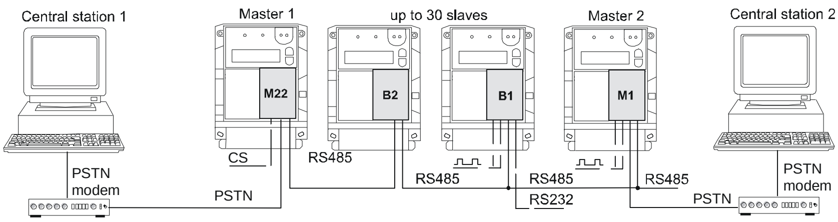
Multiple readout via fixed network, CS and RS485 interfaces

Use of a communication unit CU-M22. Communication with the central station is made via the PSTN modem, communication with the meters concerned via RS485 or CS. Simultaneous communication is not possible via the RS485 and the CS interface. For communication via CS the active CS interface of the CU-M22 communication unit supplies the current loop.



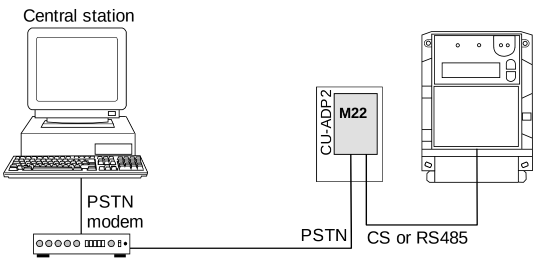
Multimaster operation via fixed network

Use of a communication unit CU-M22 as Master 1 and a further communication unit with PSTN modem (e.g. CU-M22) as Master 2. It is not possible to communicate simultaneously via both master CUs.



Application with CU adapter

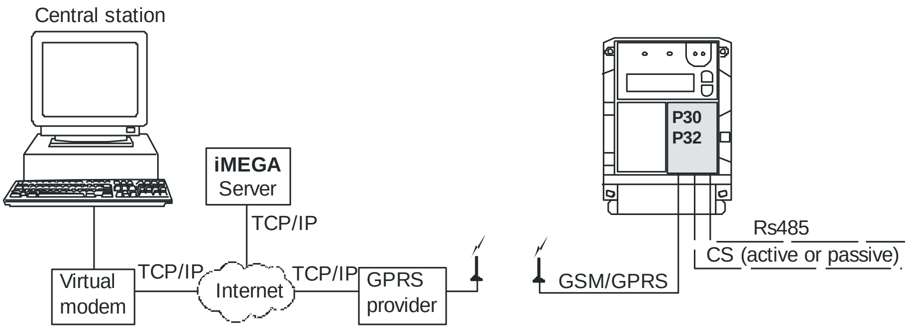
Use of an external communication unit CU-M22 in a CU adapter CU-ADP2. Communication with the central station is made via the PSTN modem, communication with the meter via one of the existing interfaces (CS, RS485). Multiple readouts of further meters can also be performed via the RS485 or CS interface. Multimaster operation is also possible of course when using the CU adapter.



Communication with GPRS via the Internet

Use of a communication unit CU-P30, CU-P31 or CU-P32. With the built-in GSM modem connection to the GSM network can be made directly, i.e. without intermediate connection of auxiliary units. This means less installation work and lower installation costs. Communication with the central station is made via the built-in GSM modem using GPRS via the internet (TCP/ IP). An existing RS485 or CS interface can be used to connect further meters, an existing RS232 interface for local applications (see following example).

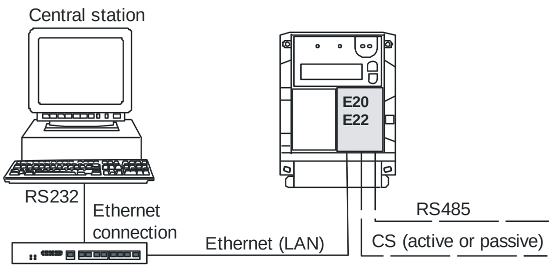
In the following example only the part on the meter side up to the GSM antenna is shown and described.



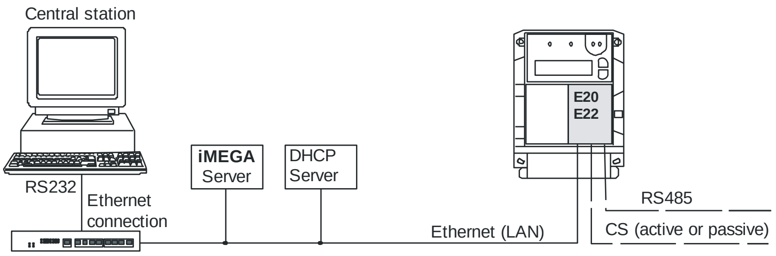
5.1 Ethernet Addressing

Communication via LAN

Use of a communication unit CU-E20, CU-E21 or CU-E22. With the built-in Ethernet controller the network connection can be made directly. Communication with the central station is made via the Ethernet with a fixed IP address of the communication unit. An existing RS485 or CS interface can be used to connect further meters, an existing RS232 interface for local applications (see following examples).



If a dynamic IP address is used on the meter side, an iMEGA server is required as additional component for providing the connection. This manages the dynamic IP addresses of all meters included, which are assigned by a DHCP server.

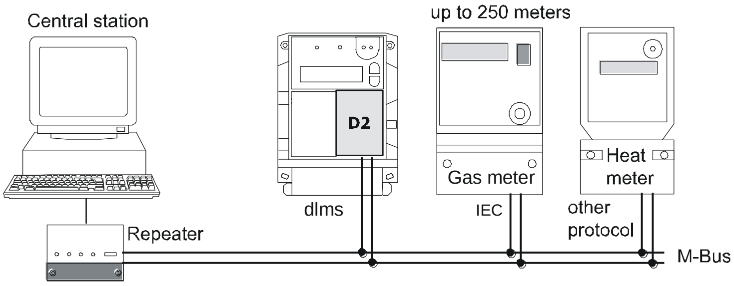


5.2 Applications with M-Bus interface

Multiple connection with M-Bus

Use of a communication unit CU-D2 (can only be used as slave). Owing to the built-in M-Bus interface the meter can be integrated in an existing M-Bus system. With multiple connections with M-Bus up to 250 consumer metering units (electricity, water, gas meters or heat counters) can be mutually connected with a standard 2-core telephone cable.

All meters connected to the M-Bus can communicate with the central station via a repeater (as master) connected to the central station via RS232 interface.



Since many already existing meters or tariff units are provided with an M-Bus interface (above all heat counters), a multiple connection with M-Bus has the advantage that these meters or tariff units can also be included in a multiple connection system (e.g. all consumption meters in a dwelling or building). This has the advantage, compared to the common use of an RS485 multiple connection, that an already existing M-Bus infrastructure can be used continually, i.e. no new cabling is necessary.

The communication unit CU-D2 cannot be used externally in a CU adapter CU-ADP2.

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