



DSfG Gateways C1 and C2 Series 2

Technical Documentation

**Function, operation,
commissioning and maintenance**



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Safety and warning notes



Attention! The following safety and warning notes must be observed:

- The *gas-net* C1 and C2 devices must neither be stored at temperatures below -20°C nor above +50°C.
- A temperature between 0°C and +40°C must be guaranteed during operation.
- The *gas-net* C1 and C2 devices must be installed outside ex-zone 2.
- The power supply of the *gas-net* devices is 24 V DC and must be secured externally by 1 A.
- The earthing is connected to PE of the power supply socket for equipotential bonding.
- Observe the regulations of the relevant standards, in particular the regulations of DIN EN 50014, DIN EN 50020 and DIN EN 50039.

General Notes on the Structure of this Manual

The documentation on hand describes the *gas-net* C1 and C2 DSfG Gateways. As the description holds mostly for both devices, C1 and C2, we refer generally to the device '*gas-net* DSfG gateway'.

In short, the functional differences between C1 and C2 are the following:

- The C2 device is available in a mounting width of 1/3 and 1/2 (the C1 has a mounting width of 1/6) and is therefore able to provide more communication interfaces. (Several additional foreign digital protocols are supported as well.)
- The C2 supports the functionality *Integrated RDT* for establishing a data connection between the *gas-net* device and a remote center. This functionality uses the public switched telephone network or GSM wireless network, a serial direct connection, or TCP.

If a functionality is not available for the *gas-net* C1, it will be explicitly stated in the text.

1 Introduction

1.1 The *gas-net* system idea

gas-net is the generic term for a whole device family. All *gas-net* devices, including future device types, stand out due to a uniform appearance, operation and parameterisation.

The FLOW COMP devices, each by itself, always cover a multitude of measurement and control functionalities.

gas-net devices also provide this functional variety. To keep the operation and parameterisation of the devices well structured and user-friendly, the *gas-net* series is based on a modular concept. A module corresponds to a specific functionality, and to each module belongs a group of settings within the parameter data record. The DSfG gateway *gas-net* C1, for instance, includes the modules System, DSfG, Data exchange, Counters, and Gas quality simulation.

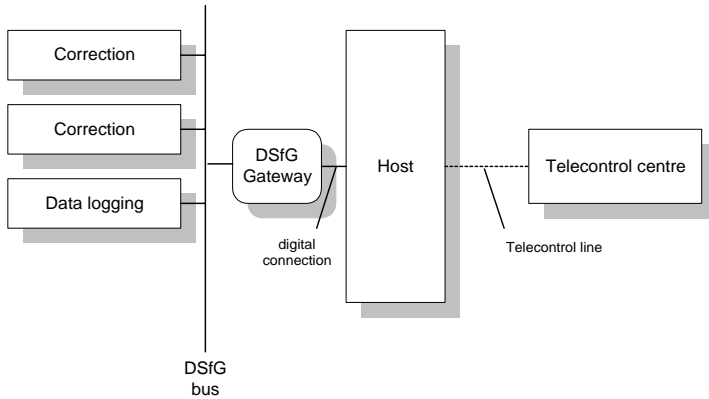
A particular module can be employed in different device types. This yields a modular system that is advantageous to the user as a particular module can always be operated and parameterised in the same way, no matter in which device type it has been installed.

1.2 The *gas-net* DSfG gateway

The DSfG protocol is a digital data protocol, especially developed for the communication between gas metering devices in gas measuring and regulating stations. However, such gas measuring and regulating stations often also contain a PLC (programmable controller), the tasks of which comprise the open and closed-loop control of the station and telecontrol interfacing to a telecontrol centre. Most of the PLCs are not DSfG-capable but use other digital communication protocols¹. Consequently, they cannot be simply included in the DSfG bus.

The *gas-net* DSfG gateway solves this problem: This device is connected to the DSfG bus on the one side and on the other via a digital connection to the PLC called *host* in the following.

¹ Typical protocols are, for instance, *3964R/RK512* (e.g. in case of Siemens S5/S7) or *Modbus-RTU* (e.g. in case of Cegelec Modicon).



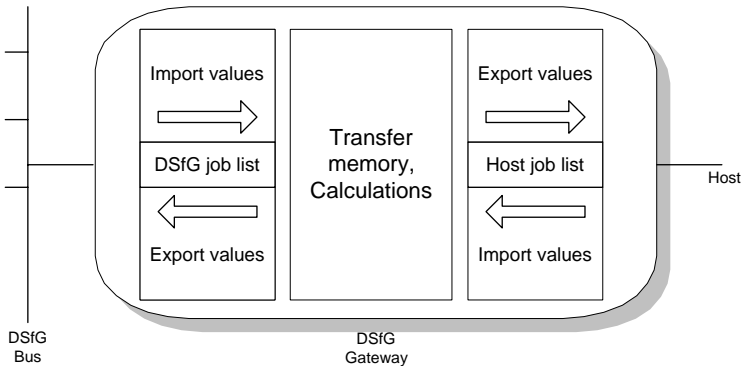
Typical system structure with an integrated *gas-net* C1 DSfG gateway

In summary, the *gas-net* DSfG gateway accomplishes the following tasks:

- Cyclic or event-driven data polling at DSfG stations. Conversion of this data into the host protocol, and its transmission to the host computer.
- Cyclic or event-driven data polling at the host computer. Conversion of this data into the DSfG protocol, and its transmission to DSfG stations.
- Simulation of a gas quality entity towards the DSfG bus using gas quality data provided by the host.

2 How the *gas-net* DSfG Gateway works

The illustration below shall explain how the *gas-net* DSfG Gateway works in principle. The comprehension of the way the *gas-net* gateway works is essential for the following description of the device operation and parameterisation.



Structure of a *gas-net* C1 DSfG Gateway

The *gas-net* gateway cyclically executes a job list for the DSfG side and one for the host side, one independent of the other. The results of import jobs are always stored as data points in a transfer memory, whereas export jobs always take their data points from the transfer memory that has been filled before. The job lists themselves are generated by a PC during commissioning and parameterised in the gateway.

To a limited extent, the *gas-net* DSfG Gateway can also calculate with the data points of the transfer memory. This function will be described in the following chapters, too.

2.1 Host job list (*Data exchange module*)

The job list of the host describes all data flows to be processed between host and *gas-net* DSfG Gateway. The system distinguishes between the flow direction to the host (data export) and the flow direction from the host (data import).

The data transport in the direction to the host is processed cyclically. If a new value arrives from the DSfG side, the associated export value will be updated. In addition to the specification of the destination in the host, the description of the export value also defines the way of positioning the data point in the host (e.g. size, scaling, limits, bit position).

A particular import value describes for the reverse data flow direction from which position in the host a data point shall be collected and in which way it shall be converted. It can be parameterised whether the transmission to the DSfG side shall be performed cyclically or event-driven.

Any number of import values from the host can be combined to a job group. All data points of a job group are always put into the transfer memory altogether and simultaneously, but only after all of them have been collected again once more. Moreover, a job group may be linked with a trigger. A trigger is a defined position within the host. It initiates a new processing of a job when its content has changed.

2.2 DSfG job list (*DSfG module*)

The DSfG job list describes all data flows to be processed between the DSfG stations and *gas-net* DSfG Gateway. The system distinguishes between the flow direction to DSfG stations (export values) and the flow direction from DSfG stations (import values).

A particular import value for a DSfG station describes the DSfG data element that shall be collected and put into the transfer memory. For this, any numerical data element provided by the addressed station can be addressed, without exception.

