



**Monitoring Unit
gas-net M1**

Technical Documentation



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Safety and Warning Notes



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

- The *gas-net* monitoring unit M1 must neither be stored at temperatures below -20°C nor above $+50^{\circ}\text{C}$.
- A temperature between 0°C und $+40^{\circ}\text{C}$ must be guaranteed during operation.
- The M1 device must be installed outside ex-zone 2.
- The *gas-net* devices may be equipped with hardware modules that are approved as *associated electrical apparatus* of category *ib* according to DIN EN 50020 with intrinsically safe circuits (input boards EXMFE5 und EXDE6). The *gas-net* M1 device is therefore suitable for being connected to sensors and pulse generators (and encoder totalizers, respectively) located in hazardous areas (e.g. zone 1). It is **not** permitted to connect intrinsically safe and non-intrinsically safe circuits to these modules together.
- 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.
- Observe the limit values stated in the respective certificates of conformity of the boards to be connected.

General Notes on the Structure of this Manual

The *Monitoring Unit gas-net M1* documentation on hand describes the function, operation, commissioning, and maintenance of the device.

- * **Tip:** Chapter 4 provides brief instructions on how to accomplish regular tasks during routine tests in the station. It is intended for the impatient reader who does not want to read the entire manual first just to accept an error. It is, however, necessary to read the entire manual to comprehend the device's mode of operation.

The Technical Documentation must always be on hand in the station.

1 Introduction

1.1 The *gas-net* System Idea

gas-net is the generic term for an Elster device family. All *gas-net* devices, including future device types, are characterized by uniformity in appearance, operation and parameterization.

gas-net devices always cover a multitude of measurement and control functionalities. To keep the operation and parameterization of the devices well-structured and user-friendly, the *gas-net* series is based on a modular concept. A module corresponds to a special functionality. Each module has its own main display within the device's menu assistance, and each module has its own group of settings within the parameter data record.

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 parameterized in the same way, no matter in which device type it has been installed.

1.2 The Messaging and Monitoring System *gas-net* M1

The main tasks of a *gas-net* M1 device consist of operational monitoring, message processing and transfer in gas measuring and regulating stations. The M1 device may contain up to seven process boards for signal processing. The number of signals and messages that can be processed by a device depends, among others, on the number and composition of the process boards.

Depending on the requirements, the M1 device can be equipped with up to two of three different interface types available for the interfacing of proprietary protocols:

1. DSfG interface for interfacing to a DSfG bus
2. Serial interface: either for modem connection (RDT functionality) or for interfacing of proprietary protocols (Modbus RTU, Modbus ASCII, RK512, 3964R)
3. TCP/IP for integration into a standard network installation (for data exchange via Modbus TCP, RDT via network or time synchronization via NTP)

The M1 device includes the following basic functionalities:

- Collecting measurements via analog inputs or digital protocol (e.g. HART)
- Monitoring measurements for limit values; gradient monitoring
- Monitoring count values for hourly limits
- Collecting messages via digital inputs
- Combining messages in groups; generating group and centralized messages
- Routing centralized messages via digital outputs
- Error listing for pending messages
- Maintaining an operational logbook
- Logging of measurements and count values (cyclically and in case of certain messages)
- Maintenance switch (M-switch) for suppressing centralized messages during maintenance; blocking of single messages
- Switching function via digital output
- Totalizing function, intercalated totalizers, totalizing counters
- RDT functionality via modem, leased line or TCP/IP network

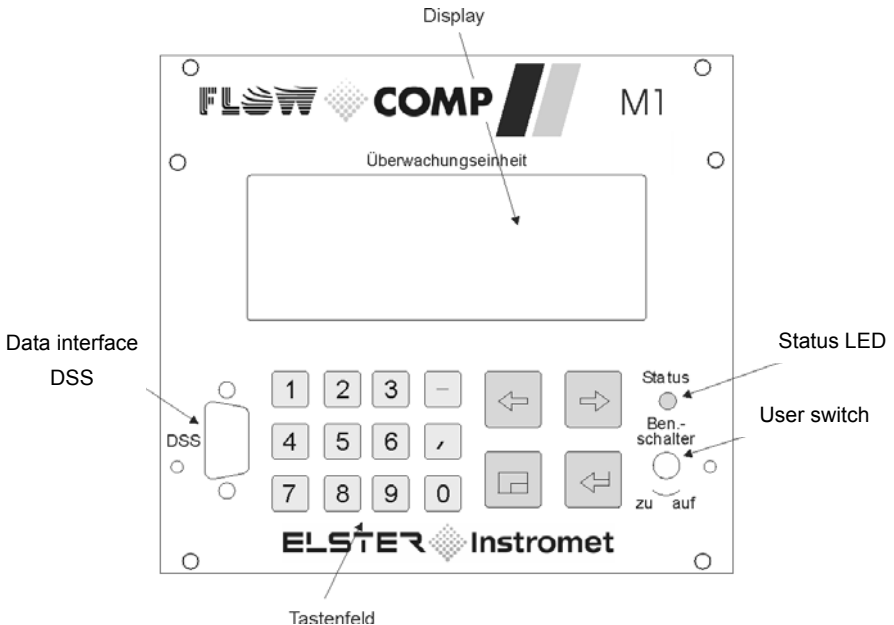
2 Device View and Design

The housing of a gas-net M1 is designed as plug-in unit for a 19"-frame with a mounting width of 1/2 for up to seven process boards.