Several import values of one and the same DSfG station are combined to a job group, a so-called *query telegram*. All data elements of a query telegram are collected via DSfG queries and thus always put into the transfer memory altogether and simultaneously. DSfG import groups also comply with some special features of the DSfG regulations relating to the telegram traffic. For instance, it is possible to process query telegrams either cyclically or upon the

arrival of an attention telegram². You can also collect the most recent entry of a standard query³. Finally, the processing of each individual query telegram can be blocked. This function is useful if the associated DSfG station is temporarily not in operation.

2.3 Foreign Protocols Module (for C2 devices only)

The *Foreign Protocols* module is incorporated in the C2 software only and facilitates the connection of several manufacturer-specific protocols (e.g. the Uniform protocol).

This functionality is intended for special applications; please contact Elster for further information.

2.4 Simulating a gas quality entity via DSfG (Gas quality simulation module)

The simulation of the gas quality data is a very special function of the *gas-net* DSfG Gateway. The DSfG regulations stipulate a specific process that announces the existence of a new gas quality analysis across DSfG and distributes this analysis to all stations interested in it. However, if there is no gas quality analyser incorporated in the gas measuring and regulating station, and the gas quality data is injected via the telecontrol system, the gateway may inject this remotely provided gas quality data in the DSfG bus as if it were a gas

² According to the DSfG specifications the DSfG entities may generate attention telegrams in case of special events. These attention telegrams are routed to all devices on the bus as multi-address message.

³ A DSfG standard query serves to collect several coherent dates of a DSfG station at once by querying with a single data element. For instance, via the "bia" data element you address the standard query 1 of a volume corrector entity. The response to this query supplies all current totalizers and important measurements. Other standard queries are updated upon certain events. The standard query 2 ("bib") for a volume corrector, for example, is always updated at the end of an interval or at the beginning and end of alarms. Each time such a data record is logged the ordinal number increases by one. When polling via an ordinal number, such standard queries always supply exactly the data record that belongs to the indicated ordinal number. The information on the highest ordinal number ("level indicator") is also available via a DSfG data element. This way, you are in the position to collect the most recent entry of a standard query via DSfG.

quality analyser itself. Thus, a gas quality analyser is being simulated for the DSfG entities interested in gas quality data (e.g. for volume correctors). It provides a new analysis each time an analysis is supplied via the host.

2.5 Counters module

The M1's counting function may file counters for different physical values, comprising *Counters* and *Totalizing counters*. The created count values are available across the system and thus can, for instance, be logged, output and in particular queried via DSfG.

2.5.1 Counters and Conversion Factors

The so-called *Counters* create a totalizer based on an input value consisting of either a count value or a flow rate. This input value may either be supplied by a transmitter directly connected to the device (e.g. a gas meter with encoder totalizer, Q.Sonic or FLOWSIC ultrasonic gas meter or a meter with a pulse interface) or come in via a digital protocol from an external source (e.g. via DSfG or MODBUS).

If the incoming count value (possibly determined based on the flow rate) is a volume, it can be multiplied by a conversion factor to create the counter. This way a counter for the base volume, energy or mass can be created based on an input of the volume at operating conditions. A base volume input can be used for creating an energy or mass totalizer.

To define or calculate the factor, a so-called *conversion factor* is assigned to the counter. The definition of such a conversion factor comprises the following specifications:

- Hs and Rho as constants
- k-ratio calculation method $k=const$ or *SGERG-88* or *no correction* (if the totalizer input value already is the base volume)
- Pressure and temperature inputs (consideration of online values for the calculation of the compression factor Z)

Up to 5 conversion factors can be parameterized, each of which may be assigned to different counters at the same time.

The following table shows useful combinations for counters being weighted with a conversion factor:

Input value	Target value	Factor for counter	k-ratio calculation method
V or Q	V	*Z	k=const or SGERG
	E	*Z *Hs	k=const or SGERG
	m	*Z *Rho	k=const or SGERG
V or Q	E	*Hs	no correction
	m	*Rho	no correction

A counter is considered being disturbed in one of the following cases:

- The optional related message input *Disturbance information* has been set.
- The input value for the creation of the counter is disturbed (protocol timeout, cable break, etc.)
- A coefficient is disturbed (e.g. the pressure input value of a parameterized conversion factor)

If the totalizer is transferred digitally, it is possible to either transfer the original totalizer or to create an own counter. Totalizers/counters being created by the device itself can be set via the data interface by means of the GW-GNET+ software during an online connection. The setting of totalizers is subject to the user lock (numeric code).

The *Counters* module is able to file up to 100 counters.

2.5.2 Counters - Intercalating Totalizers

If an input totalizer comes in via a digital protocol only at regular intervals, the option *Intercalate totalizer* is available to achieve that the counter increases continuously and not suddenly.

Based on the input values the *Intercalate totalizer* functionality creates a count value, which is updated continuously. This updating is based on the change of the incoming count value during the previous time interval and can thus not start unless valid count values permitting a calculation of the average change have arrived two times in a row.

This calculated average change per time interval is continuously added to the internally created totalizer. As soon as the next totalizer arrives, the change rate is calculated anew, thus achieving that the difference in case of deviations between the created totalizer and the original totalizer is compensated over the

course of time. The original totalizer is thus not just automatically transferred to the created totalizer. This is important because a possible running backwards of the intercalated totalizer must be prevented.

An intercalated totalizer will fluctuate around the original totalizer when the flow rates are changing. In principle, this totalizer can only represent an approximate value, which is the more precise the lower the flow rate fluctuations are and the more often a new intercalation value comes in.

The procedure is only started anew if an error occurs, such as a mains failure, an error of the totalizer input value or an exceeding of the parameterizable communication timeout. As soon as the error is no longer pending, the newly supplied totalizer will be transferred to the intercalated totalizer and the creation of the intercalated totalizer will be restarted.

There is a special procedure for recognizing the setting of a totalizer: A maximum flow rate Q_{max} is parameterized that must not be exceeded. An implausible totalizer increment violating the defined maximum flow rate is interpreted as "setting". In such a case, too, the new totalizer will be immediately transferred to the intercalated totalizer and the creation of the intercalated totalizer will be started anew.

Furthermore, the intercalation of the intercalated counters is stopped below a flow rate of $1/10$ of the maximum flow rate. In such a case only the totalizers being supplied via the protocol will be transferred to the intercalated totalizer. This prevents that the intercalated totalizer reading is higher than the original totalizer when the station is shut.

2.5.3 Totalizing Counters

A totalizing counter totalizes up to 10 counters and creates a total count value. Each of the involved counters may be included in the totalizing counter with a positive or negative sign. If all involved counters have a flow rate input value, a total flow rate is additionally created.

A totalizing counter is considered being *disturbed* if at least one of the involved counters is disturbed.

If a counter with a negative sign influences a totalizing counter, the overall result should always be positive. Nevertheless, it may happen from time to time that, in terms of figures, a negative total increment occurs – for instance, in case of pulse inputs with different input types (HF, LF). A totalizing counter never counts backwards. An internal buffer retains negative quantities instead. The retained

negative quantities will be subtracted as soon as the total increment is positive again.

The negative quantities can be deleted with a menu command. In addition, accumulated negative quantities of a totalizing counter are always deleted when the counter changes from the *disturbed* to the *undisturbed* status.

A total flow rate is always positive; if a negative value is determined in terms of figures, the total flow rate is set to 0.