The device front includes one 8x32 character-LCD, one keypad with 16 keys, one status LED and the user switch. The DSS data interface is also located on the device front. It serves the connection of a PC or laptop for servicing purposes.

All other interfaces and process connections are located on the back of the device.

The following illustration shows the front view of a gas-net M1:



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. 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, RDT via network, or time synchronization via NTP)

All process connections are implemented via process boards installed in the housing. The exact composition of the I/O boards depends on the tasks of each individual device.

Following process boards are available (detailed technical data see chapter 10):

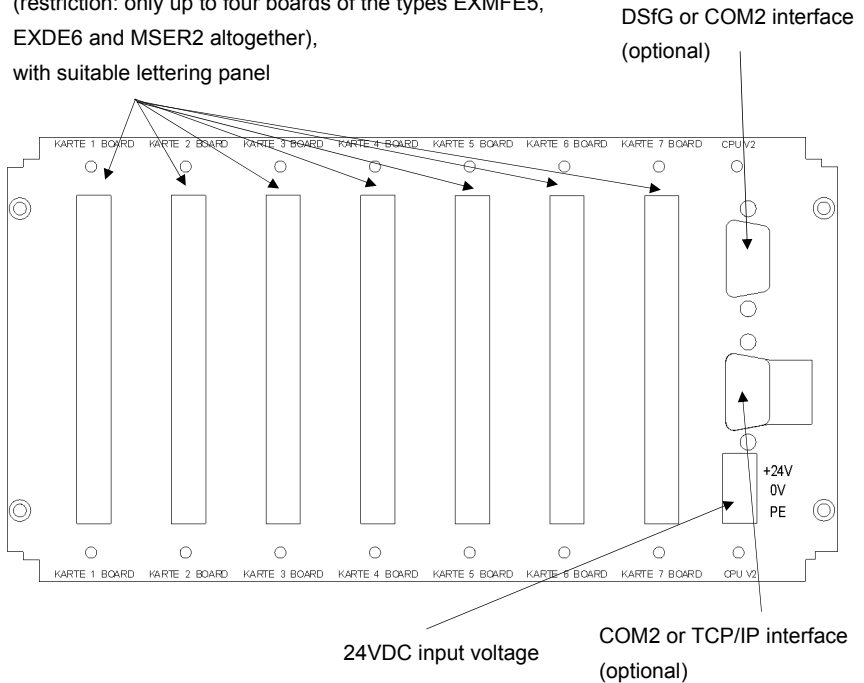
- **EXMFE5 input board** [EEx ib] IIC
 - Three inputs IIC for the connection of LF and HF pulsers or message signals. The first channel is also suitable for connecting an encoder totalizer.
 - Temperature sensor input for a PT100 in 4-wire technique.
 - Measuring sensor input from 4 to 20 mA. This channel can alternatively be used for the connection of up to 4 measuring sensors with HART interfaces (multi-drop).
- **Digital input board EXDE6** [EEx ib] IIC
 - 6 input channels for pulses or messages.
- **Input board MFE11**
 - 8 message inputs and 3 measuring sensor inputs 4.. 20 mA.
- **Output board MFA6** for pulses, messages and measurings.
 - 1 relay output for a message, 3 transistor outputs for messages or pulses, 2 analog outputs for measurements.
- **Output board MFA8** for pulses, messages and measurings.
 - 1 PhotoMos message output, 3 PhotoMos outputs for messages or pulses, 4 analog outputs for measurements.
- **Output board LMFA7.**
 - One relay message output.
 - Two transistor outputs for messages or pulses.
 - Four analog outputs for measurements.

- **Serial process board MSER2.**
 - Two serial interfaces for one protocol channel each.
 - Each interface may be configured to RS232, RS485 or RS422 by a suitable assignment of the interface terminals.
- **Analog input board AE12**
 - 12 analog outputs for measurements.
- **Digital output board DA12**
 - 12 transistor outputs for messages or pulses.

The illustration below shows the rear view of an M1 device:

Seven slots for any gas-net process board

(restriction: only up to four boards of the types EXMFE5, EXDE6 and MSER2 altogether),
with suitable lettering panel



3 Operating gas-net Devices

This chapter's objective is to give you an understanding of the basic operating and menu structures of gas-net devices.

As already mentioned, all devices of the gas-net family have a uniform appearance and a comparable menu structure.

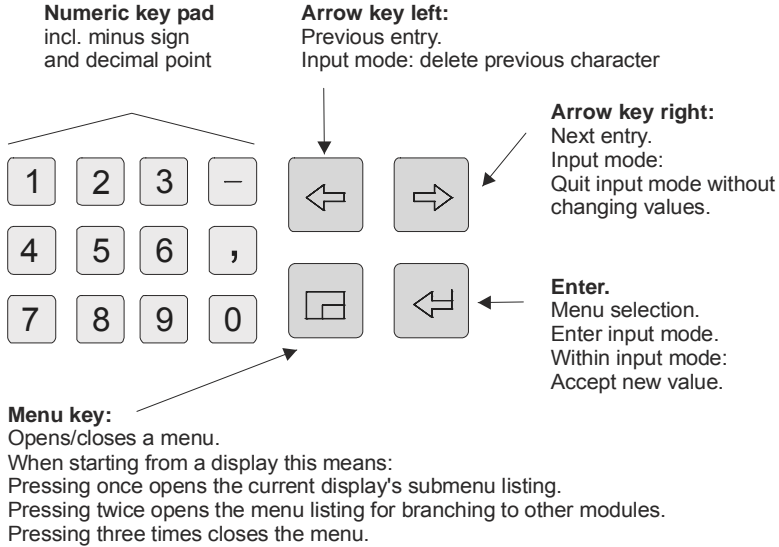
This means: If you have operated a gas-net device once, you will also be able to operate all other device types without any problems.

According to our philosophy of how to parameterize gas-net devices, they are parameterized by means of a PC or laptop and not via the operator panel. The device operation via the operator panel mainly serves the indication of the most important information on the display. The content of the operator interface on the display depends on the individual gas-net device type.

3.1.1 Keypad

The keypad of gas-net devices consists of a numeric keypad for entering numbers, the minus sign and decimal point keys and a group of four navigation keys. With these keys, you may move within the menu structure and invoke menus and displays. In some cases you may also trigger actions or change values via the navigation keys.

The illustration below shows an overview of the keys' meanings. The exact context-related meaning of each navigation key will be explained together with the menu structure in Chapter 3.1.4.



3.1.2 Other Operating Elements: Status LED, User Switch

The status LED on the device front is a three-color light emitting diode.

The different colors and states of the LED (red, yellow, green; each of the colors is either flashing or non-flashing) signal different operating conditions. A flashing green light always indicates the start-up phase after a mains failure; a permanently illuminated green light indicates that the device is running error-free. The exact meaning of the other LED colors and their states depends on the actual device type and can therefore not be described generally.

The user switch is on the lower right side of the front panel. Open it by turning it anticlockwise as far as it will go.

Note: The *User lock* as the safety concept's second level consists of one numerical lock for each of the two contract parties. The user lock is, in contrast to the user switch, implemented via the device software. This means that the locks are defined via the device parameterization and opened or closed via the operator panel. Open locks allow the user to access all parameters and certain actions.

All parameters being subject to the user locks can be changed when both locks are or the user switch is open.

Opening the user switch automatically opens the locks; closing the user switch also closes the locks.

Some actions (e.g. exporting the entire parameterization via the data interface or deleting the archives) are only possible when the user switch is open.

3.1.3 Display

The display is an illuminated LCD consisting of 8 lines with 32 characters each. Typically, the display's background illumination switches off automatically after approximately 30 minutes without a keystroke (parameterizable).

3.1.4 Displays / Menus / Dialogs

This chapter describes the menu assistance and operation of all gas-net devices in general. Where appropriate, individual subjects have been illustrated with examples. These examples refer to currently available device types; therefore, it may happen that a special menu illustrated in an example does not exist in your gas-net device type or does not occur in the software variant. The operating mechanisms generally described here function in all devices in the same way.

Each module has a main display, in which all important current values are indicated.

For example: All gas-net volume correctors and flow computers contain, among others, *Correction* and *Monitoring* modules. The main display of the *Correction* module shows the current totalizers and measurements, whereas the main display of the *Monitoring* module shows the error listing.

The main display of the first module is also the basic display of the device.

For example: The basic display of a gas-net M1 Monitoring Unit is the main display of the *Monitoring* module.

A display serves to indicate values. If there are more entries than can be made visible at once, little scroll arrows on the right side indicate whether or not you may scroll upwards or downwards.

The following pictures show an example for a gas-net F1 flow computer:

```

Correction 1  FD1  12:54:17 W
Cal. lock open 22.01.2007
+ E: 000000024042.977 kWh
+ Un: 000000002334.269 m3
+ Uo: 00000000289.209 m3
+ U: 00000000194.443 m3
+ m: 000000001937.677 kg

```

„Down“ scroll arrow pointing downwards: Scroll downwards with the rightward arrow key.


```

Correction 1  FD1  12:55:15 W
Cal. lock open 22.01.2007
P: 12.6598 bar
T: 16.12 °C
z: 0.974884
zn: 0.997527
k: 0.977301
Z: 12.071458

```

„Up“ scroll arrow pointing upwards: Scroll upwards with the leftward arrow key.

Each invocable display belongs to a module within the device software and thus to an enclosed functionality. In the display of a module, no matter which one, there are principally two different navigation targets within the menu of the device. One target may be a subordinate display/dialog¹ of the indicated module, another one the basic display of any other module.

To be able to navigate within the menu structure as easily and quickly as possible, the Menu key  has been provided with the following functions:

Pressing the Menu key once opens the submenu listing offered by the currently opened module display. Pressing the Menu key again opens the menu listing containing all branching possibilities to other modules. Pressing the key again closes the menu.