Total flow rate and total count value are available as values across the system; therefore, they can in particular be logged and output.

Totalizing counters can be set via the data interface using the GW-GNET+ software during an online connection. Possibly retained negative quantities are deleted when a totalizing counter is set. The setting of a counter is subject to the user lock (numeric code).

The *Counters* module can file up to 20 totalizing counters.

2.6 Integrated RDT Module (for C2 devices only)

The *Integrated RDT* (**R**emote **D**ata **T**ransmission) module implements the data connection between the *gas-net* device and a remote center. The center accesses the data traffic as a logical equal-access station via the integrated RDT during an established data connection. The data transmission is implemented according to DSfG specifications by means of a Class B DSfG interface. If the device is equipped with a DSfG interface, further devices may be connected via this interface. If such a local DSfG bus exists, the connection to the center not only refers to the communication with the entities inside the device but with the entire local DSfG bus traffic. With respect to data communications, the RDT integrated in the device thus completely replaces an independent DSfG RDT as other devices connected via DSfG may also use it.

The parameterization of the *gas-net* device assigns an own bus address (EADR) to the internal *Center via RDT* entity⁴.

The data connection may use one of the following transmission media:

⁴ According to DSfG terminology an *Entity* is an enclosed functionality within a device. One single entity is not necessarily identical with an enclosed device, as a device may contain different entities with their own DSfG bus addresses.

- 1) Public switched telephone network or GSM wireless network (hardware requirements: modem, COM2 interface)
- 2) Serial direct connection (hardware requirements: null-modem cable, COM2 interface)
- 3) TCP (hardware requirements: computer network, TCP/IP interface)

Independent of the data transmission type, the data connection established by the integrated RDT offers multiple diagnostic and information gathering possibilities.

For example, it is possible to poll archive data from a remote location. However, the RDT may also be parameterized in such a way that a special event (e.g. a correction alarm) will trigger a call at the center. This works as follows: According to the DSfG Specification, the entities generate *Attention telegrams* that are forwarded to all other stations in form of a multi-address message in case of special events. It is possible to separately define for each station that the center will be informed spontaneously in case of particular generated telegram types⁵.

⁵ Each DSfG telegram contains a character for the telegram type (TTY). The telegram type identifiers of the currently valid attention telegram types are the following:

Telegram type	TTY
Bus alarm	B
Freeze request	F
Hint	H
End of billing period	I
Alarm	L
New measurement	M
Parameter change	P
Warning	W
Make-specific meaning	Y
Timesynch telegram	Z

Re 1) Data connection via modem and telephone line or GSM wireless network

The data connection usually uses either the public or the company telephone network. If a system is not connected to a line-bound telephone network, a connection can be implemented via the GSM wireless network.

An external modem is connected to the COM2 interface of the *gas-net* device for connection to the respective telephone network.

In order to check the access authorization of the center, the integrated RDT manages the bus address, bus identifier and password of the center (*Center identifier*). A login procedure is carried out during a call connection. If errors occur during this procedure, each side is authorized to interrupt the connection by 'hanging up' for in this case a faulty connection or an unauthorized access can be assumed.

The remote center, however, is only linked via the integrated RDT during an established telephone connection. If the transmission of attention telegrams has been parameterized, the center will be spontaneously called and informed. For this, the integrated RDT has to know the center's telephone number.

Furthermore, it is possible to synchronize the internal device time via the integrated RDT if there is a server reachable by telephone and providing the time via telephone in accordance with a defined protocol. Should you be interested, please consult Elster-Instromet systems to clarify the usability of this functionality in your case.

Re 2) Serial direct connection (null-modem cable)

In case of a serial direct connection the RDT assumes a continuous connection, i.e. a leased-line operation. The interface hardware is connected by a three-core null-modem cable; control lines are therefore not supported. The RDT is always online, so there is no connection set-up, no login procedure, and no connection tear-down. Telegrams to DSfG Class B may arrive at the RDT at any time and are processed there accordingly, i.e. they are answered by internal bus stations or routed to the local DSfG bus. Attention telegrams from local entities are spontaneously sent by the RDT via the leased line to the center directly after their creation.

This operating mode is thus intended for applications for which a continuously established serial direct connection is guaranteed.

Re 3) TCP (computer network)

The TCP connection type is intended for applications which use a TCP/IP network for the transmission of DSfG data. The easiest way is to imagine this operating mode without the modems and telephone network and with an IP network instead. Only the hardware is exchanged and telephone numbers are replaced by IP addresses. The connection remains being a dial-up network (between any IP address of the network and the IP address of the RDT). Like in case of the telephone dial-up network the connection set-up may be initiated by the center or local RDT.

In addition to the IP addresses of RDT and center, the values for the subnet mask and gateway usually used in the IP world and the port to be used for the transmission are special parameters of the TCP connection.

In case of this operating mode the preferred service for time synchronization would be NTP, which is a common network service.

A center that also supports DSfG queries via TCP/IP network is required for this operating mode; e.g. GW-Remote+.

The use of the TCP/IP network is advantageous for applications provided with a nearby IP network. In this case modem and telephone network can be saved.

3 Device view and design

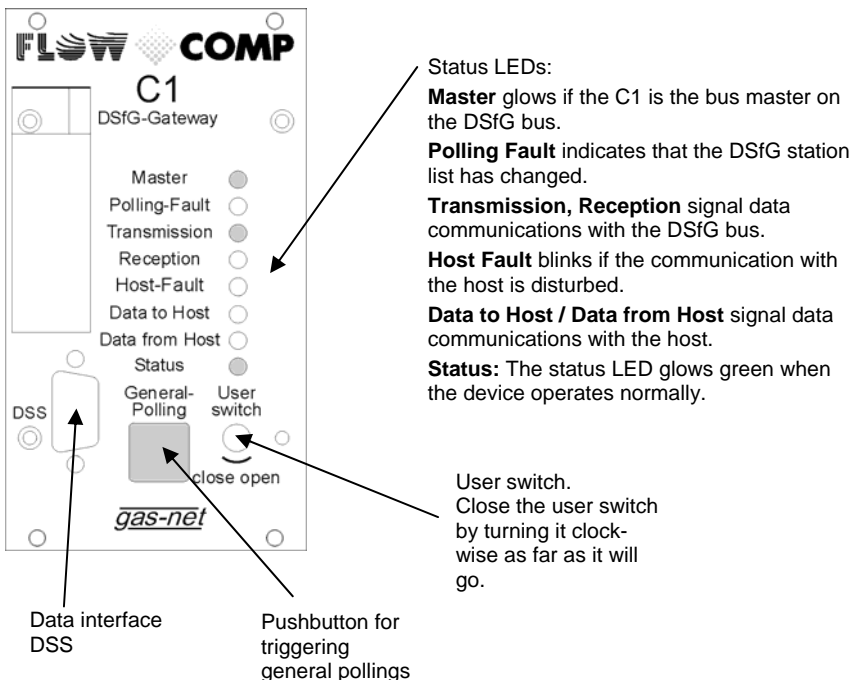
The housing of the *gas-net* C1 is designed as slide-in unit for a 19"-frame with a width of 1/6, the *gas-net* C2 device has a mounting width of 1/3 or 1/2.

The front panel of the device contains the following operating and display elements:

- 8 LEDs for status indication.
- One pushbutton for triggering a general polling.
- One user switch protecting particular parameters from being changed when it is in the closed position. You can only export an entire parameterisation data record into the device if the user switch is open (cf. Chapter 4.1).

The DSS data interface for the connection of a PC or laptop for servicing purposes.

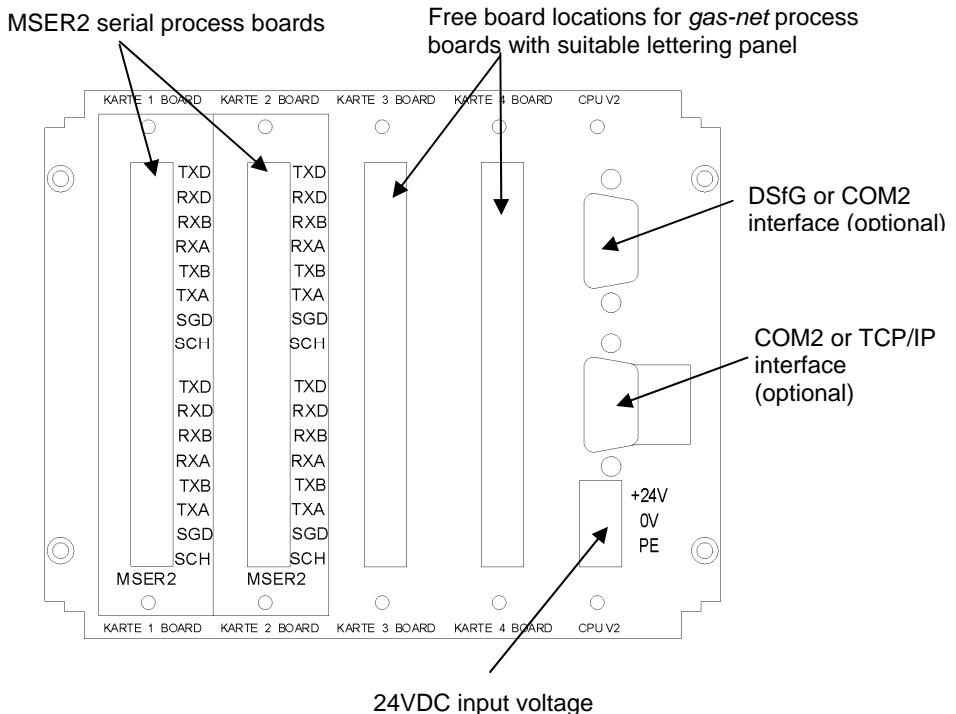
The following illustration shows, as an example, the front view of a *gas-net* C1 (narrow design with a mounting width of 1/6):



In addition to the 24 VDC mains connection up to two of the following interfaces are located on the back of the device:

- DSfG interface
- COM2 interface: serial interface according to RS232. Intended for connecting the modem for the integrated RDT (supported by C2 devices only). Alternatively suitable for connecting proprietary protocols (Modbus RTU, Modbus ASCII, RK512 or 3964R)
- TCP/IP for integration in a standard network installation (for data exchange via Modbus TCP or time synchronization via NTP)

Additionally, the C1 provides a slot for a *gas-net* process board (typically, a serial process board MSER2 is installed here). A *gas-net* C2 device with a mounting width of 1/3 accommodates up to four process boards. The illustration below shows a typical rear view of a C2 device with a mounting width of 1/3.



4 GW-GNET+

gas-net devices are always parameterised via the GAS-WORKS software system with a PC or laptop. All *gas-net* devices are parameterised with the same GAS-WORKS module, called GW-GNET+.⁶

The next two sections generally explain how to create or edit a complete *gas-net* parameterisation using GW-GNET+ and how to export it to the device. It is easy to learn how to work with the parameterisation program. As soon as you have mastered the techniques you only need to know the meaning and effect of each adjustable parameter, no matter which *gas-net* device type is actually concerned. This is why we have enclosed a complete parameter list with additional information in the annex to this documentation.

For a detailed description of the parameterisation program, please refer to the GW-GNET+ online help. It also describes other editing methods the parameterisation program offers.⁷

We recommend activating the context-sensitive online help of GW-GNET+ in case of concrete questions.

4.1 Creating and exporting a *gas-net* parameter data record: Brief description

Should you want to create a completely new *gas-net* parameterisation, please proceed as follows:



1. Start GW-BASE from the Windows environment by double-clicking the lantern icon.

⁶ Please refer to the GAS-WORKS CD-ROM, which is part of the delivery scope of each *gas-net* device, for further information on the GAS-WORKS program system with all the possibilities it provides. All GAS-WORKS components can be installed from this CD, which also contains the operating instructions for all GAS-WORKS modules, in particular GW-GNET+.

⁷ It is possible to change the device parameterisation or individual parameters when the data connection between computer and device is established. These methods are advantageous to different situations: For instance, particular parts of the parameterisation can be exchanged in the GW-GNET+ **Edit parameterisation** mode, even if the user switch is closed. In the **Change parameter** mode parameters characterised as *online changeable* can be edited without a device restart being necessary.



2. Invoke the GW-GNET+ module by clicking the **New – Create gas-net parameterisation** tool in the toolbar. Alternatively, you may select the **Tools – New – Create gas-net parameterisation** menu item from the main menu.

3. Select the device type you want to parameterise in the appearing dialog box and in the next step the version number of the device software. Choose an existing standard parameterisation, on which the new parameter data record shall be based, in the following dialog box.

After you have confirmed your selection by clicking **OK**, the GW-GNET+ interface is activated.

4. Within the **Modules and Linkages** window, each module included in the device software is listed by name and the corresponding icon. By double-clicking this line you activate a dialog listing all parameters that belong to the module concerned.

Adjust the settings according to your requirements.

Tip: There is a corresponding topic for every adjustable parameter within the context-sensitive online help (mark the parameter and press **Ctrl + F1**).

5. Go through all modules in this way until all adjustments meet your demands.
6. Select **File – Save as**, and enter the name under which the parameter data record shall be saved in GAS-WORKS. Close GW-GNET+, for instance via the **File – Exit** menu item.
7. The parameter data record is now in the worksheet of GW-BASE. Before exporting it to the device, you have to drag it into a suitable hierarchy of the GAS-WORKS data management.⁸

⁸ To drag a data record from the worksheet into a hierarchy, proceed as described below:

1. Mark the target hierarchy (which you must possibly create first).
2. Drag the data record from the worksheet into the right half of the configuration window using the mouse.

Alternatively, you can also drag the data record directly to a folder in the hierarchy (on the left in the configuration window).

Please refer to the GW-BASE online help for further information.

8. Connect the DSS data interface at the device to a COM computer interface using a parameterisation cable.
9. Turn the user switch at the device to “open”.
10. Mark the parameter data record and select the **Data – Export** menu item from the main or context menu of GAS-WORKS.
11. The communication program starts.

The window appearing on your monitor shows the information **Data transmission to *gas-net* device**.

After the transmission has been finished, the device will be restarted. The message **Data transmission to *gas-net* device** disappears from the communication window. The type plate of the connected *gas-net* device is shown instead, indicating the most important device data.

You can close the communication program now.

4.2 Importing and editing a parameterisation: Brief description

You can read out the current parameterisation of a *gas-net* device via the data interface and edit it afterwards.

The following description explains how to read the parameterisation into your computer:

1. Connect the COM interface of the computer to the DSS interface at the *gas-net* device using a parameterisation cable.
2. Start GAS-WORKS on your computer if it has not been started already. Activate the communication program by clicking the **Import – Data interface** tool in the GW-BASE toolbar.



After having successfully started the communication program you are linked with the connected device data technology-wise. The window appearing on your monitor shows some important basic device information.