The structure of a module's submenu listing depends on the current parameterization: Menu items referring to functionalities that have not been parameterized will not be offered for selection.

Submenus of a module either invoke further displays or dialogs in which the user may adjust values via the operator panel.

The menu structure is tree-like: A subordinate menu item of a module may also have its own subordinate menu items.

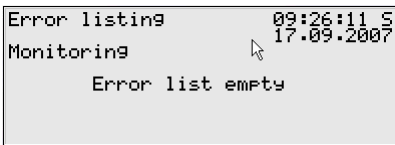
¹ A dialog is a special kind of display indicating values that can be changed by the user via the operator panel.

At lower hierarchy levels of the menu tree the following menu items exist for returning to the next higher level, depending on the context:

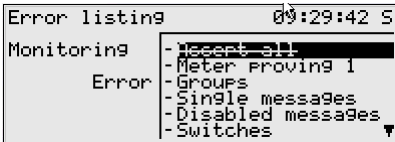
- In a display: menu item *Back*
- In a dialog: menu items *OK / Cancel*
(*OK* also means accepting the modified values; *Cancel* means rejecting the modifications)

No matter on which menu level you currently are: You may move back and forth within a menu listing and select a menu item by using the arrow keys. The selected target is presented in an inverted way, i.e. with green writing on a black background. Activate the menu item belonging to the selected entry by pressing the Enter key.

For example:
 Let's assume you would like to check the signals of a protocol channel. There is an own display in the *System* module for this; we therefore have to invoke the *System* module and branch to the module-specific submenus from there.
 Let's also assume the basic display of the *Monitoring* module is currently invoked. If you press the Menu key, you will see the submenus offered by the *Monitoring* module.



Start:
 Basic display of *Monitoring*



Invoke the menu:
 Menu listing of the *Monitoring* module.
 The dashes in front of the menu names indicate that the listing refers to subordinate menus.

As we do not want to activate a monitoring menu in our example but branch to a different module, please press the Menu key again.



```

Error listing          09:30:52 S
Monitoring            monitoring
Error                 Data logging
                     Integrated RDT
                     Counters
                     Host-Communication
                     System
    
```

Module listing
(without listing dashes
in front of the menu
name)

Now the menu shows the listing of all modules included in the device software. Press the rightward arrow key a couple of times until the module you would like to invoke is selected. It's the *System* module in our example.



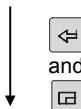
```

Error listing          09:32:32 S
Monitoring            Monitoring
Error                 Data logging
                     Integrated RDT
                     Counters
                     Host-Communication
                     System
    
```

Module listing:
The System module has been
selected.

Press the Enter key and the display of the module you have just selected will be invoked.

Now you can probably guess how to proceed: Please press the Menu key to open the subordinate menu listing.



```

System                09:34:13 S
- Inputs
Device ID - Protocols
Software  - DSFG
Serial No - Locks
Checksum: - Set clock
Operation - Synchronize clock
    
```

Basic display of the *System*
module with related menu
listing

Our destination, the *Protocols* menu, is the second entry in the menu listing. Therefore, press the rightward arrow key once to select the *Protocols* line. Press the Enter key afterwards to confirm your selection and to invoke the related display.

Further tips on navigating within the displays:

- * If you have pressed the rightward arrow key too often and went too far down in the menu selection list, move upwards again by pressing the leftward arrow key.
- * If you would like to quit an invoked menu selection window without having made a selection, just press the Menu key again as often as necessary to close the menu window (twice in case of a menu listing within a certain module; once in case of the module listing).

The selection of some menu items invokes a dialog. These dialogs are displays in which values can be modified. However, only a few values can be modified via the operator panel.

In such input dialogs you move from one parameter to another by using the arrow keys. If a parameter must not be changed (for instance, because it is a parameter that is subject to the user lock, which is closed at that moment), it is crossed out in the display.

If you have selected a changeable parameter, you may switch over to the edit mode via the Enter key.

To make the operation more comfortable, there are different methods of defining a new value, depending on the type of the value to be changed:

Direct Entry of a New Numerical Value

If you would like to replace individual characters only, delete the characters step by step from the right using the leftward arrow key. Then enter the new characters via the numerical keys including decimal point and minus sign.

If it is easier to replace the entire value by a new one, just start with your entry right away: As soon as you press any numerical key the preset value will be deleted and may then be overwritten by the new entry.

Quit the edit mode via the Enter key. This initiates a consistency check: If you have entered a value that does not make sense in the present context or is not permissible, you will not be able to quit the edit mode. This way, the user is forced to correct the value he has entered.

In order to quit the edit mode without accepting the change, for instance after a false entry, just press the rightward arrow key.

In order to quit the entire dialog, invoke the menu and select either *OK* (the new values will be accepted) or *Cancel* (the values will be rejected).

New Value by Selection from a Listing

The device software lists possible values in case of editable values the range of which is restricted to a fixed number of selectable values. Choose a suitable value from the listing via the arrow keys and accept it by pressing the Enter key.