3. Select the **Content** tab now.
4. Mark the **Parameterisation** data record, and click the lantern icon. A **Save as** dialog box appears asking for the name under which the data record shall be saved in GAS-WORKS. After you have entered the name and confirmed your entry by clicking OK, the reading in of the data will start.

5. After the reading in has been finished, you can close the communication program via the main menu item **File – Exit**.

The parameter data record is filed in the GAS-WORKS worksheet under the specified name. Before you can start GW-GNET+, you have to file this data record away in the hierarchy. It is principally impossible to process data records when they are still in the worksheet.⁹

And this is how to edit an existing parameter data record:

1. Mark the parameter data record in the configuration window of GW-BASE.
2. Select **Data – Edit** from the main or context menu.
GW-GNET+ starts.
3. Edit the parameterisation according to your demands.
4. Save the changes you made:
By clicking **Save** you save the data record under its old name.
If you select the **Save as** menu item, you can save the data record under a new name. In this case, the newly created data record is transferred to the GW-BASE worksheet first and must then be incorporated in a suitable hierarchy.¹⁰
5. Close GW-GNET+, and export the changed parameterisation as described in Chapter 4.1, steps 8 to 11.

⁹ For brief instructions see footnote 8, page 6-2.

¹⁰ For brief instructions see footnote 8, page 6-2.

4.3 Extras: GW-GNET+ service programs

The GW-GNET+ program includes some additional service programs fulfilling different tasks relating to *gas-net* devices. The range of available service programs depends on the *gas-net* device type.

For instance, the following tools are available for *gas-net* C1 and C2 devices:



Edit parameterization

for changing the parameterization during an established data connection to the device.

Purely operational parts of the parameterization can be changed this way, even though the user switch is closed.

Note: Please refer to the GW-GNET+ online help for further instructions.



Change parameters

for changing individual parameters during an established data connection to the device.

Note: Please refer to the GW-GNET+ online help for further instructions.



DSfG bus access

Starts GW-REMOTE+ via the data interface, if installed. Facilitates the data access to all devices connected via DSfG; for instance, for reading out archive data and viewing current data.

These programs may only be activated via the DSS data interface with the data connection being established. Proceed as usual:

1. Start GW-BASE on your laptop.
2. Connect the DSS interface of the *gas-net* device to a COM interface of the laptop using a parameterisation cable.
3. Start the communication program by clicking the **Import – Data interface** tool in the GW-BASE toolbar. After the data connection to the device has been established, the type plate of the connected device appears on your monitor.
4. Select the **Tools** tab. The appearing tab lists all available service programs.
5. Start the desired program by double-clicking it.



The functional range of the service programs is manageable and practical. They are therefore quite easy to operate. Comprehensive online help, which can be activated via the **Help – Content** menu item or by pressing the **F1** key, is available for each program.

5 Installation

5.1 Mounting the *gas-net* C1 / C2

The *gas-net* devices are designed for mounting in a 19"-cabinet; the *gas-net* C1 has a mounting width of 1/6 whereas the width of the *gas-net* C2 is 1/3.

A mounting depth of 170 mm must be taken into consideration to leave the terminals on the back accessible. We recommend mounting the device in a swing frame.

The *gas-net* devices must be installed in an explosion-free plant area (where electrical appliances are located) according to protection class IP 20.

5.2 Line Connection

The device must always be load-free during the connection of the generator, supply, signal and data lines.

Any modification of the wiring is only permitted if the supply has been disconnected before!

The connection of the signal lines to the *gas-net* device is implemented via plug-gable screw terminals each of which is located in a cable terminal box. The power supply is connected via fixed screw terminals. Data lines have to be connected to the according SUB-DB9 connector housings.

Please consider the relevant installation guidelines when arranging the wiring. The lines must be tensile stress-free and must be provided with a bend protection, if the *gas-net* device is mounted in a hinged bay. The cable length must be dimensioned in such a way that there is no tensile stress on the cable during the swinging of the swing bay.

5.2.1 Power supply and earthing

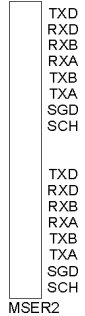
Operate the *gas-net* C1 or C2 device with a nominal voltage of 24 V DC.

The connection of 24 V is implemented via the terminals + and – on the back of the device and must be protected externally against short circuits with 1 A. The internal device protection is guaranteed by a self-resetting overcurrent protector. Connect the protective earth to **PE** of the power supply socket for equipotential bonding.

5.2.2 MSER2 Serial Process Board

The MSER2 serial process board provides two interfaces supporting V24 (RS232) as well as RS422 and RS485. The table below shows the assignment of the individual pins:

Signal	Assignment
TXD	RS232: Transmitted data
RXD	RS232: Received data
RXB	RS422/RS485: Received data (B)
RXA	RS422/RS485: Received data (A)
TXB	RS422/RS485: Transmitted data (B)
TXA	RS422/RS485: Transmitted data (A)
SGD	Signal ground
SCH	Shield



An MSER2 board must always be installed in the device if an ultrasonic gas flow meter (type Q.Sonic or FLOWSIC) is connected via RS485. Another application of an MSER2 board is the connection of a host computer via RK512/3964R or MODBUS protocol or the connection of a GPS receiver for the time synchronization.

Notes:

- When RS422 and RS485 are used, a terminating resistor of 120 ohms may be required in the receiver between RXB and RXA, depending on the cable length.
- In case of RS485, you have to externally connect RXB to TXB and RXA to TXA.

Please pay attention to the specification of the individual protocols. For instance, there are protocols that render a connection via RS485 impossible (e.g. in case of RK512).

5.2.3 Serial interface DSS

The serial interface DSS consists of a SUB-DB 9 female connector mounted on the front and serves to connect the *gas-net* C1 or C2 to other devices, such as a laptop or PC. A connecting line to the computer can be supplied as accessory equipment. A standard COM connection (one-to-one connection) is not permissible.

5.2.4 DSfG interface (optional)

The DSfG protocol is an internal protocol for gas meters for data transmission between devices of the *gas-net* series.

The DSfG interface is a SUB-DB 9 male connector located on the back of the device. Secure the connector with screws.

5.2.5 TCP/IP Interface (optional)

The TCP/IP interface is an RJ45 socket at the back of the device. It facilitates the communication via Ethernet with 10/100 MBit/s and thereby integrates the device in a standard network installation. In addition to time synchronization based on the NTP protocol, remote inquiries and the Modbus-TCP protocol for exchanging data with external devices are also possible via the TCP/IP interface.

The IP address, subnet mask and gateway address must be parameterized for an adequate integration in the existing network infrastructure. Please pay attention to the fact that the IP address must be unambiguous in the subnet. Please ask the network administrator for the subnet mask and gateway address. The use of an STP CAT5 network cable (not transposed) is mandatory.

The pin assignment of the RJ45 socket corresponds to the general Ethernet standard.

The TCP/IP interface adjusts itself automatically to the network transmission rate.

5.2.6 COM2 interface (optional)

The COM2 interface is a serial interface to RS232 and may be used as protocol interface for the connection of a host computer.

The corresponding pin assignment is as follows:

Pin no.	Signal	Signal name	Assignment of the 9-pin rectangular connector
1	DCD	Data carrier detect	--
2	RXD	Received data	used for RK512/3964R and MODBUS
3	TXD	Transmitted data	used for RK512/3964R and MODBUS
4	DTR	Data terminal ready	--

5	GND	Signal ground	used for RK512/3964R and MODBUS
6	DSR	Data set ready	--
7	RTS	Request to send	--
8	CTS	Clear to send	--
9	RI	Ring indicator	--
Screen	--	Chassis	has the same potential as the protective ground

In case of a C2 device, the COM2 interface may be used for the connection of the modem or null-modem cable for the functionality of the integrated RDT.