Example: The status of the switches can be changed in the *Switches* menu of the *Monitoring* module. Therefore, go to the related dialog via the *Monitoring - Switches* menu item.

```

Switches                               11:47:10 S
                                       28.07.2007
Switch 1:  off
Switch 2:  off
Switch 3:  off
Switch 4:  off
Switch 5:  off

```

Let's assume you would like to activate switch 3. Press the rightward arrow key until *Switch 3* is selected. Press now the Enter key for switching over to the edit mode. A selection list

opens, offering useful values (in this case: *off* and *on*). Select the desired value via the arrow keys, in our example: *on*.

The display looks as follows:

```
Switches                               11:47:12 S
                                       28.07.2007
Switch 1:  on
Switch 2:  off
Switch 3:  off
Switch 4:  off
Switch 5:  off
```

Press the Enter key to quit the edit mode and invoke the menu:

```
Switches                               11:47:14 S
                                       28.07.2007
Switch 1:  on
Switch 2:  on
Switch 3:  off
Switch 4:  off
Switch 5:  off -Ok
                                       -Cancel
```

Confirm the new setting with *OK* or reject it with *Cancel*.

Modifying Several Values at once

Most of the dialogs do not offer individual values but whole groups of values for being modified. In such a case, edit the first selected value first. Switch to the edit mode by pressing the Enter key.

Move to the next value by pressing the Enter key.

* **Tip:** If you don't want to modify an offered value, skip it by pressing the rightward arrow key.

Change the value either by directly entering the new value via the numerical keypad or by selecting a new value from a listing.

After having edited all values, press the Menu key. The invoked menu contains the menu items *OK* and *Cancel*. Selecting *OK* means accepting the modified values². Selecting *Cancel* means rejecting the changes. In both cases you will return to the display you have invoked last.

² In this case, too, a consistency check is performed: If you have entered a value that does not make sense in the present context or is not permissible, you will not be able to quit the edit mode. You will have to correct your entry first.

4 Primer for Impatient Operators: What do I have to do to ...

Note: The following instructions are based on the assumption that you are in the basic device menu, i.e. in the main display of the *Monitoring* module.

4.1 ... get an overview of pending messages?

The basic display of an M1 device consists of the error listing of the *Monitoring* module. The phrase *Error list empty* appears here if currently no messages are pending which are meant to be entered in the error listing. If the error listing contains entries, it is possible to move within the listing by means of the arrow keys.

Please consider that only centralized messages of the message groups are automatically added to the error listing. A single message only appears in the error listing if this has been explicitly parameterized for the respective message. However, there is also a practical way to get information on the status of all single messages of a group. This is particularly useful if you would like to analyze the reason for the pending of a centralized message.



- 1) Open the menu by pressing the Menu key, select the **Groups** menu item and press the Enter key.
- 2) You are in the Group view display now. This display tells you which of the single messages of the group began first and which one began last.
- 3) Go to the **View** submenu now. This submenu provides information on all single messages that are contained in the previously indicated group. At the beginning the display shows the first of the contained messages. To view a different message, just press the Enter key. Choose the message you are interested in from the appearing selection list and press the Enter key again.




4.2 ... accept messages or the sounder?

Single messages do not require acceptance: A single message automatically disappears from the error listing after it has ended.

However, there are groups within message processing which generate centralized messages requiring acceptance (see Section 5.1.1.3). Furthermore,

there is a main signaler that is, for instance, suitable to drive a sounder. This main signaler must also be accepted.









It is possible to accept all messages requiring acceptance at once via the operating panel of the gas-net M1 device. This is how to proceed:

-  1) Open the menu by pressing the Menu key.
-  2) If it is currently not required to accept any messages, the menu item is crossed out: **Accept all**. Press the Menu key again to quit the menu in this case.
-  Otherwise, just confirm the **Accept all** menu item by pressing the Enter key.

Note: The sounder will go out immediately after an acceptance, no matter whether involved messages are still pending or not. The behavior of the centralized message of a group requiring acceptance depends on the type of acceptance procedure set in the *Monitoring* module. Please refer to Section 5.1.1.3 for further information on message processing; the description of the different acceptance procedures starts on page 5-6.

4.3 ... disable a single message?

To exclude single messages completely from the message processing, it is possible to disable them via the operating panel of the device. The entire message processing regards a disabled single message as *not pending*.

-  1) Pull down the menu by pressing the Menu key. Go to the *Single messages* entry by pressing the rightward arrow key and press the Enter key.
-    2) Single messages are identified by their names. Press the Enter key again and select the message you would like to disable by using the arrow keys. Confirm your selection by pressing the Enter key. The desired single message will then be indicated.
-   3) The disable note (normally: **enabled**) has automatically been selected. Press the Enter key to get into the edit mode. Select the **disabled** entry by using an arrow key and quit the field by pressing the Enter key.
-   4) Invoke the menu and confirm the change with **OK**. The message is disabled now.





To cancel the disabling again, just repeat the above described steps and choose the **enabled** entry instead in step 3.

4.4 ... adjust hint limits or gradients?




In case of single messages derived from measurement monitoring, it is possible to adjust the limit values via the operating panel of the device.

This is carried out – like the above described disabling of messages – via the **Single messages** menu. Select the desired single message first (see above, Section 4.3 , steps 1 to 3).

Then proceed as follows:


-  1) Press the rightward arrow key to select the limit value.
-  2) Press the Enter key now. The insertion character is flashing. You may now enter the new value via the keypad.
-  3) Quit the field by pressing the Enter key again.
-  4) Invoke the menu and confirm the change with **OK**. The new limit value has been accepted.

4.5 ... view archives?

-  1) Change to the display of the *Data Logging* module: While in the basic display, press the Menu key, move to the *Data logging* entry using the rightward arrow key and press the Enter key.
-   2) Select exactly the archive information you want to view in the appearing dialog. Please refer to Chapter 5.2.2 starting on page 5-30 ff for a detailed description of the filter function.

4.6 ... check all parameter settings?

The parameterization of a gas-net device contains too many settings for them to be conveniently displayed via the operator panel. It is much easier to get a general idea of the device settings by means of the GW-GNET+ parameterization program and a laptop.

1. Connect the COM interface at the PC to the DSS interface at the gas-net device using a parameterization cable.
-  2. Start GAS-WORKS on your computer. Activate the communication program by clicking the **Import – Data interface** tool in the GW-BASE toolbar.
3. After having successfully started the communication program, you are linked with the connected device data technology-wise. The window appearing on your display shows some important basic device information.
4. Select the **Tools** tab now. Double-click the **Change parameters** or the **Edit parameterization** entry. The GW-GNET+ interface will appear on the

screen. This is where you can invoke and check the parameter listings of the individual modules.

Please note: The **Change parameters** or **Edit parameterization** service programs also offer the option of changing device settings. The current status of the protection mechanisms (user switch / user lock) is of course taken into consideration. Please refer to the GW-GNET+ online help for further information.

5 Functional Description

5.1 *Monitoring* Module

5.1.1 Function

The *Monitoring* module basically performs the signaling and monitoring tasks of the device:

- Monitoring of any logged measurements.
- Signaling of operating states.
- Measurements.
- Log-on of process value archives (archives for measurements and count values which may be used to replace a recording instrument).
- Switching functionality.
- Performance of meter provings between correction entities connected via DSfG.
- Summation of count and flow values of two correction entities connected via DSfG.
- Controlling the gas meter lubrication

5.1.1.1 Meter Proving for Correction Entities via DSfG

The gas-net M1 can carry out a meter proving between two correction entities. For this, both corrector entities must be connected via DSfG.

The comparison quantity (V_n , energy E or mass m) is defined by parameterization.

There are two different operating modes for the meter proving:

1. Manual proving

The proving is initiated and stopped directly at the device (see Chapter 5.1.1.5). After the proving has been stopped, the device determines the percentage deviation of the quantities or rates that have flown via the two correction entities.

2. Automatic proving

The device parameterization includes the definition of a proving time and a maximum percentage deviation. If both volume correctors and flow com-

puters operate faultlessly, the proving is started automatically. The percentage deviation is calculated at the end of each proving time. Should the maximum deviation be exceeded, the device generates an internal message, which can be output via a digital output.

5.1.1.2 Summation between correction entities via DSfG

A gas-net M1 is capable of adding count values and flow rates of any two correction entities connected via DSfG and making them available for further processing. This way, for instance, summated quantities can be output via a pulse output or summated flow rates via an analog output.

Any two correction entities to participate in the summation may be defined in the parameterization.

The procedure works similar to the meter proving function described above: The information provided by the two corrector entities is obtained via DSfG approximately every 10 seconds. In case of totalizers the calculated difference is evenly distributed over one query interval to ensure that the totalizer sum is continuously increased and not suddenly every 10 seconds. This provides, in particular, a uniform output of pulses in case that a summated quantity or rate has been assigned to a pulse output.

5.1.1.3 Measurement Monitoring; Messages and Groups

If you know the DIN 19 235 standard (*Signaling of operating conditions*), you may be familiar with many terms mentioned in the description below. The message processing of the gas-net device is oriented towards this standard wherever it has proved to be useful and possible with regard to the monitoring function.

The message processing may manage up to 64 single messages defined by parameterization. In principle, there are different types of conditions to be signaled which can be mapped to such a message. The operator himself defines the events that shall result in messages within the message processing when parameterizing the device.

First, the status of a digital message input (set/not set) can be evaluated as message. Messages generated by the device itself during operation may also be included in the message processing, such as a flow computer alarm.

Second, measurements can be monitored for limit violations. This applies to measurements supplied via analog inputs or measurements created internally,

such as flow values of the *Correction* module. In addition to monitoring upper and lower hint limits, it is also possible to *monitor gradients*. The gradient monitoring observes measurement changes within defined time ranges: If the difference between the largest and smallest values of a measured quantity exceeds the defined maximum value within a parameterized time range, the condition for generating the *Hint limit gradient* message has been met.