The connection of a wireless modem requires special attention and thus some preparations that must be accomplished before you may actually commission the device:

Provider Selection / Preparation for Antenna Selection

The first step is the selection of a suitable provider for the usage of the wireless network, with consideration of area coverage and service rates. The provider's data service has to use the RLP protocol for data backup. The converter (gateway) of the provider has to offer an error protocol conversion according to MNP4 and V42, respectively.

In order to be able to select the correct antenna, check the data signal quality on site; for instance, check the field strength by means of a normal mobile phone.

Also check the installation possibilities for the antenna. Especially consider the characteristics of the building. An external installation is always preferable. Attention is to be paid to the station's environment. In case of stations located within built-up areas an antenna that can be protected against vandalism might be useful.

It is also important to measure the distance between antenna and modem to be able to order the antenna cable in the required length.

Component Composition

As soon as you have finalized the contract with the provider you have to apply for the data service. Furthermore, make sure that the data service will be released by the scheduled commissioning date and that the chip card will be available, too.

Select the antenna depending on the determined data signal quality and preferably after consultation with Elster-Instromet Systems.

The following specifications are guidelines:

Field strength	Suitable antenna
High	omnidirectional dipole antenna with mounting base
Medium to low	flat omnidirectional antenna, also for external mounting and for mounting on metal surfaces
Low	directional antenna for pole mounting

The length of the antenna cable to be ordered depends on the distance between modem and antenna.

Commissioning of Wireless Modem

Have the PIN number at hand, if required.

After having installed the antenna, connect it to the modem using the antenna cable. The antenna must be aligned to the maximum receiving level, except for the case that the antenna is an omnidirectional one.

Note: The further commissioning of the integrated RDT with wireless modem is described in Chapter 6.3. It is especially important for the further proceeding to enter the correct PIN number of the SIM card in the parameterization data record of the *gas-net* device. Please also observe the following notes on the correct voltage connection of a Siemens M20 or TC35 wireless modem:

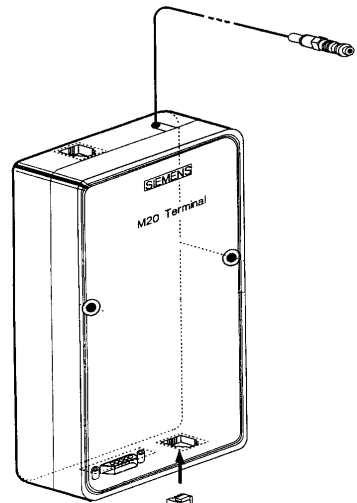
Connection of the Siemens M20 / TC35 Wireless Modem to 24 V

Unfortunately, no generally valid color-coding details can be given for the connection of the M20 or TC35 wireless modem to 24 V DC. Due to the variety of different cables supplied, it is not possible to guarantee a uniform color coding.

Therefore, please proceed as follows: Position the Western plug of the connecting cable in such a way that the locking catch is at the front and pointing upwards. Look at the clamped cable: There are 6 wires. The assignment of the wires from left to right can be seen from the illustration on the right.¹¹

In this way it is also possible to assign the color coding correctly at the open end of the cable and to connect the voltage supply correctly.

Note: Wires 3 and 6 must both be connected to +24 V! These are monitoring and supply signals.



From left to right:

- 1: Earth
- 2: not assigned
- 3: +24 V
- 4: not assigned
- 5: not assigned
- 6: +24V



¹¹ The illustration shows a Siemens M20 wireless modem, but holds by analogy for the Siemens modem type TC35.

6 Commissioning

6.1 Device Parameterisation

A complete parameterisation as well as a modification of all parameters are executed via PC / laptop computer. The parameter data record is created by means of the parameterisation software GW-GNET+.

Note: Please refer to Chapter 4 for a brief instruction on the parameterisation by means of the GW-GNET+ program. For a comprehensive description of the parameterisation program, please refer to the GW-GNET+ online help.

6.2 Commissioning of the Gateway

The following instructions explain the commissioning of a gateway step by step. It may be helpful to have a look at the device view in Chapter 3 from time to time to check where the individual LEDs, interfaces and connections are located.

- Check the installation and wiring of the *gas-net* C1 or C2 gateway in de-energised conditions.
- Pull off the connector marked **DSfG** on the back of the *gas-net* device. Also pull off the connector that establishes the connection to the host (at **COM2**).
- If necessary, consult the specifications of your DSfG bus installation for the intended position of the end-of-line resistors. A bus termination or open-circuit generation is not necessary if exclusively *gas-net* devices are connected to the DSfG bus. If you connect also other stations to the bus, other devices must ensure the bus termination and supply. In this case, please ask the respective manufacturer for information. Also, make sure to comply with the regulations of the DVGW Code of Practice G 485¹².
- Connect the *gas-net* DSfG gateway to the supply voltage. Make certain that the device contains the desired parameterisation.
- Verify the following indications on the front of the DSfG gateway: The status LED glows green. If the gateway is the DSfG bus master, i.e. the EADR “-“ has been assigned to it, then the **Master** LED glows. As the host has not been connected yet, the **Host Fault** LED flashes red.

¹² For source of supply see Appendix (Bibliography).

- Plug in the connector that establishes the connection to the host at COM2 on the back of the *gas-net* device now. If the connection is physically and logically okay, the data connection must be established instantaneously if the host has been switched on and configured accordingly. You may recognise this by the lighting up of the **Data to Host/Data from Host** LEDs on the front of the DSfG gateway. Moreover, the **Host Fault** LED must have gone out.

If the data exchange is physically okay but the data cannot be interpreted, you have to check the associated parameter settings. For instance, a different transmission rate may have been set erroneously for gateway and host.

- Plug in the connector marked **DSfG** on the back of the DSfG gateway, thus connecting the local DSfG bus. Perform a general polling at the device being the DSfG bus master, i.e. the device with the EADR “_”. If the DSfG gateway is the bus master, you can initiate a general polling by pressing the pushbutton marked **General polling** on the front of the *gas-net* DSfG gateway. The LEDs **Transmission /Reception** are flashing alternately. Even after quite some operating time has elapsed, the **Polling Fault** LED must not glow (unless you have changed the number of bus stations), for this would indicate that the bus structure is erroneous or some bus stations are unreliable.
- Check, possibly by means of a make-dependent host-programming device, whether all data points agreed in the DSfG gateway are being exchanged.
- When you are convinced that the DSfG bus and host protocol run reliably at the DSfG gateway, start with a systematic test. Each data point being transferred should be checked from its point of creation (sensor simulation) to its final destination (e.g. the telecontrol centre). The test is only finished, after all data points have been thoroughly tested in this way.

The commissioning is now completed. Remove the parameterisation cable, and make sure again that the **Polling Fault** LED still does not glow. The *gas-net* DSfG gateway should now run reliably and free of maintenance.

6.3 Commissioning the Integrated RDT

Parameterize the settings for the integrated RDT (together with all other parameters of the *gas-net* device) using the GAS-WORKS module GW-GNET+.

Please pay attention to the consistency of the parameter data record; it is especially important to choose the correct modem.