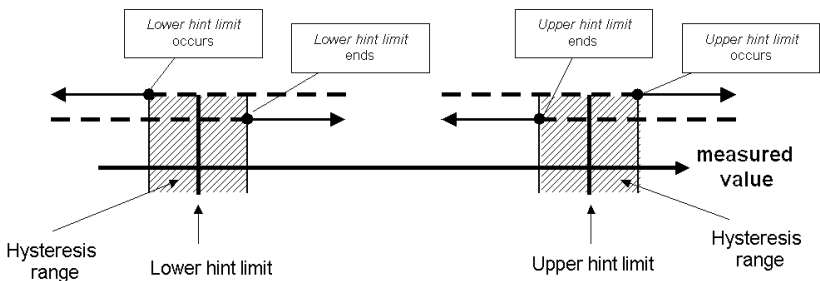
Third, pulses or quantities may be monitored for the violation of hourly limits. This applies to pulses that come in via inputs and to internally calculated quantities. Should the quantities that have been summated since the beginning of the hour exceed the defined limit value, the message is regarded as being set till the hour ends.

Note: All single messages referring to measurements are also pending if the related input value is regarded as being disturbed.

There are two different methods of avoiding fluttering messages:

1. Hysteresis monitoring (only in case of measurement monitoring)

A hysteresis can additionally be defined to avoid fluttering messages when a measurement fluctuates around a limit value. The message *<Hint limit begins>* will then only be generated or removed if the measurement is not within the hysteresis range.



2. Considering a minimum pending time

If a minimum pending time is evaluated, a message is only considered pending if the condition to be signaled (set digital input, hint limit violation, etc.) is pending longer than the minimum pending time lasts.

The target of the message-processing concept is to combine messages in groups. Owing to group monitoring and evaluation the monitoring itself remains clearly understandable even if the amount of signals is rather large.

The user himself may define the scope of the related error listing. Via the device parameterization he determines for each message whether a *single* message shall be entered in the error listing and logbook of the *Monitoring* module. Only if this is the case, the message will be entered in the error listing as soon as it begins. There is no acceptance required for single messages; they are automatically removed from the error listing when they end. If a message is entered in the error listing, beginning and end of this message are also entered in the logbook. The *Archive* module is able to log the logbook of the *Monitoring* module.

Individual single messages can be *disabled* during operation, which is, for instance, rather helpful during a plant inspection. The message processing completely disregards disabled messages, which are always considered not pending. The disable note of a message can be changed via the operator panel of the device, via the parameterization and with a DSfG setting telegram.

Single message data (characteristics, current values) can be enquired via DSfG. Some properties are also adjustable via DSfG, such as hint limits and gradients.³

In order to simplify the monitoring of up to 64 messages, single messages can be combined by parameterization in up to 8 groups in any composition whatever. Each group generates 3 different messages that are created by linking the single messages contained in that group. This way, the operator is able to monitor the status of content-related messages without getting lost in the observation of single messages.

The different message types of a group are called *Group message*, *Held group message* and *Centralized message*.

³ The DSfG data elements for message processing are included in the DSfG data element tree of the *Control* entity. Please ask Elster for a precise list of the supported or used DSfG data elements, when required.

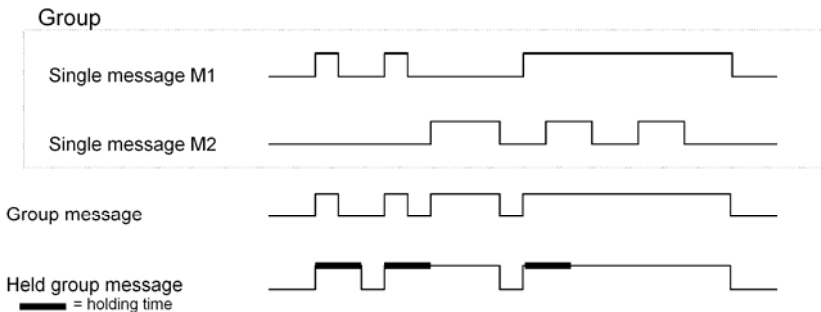
Group message

A group's group message results from the OR operation of the single messages belonging to the group. Thus, a group message is pending if at least one of the messages of the group is pending.

A group message is not linked with an acceptance.

Held group message

The held group message only differs from the normal group message by always keeping to a holding time; for instance, for taking the telecontrol response times into consideration. A held group message is pending at least as long as the holding time lasts, even if the normal group message ends during the holding time.



Centralized message

A special feature of the centralized message is that it can link the states of single messages with an acceptance signal. The *Acceptance required* or *No acceptance required* property is defined as group characteristic in the parameterization.

All centralized messages are entered in the logbook and error listing.

If a group is marked with *No acceptance required*, the result of the centralized message is always the same as the result of the group message. In contrast to the group message, however, the no acceptance requiring centralized message is entered in the error listing and logbook.

There are two different procedures for the acceptance technique and the status of the centralized message of a group marked *Acceptance required*. These two procedures are described below.