Different procedures are necessary for commissioning the integrated RDT, depending on the operating mode (dial-up line, GSM modem or TCP/IP network).



Dial-up line



GSM wireless
modem



TCP/IP network

Dial-up Line:



- 1) Remove the DSfG connector on the back of the *gas-net* device if a local DSfG bus exists.
- 2) Connect the modem and COM2 interface at the *gas-net* device using the supplied V24 cable. Pull the telephone plug out of the TAE socket outlet.
- 3) Switch the supply voltage of the *gas-net* device off and on again. Switch to the basic display of the *Integrated RDT* module.

The current status of the RDT is visible here. The device will try to initialize the modem directly after start-up.

If the initialization fails, you will regularly receive *No modem* status messages between the individual initialization attempts. Check the modem settings of your parameterization in this case.

Once the initialization has been successful, the status indication will change from *Modem initialization* to *Basic status*.

- 4) If there is a local DSfG bus, plug in the connector marked **DSfG** on the back of the *gas-net* device.

Perform a general polling at the device representing the bus master, i.e. which contains the entity with the EADR “_”.¹³

Invoke the *DSfG* menu (*System* module) at the *gas-net* device, if this hasn't happened yet. You may view the station list here and compare it with the planned bus configuration to check.

¹³ If an entity of the *gas-net* device is the bus master, initiate the general polling via the operator panel at the device:

- Switch to the main display of the *System* module.
- Invoke the menu and select the subordinate menu item *DSfG*.
- Press the Menu key again and confirm the subordinate menu item *General polling*.

- 5) Call your center and verbally announce the connection test. Switch the device off and immediately on again; this way you avoid the call delay times that may have been activated already and thus a waiting period. Then plug the cable into the TAE socket outlet.
If a routing job has already been pending, the RDT establishes the connection to the center. If this is not the case, you have to trigger an event that induces the RDT to call first; for instance, a correction module alarm. The main menu of the *Integrated RDT* module indicates the RDT's status change. Once a data connection has been established and data has been exchanged, the **RX** and **TX** LEDs keep blinking irregularly on the back of the device.
- 6) After the connection to the center has been terminated successfully, check the telephone connection in the other direction. This means that the call has to originate in the center. The connection is implemented as described above. The employee at the center should formally release the telephone connection from his point of view.

GSM Wireless Modem:

Important note: Before starting with the commissioning of the integrated RDT, make sure the accurate PIN number of the SIM card has been set in the parameterization of the *gas-net* device (*Integrated RDT* module). The reason is that the entry of a wrong PIN is only possible twice; if you enter the wrong number a third time, the SIM card will be deactivated.



- 1) Remove the DSfG connector on the back of the *gas-net* device if a local DSfG bus exists.
- 2) Disconnect the wireless modem from the supply and pull the V24 cable off the *gas-net* device.
Check whether the V24 cable is plugged in the modem. Test the antenna installation (has the antenna been connected?).
Insert the chip card in the modem if you haven't done it yet.
- 3) Switch off the *gas-net* device and plug in the V24 cable at the **COM2** interface. Switch the GSM modem and *gas-net* device on again.
- 4) Change to the basic display of the *Integrated RDT* module. The current status of the RDT is visible here. The device will try to initialize the modem directly after start-up.
If the initialization fails, you will regularly receive *No modem* status messages between the individual initialization attempts. Check the modem settings of your parameterization in this case.
Once the initialization has been successful, the status indication will change from *Modem initialization* to *Basic status*.
If the status indication shows the text *RDT not in operation*, the SIM card could not be recognized (for instance, because the card is defective or the PIN is not parameterized correctly). In such a case, the integrated RDT remains deactivated until the next start-up of the device will take place.
- 5) Check the modem's data signal quality via the *Integrated RDT – GSM* menu (cf. description in Volume 1 under *Integrated RDT Module, Display and Operation*).
- 6) If there is a local DSfG bus, plug in the connector marked **DSfG** on the back of the *gas-net* device. Perform a general polling at the device representing the bus master, i.e. which contains the entity with the EADR “_”.¹⁴
Invoke the *DSfG* menu (*System* module) at the *gas-net* device. You can view the station list here and compare it with the planned bus configuration

¹⁴ If an entity of the *gas-net* device is the master, please refer to Footnote 13, Page 8-**Fehler! Textmarke nicht definiert.**, for information on how to perform a general polling.

to check.

- 7) Call your center now and announce the connection test.
- 8) If a routing job has already been pending, the RDT establishes the connection to the center. If this is not the case, you have to trigger an event that induces the RDT to call first; for instance, a correction module alarm.
The main menu of the *Integrated RDT* module indicates the RDT's status change. Once a data connection has been established and data has been exchanged, the **RX** and **TX** LEDs keep blinking irregularly on the back of the device.
- 9) After the connection to the center has been terminated successfully, check the telephone connection in the other direction. This means that the call has to originate in the center. The connection is implemented as described above. The employee at the center should formally release the telephone connection from his point of view.

TCP/IP Network:



- 1) Remove the DSfG connector on the back of the *gas-net* device if a local DSfG bus exists.
- 2) Remove the network connector from the respective socket at the *gas-net* device.

Go to the main display of the *Integrated RDT* module.

It shows the current status of the RDT. The device will try to initialize the integrated network module directly after start-up.

If the initialization fails, you will regularly receive *Module error* status messages between the individual initialization attempts. Check whether your *gas-net* device is actually equipped with a network module.

Once the initialization has been successful, the status indication will change from *Initialization* to *Basic status*.

- 3) If there is a local DSfG bus, plug in the connector marked **DSfG** on the back of the *gas-net* device. Perform a general polling at the device representing the bus master, i.e. which contains the entity with the EADR “_”.¹⁵ Invoke the *DSfG* menu (*System* module) at the *gas-net* device if this has not happened yet. It is possible to view the station list here and compare it with the planned bus configuration to check.
- 4) Now plug the network connector in the corresponding socket at the *gas-net* device. Call your center and ask for the connection test. The center staff

¹⁵ See Footnote 13.

now have to establish a connection to the IP address of your RDT with their data polling tools (which must support DSfG connections via network) and check the data polling. Once the connection has been successful, the main menu of the *Integrated RDT* module indicates the status change of the RDT. Afterwards, the center staff should release the connection.

- 5) After the connection has been successfully established by the center, the network connection has possibly to be checked in the other direction afterwards. This step has only to be taken if DSfG-related events shall spontaneously be signalized to another center via the network. This center must be able to receive DSfG calls via network. In this case the RDT wants to establish the connection. To initiate such a connection request, you first have to trigger an event that induces the RDT to call; e.g. an alarm. The connection will then be established as described above.

7 Maintenance

gas-net devices do not require much maintenance.

7.1 Battery Replacement

The device battery mainly runs down when the device is switched off. The battery consumption can be neglected as long as the device is switched on.

The battery should therefore be replaced after 5 years when in the meantime the device has been switched off for a longer period of time. Otherwise it is sufficient to replace the battery after 10 years at the latest.

If the battery must be replaced, this should only be executed by a service engineer or trained expert for safety reasons.

Important: The old battery must be disposed properly; i.e. it must either be returned to the distributor (Elster-Instromet Systems) or handed in at special battery take-back facilities.

To exchange the battery, you need to open the housing of the *gas-net* device.

Proceed as described below:

- A battery of the following type is required: lithium 3V CR ½ AA.
- Save the device parameterization by reading it out with GAS-WORKS, to be on the safe side. Read out the archives, too.
- Disconnect the supply voltage.
- Loosen the 4 fixing screws on the back of the device.
- Slightly withdraw the mounting rail.

Attention: The boards are sensitive! Avoid any contact with other components!

- The battery compartment is (seen from behind) on the board located back at the top on the far right side. Detach the cover strap of the battery compartment with a screwdriver. Remove the old battery. Now you have 15 minutes for the battery exchange. During these 15 minutes a data backup is guaranteed by a capacitor. Insert the new battery.

Note: When inserting the battery, pay attention to the correct polarity: The positive pole (+) must point downwards! A wrong polarity will not be noticed at first, but during the next power failure that lasts more than 15 minutes the device data will be lost.

- Re-assemble the device and connect the supply voltage.

8 Technical data: *gas-net* C1 and C2

Device type

Electronic DSfG gateway.

Housing

Plug-in unit in 19"-design, 3 height units, 1/6 mounting width (C1 devices) or 1/3 mounting width (C2 devices) for swing frame mounting. Mounting depth without connectors: approx. 170 mm, with connectors: approx. 220 mm. The process interfacing is implemented on the back of the device.

Power supply

24 V DC +/- 20 %; power input: approx. 4 W. As an option: 230 V AC via external power supply.

Indicating instruments

LEDs for indicating the status on the front and back of the device.

Interfaces

DSS data interface for the connection to the COM interface of a PC or laptop for parameterization.

Optional DSfG interface for data transmission between *gas-net* devices.

Optional COM2 interface (serial interface to RS232C) for connecting the host; maximum transmission rate: 38400 baud.

In case of a C2 device, the COM2 interface may alternatively be used for connecting a modem with a maximum transmission rate to V.34 bis (33600 baud) and data compression to V.42 or NMP5 (Integrated RDT functionality). An integrated RDT is also possible via a serial direct connection (null-modem cable at COM2).

Optional TCP/IP interface in form of an RJ45 socket; facilitates data communication via Ethernet with 10/100 MBit/s and thereby integrates the device in a standard network installation. In addition to time synchronization based on the NTP protocol, remote inquiries and the Modbus-TCP protocol for exchanging data with external devices are also possible via the TCP/IP interface.

Parameterization

Commissioning and parameterization via the PC software GAS-WORKS. Parameter data records can be stored, documented and managed in the PC under GAS-WORKS.

9 Annex

9.1 Host protocols

9.1.1 RK512 / 3964R

The *gas-net* DSfG gateway supports the protocol consisting of 3964R (data link layer) and RK512 (data presentation).

Look up the settings of the protocol parameters in exactly this form in the manuals of the programmable controller, and adjust them in the communications processor procedure.

The implementation of the RK512 protocol in the *gas-net* Gateway is restricted to the data transmission between data blocks. The smallest information unit is a so-called *data word*. Such a data word has a length of 16 bits and may contain, for instance, several messages, a status overview in the form of a bit string, or a binary measurement.

The structure of the management of these data words is rather simple; there are up to 256 larger units, *data blocks*, each of which may contain up to 256 data words. Data blocks and words are numbered consecutively from 0 to 255, with the numbers serving as addresses.

A single data word is clearly defined by exactly three details:

- the address of the data block (0..255)
- the address of the data word (0..255)
- the content of the data word

The addresses to be assigned to the host data in the gateway parameterisation therefore consist of a data block/data word (DB/DW) pair. The data block 0 is usually used for intrasystem host variables. This is why you should use the data block 0 neither for exporting values towards the host nor for importing host values.

In some special cases the host only masters the subordinate 3964R protocol layer.

This means that the following restriction applies: As no DB/DW information is transmitted on the 3964R protocol level, all data to be exported or imported must be arranged in a row. The number of data is thus limited to 64 data words per transmission.

This is why in the GW-GNET+ interface the positions for import and export values are not indicated in the DB/DW form but as serial register numbers.

We therefore recommend to switch to the 3964R protocol type in the program's surface first, if necessary, and then to position the export data points or import values during the creation of the parameterisation.

The necessary programming of the host can be minimised by selecting the *Master* operating mode for the gateway side of the RK512 protocol. In this case it is not necessary to compile a job list for the host as the entire data block assignment is carried out via the gateway parameterisation. However, at least the agreed data blocks and the basic protocol functionality must be defined in the host of course.

The communication between the host and the *gas-net* DSfG gateway is subject to several basic requirements. The following list provides a summary:

Communication protocol:	RK512/3964R – point-to-point
Interface:	V24 with PC/AT pin assignment at the gateway
Transmission rate:	adjustable to 2400, 9600, 19200 or 38400 baud
Transmission parameters:	8 data bits, even parity, 1 stop bit
3964R telegrams:	max. 128 bytes (64 data words) per telegram
RK512 response telegrams:	Max. 64 data words per telegram; no 3964R telegram chains possible. In the RK512 slave operating mode (i.e. gateway = slave), the gateway generates the response telegrams listed in the table below:

Error number	S5/S7 Error designation	Cause of error
00H	-----	OK telegram after SEND
0CH	Memory access	<ul style="list-style-type: none"> - A data block has been addressed, which does not correspond with the data block of an RK512 job. - The first addressed data word is not within the data area of the addressed data block. - The addressed data is longer than the addressed data block.
10H	Instruction 2	The second instruction letter is wrong. Here, only 'D' for DB is permitted.
11H	Access not permitted	A telegram with data has been sent, but no access rights for its DB/DW area exist.
16H	Instruction 1	The first instruction letter is wrong. Only 'A' for SEND and 'E' for FETCH are admissible.
34H	Telegram length	<ul style="list-style-type: none"> - The telegram that arrived was incomplete (not enough data). - The length stated in the SEND telegram and the length of the telegram itself do not correspond.

9.1.2 MODBUS RTU / MODBUS ASCII

The Modbus protocol is supported, for instance, by the PLC series of AEG Modicon.

The data presentation according to the Modbus protocol is one-dimensional. The smallest data unit in the memory consists of 16 bits. The protocol contains a number of registers, which are numbered consecutively from 0 up and each of which may contain exactly such a 16-bit word. In each individual case the number of registers depends on the size of the memory available on the host side.

The positions of the import and export values of the host are indicated as serial register numbers in the parameterisation of the *gas-net* Gateway, too. These register details always refer to the MODBUS telegram presentation, which may lead to different register numbers in the PLC, depending on the host type.

Communication protocol:	Based on Modbus RTU/Modbus ASCII according to the <i>Modicon Modbus Protocol Specification</i> (Jan. 1991, MODICON Inc.), point-to-point.
Interface:	V24 with PC/AT pin assignment at the <i>gas-net</i> device.
Transmission rate:	adjustable to 2400, 9600, 19200 or 38400 baud
Transmission parameters:	Modbus RTU 8 data bits, Modbus ASCII 7 data bits. Even parity, 1 stop bit pre-allocated.
Modbus telegrams:	Maximum of 250 bytes (125 register words) per telegram. Only the Modbus telegram types 03 and 16 are supported.
Modbus response telegrams:	In the gateway = slave operating mode, the gateway generates response telegrams when an error occurs. These telegrams are listed in the table below:

Error number	Modbus error designation	Cause of error
01	illegal function	The telegram type received is not permissible, i.e. it is neither of the 03 nor of the 16 telegram type. Only Modbus telegram types with the functional numbers 03 (= read holding registers) or 16 (= preset multiple registers) are needed in the gateway; this why only these are supported.
02	illegal data address	The indicated data address is not permissible.
04	failure in associated device	Other

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