Acceptance technique of centralized messages, procedure to DIN 19 235

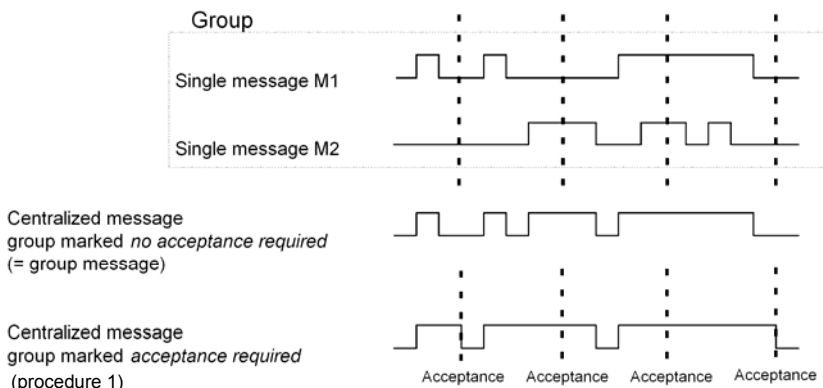
According to this procedure, the centralized message of a group characterized *Acceptance required* links the states of the single messages contained in that group with an acceptance signal.

The acceptance can either be implemented via an assigned digital input or via a corresponding menu item, i.e. via the operator panel. An acceptance accepts all groups at once. The source of the acceptance does not matter.

The centralized message of a group classified as *Acceptance required* is pending if at least one single message of the group is pending. However, it will only end with the end of the last single message if all pending messages have been accepted. A currently pending single message is also considered accepted if it had been accepted before it ended.

The fact that a centralized message is still pending after the last single message has ended indicates that at least one of the single messages has begun again after the last message was accepted. In such a case the single message is or the single messages are to be accepted.

The following illustration shows how, according to procedure 1, the centralized message of a group classified as *No acceptance required* differs from the one of a group classified as *Acceptance required*.



Acceptance technique of centralized messages, standard procedure

According to this procedure the result of the centralized message of a group classified *Acceptance required* ensues from the OR operation of the single messages. It does therefore not differ from the result of the group message and the no-acceptance-requiring centralized message.

This means in particular that the centralized message also ends when the last contained single message ends. In this case, however, it remains in the error listing and waits for being accepted. After acceptance, the centralized message disappears from the error listing.

These groups with their centralized and group messages are intended to provide an overview of the plant conditions. This is why the output of these message types is supported in different ways:

- In contrast to single messages, centralized and group messages can be output via digital outputs.
- The events *Group message begins / Group message ends / Any message of the group begins / Any message of the group ends* can be routed to the DSfG bus with an attention telegram. It can be determined separately for each group upon which events such attention telegrams shall be generated and of which type they shall be (*Alarm, Hint* or *Warning*).
- The status of centralized, group and held group messages can be enquired via DSfG.
- Only the centralized message of the messages linked within a group is entered in the error listing and logbook of the message processing to keep them well-structured.

A *Maintenance switch (M-switch)* is used to suppress group and/or centralized messages if maintenance work has to be carried out.

The setting of this M-switch may affect each group differently:

- No influence

A set M-switch does not have any effect on the signaling reactions of this group.

- Suppression "towards telecontrol"

This means that, if the M-switch is set, the group does no longer trigger any DSfG attention telegrams and the *Held group message* is always considered *not pending*.

- Suppression of all signaling reactions without exception

In this case all messages generated by a group are suppressed if the M-switch is set.

This means that the group neither generates held group nor group nor centralized messages. Nevertheless, the centralized message is still entered in the logbook and error listing.

If the M-switch is set, the main signaler no longer takes the group into account.

The M-switch is activated via an assigned digital input. It cannot be set via the operator panel for safety reasons.

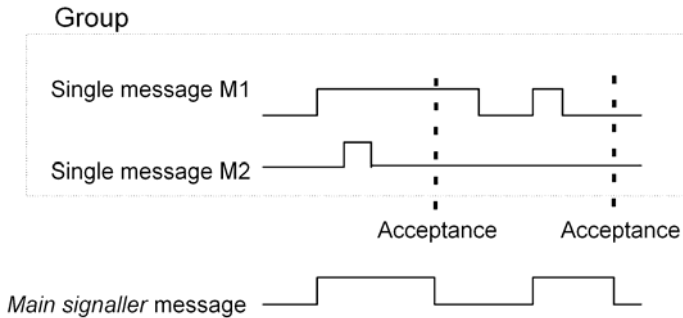
Status and signaling reactions of *single* messages remain unaffected by the M-switch. Single messages are suppressed via the disabling mechanism explained above.

In addition to the above-mentioned messages a message named *Main signaler* is also available. It usually triggers a hooter if being routed to an output. An additional acceptance input is assigned to the main signaler.

The main signaler may include any number of groups.

It starts operating when a message arrives that belongs to one of the involved groups, and it ends upon acceptance, no matter whether or not messages are still pending. The acceptance can be implemented via the digital input assigned to the main signaler. Besides, if all groups are accepted via the operator panel, the main signaler is also accepted. It starts operating again when the next involved message arrives.

The following illustration shows the behavior of the main signaller in connection with the acceptance (in case of one involved group):



5.1.1.4 Logging on Measurement or Counter Archives

A gas-net M1 is able to keep archives for process values, i.e. archives for measurements and count values. Up to four archive groups with up to 8 channels each are available. It can be determined individually for each archive group in which conditions the contained archive channels shall be logged.

The standard procedure used is cyclic data logging (with parameterizable data logging cycles of one second up to one hour).

Additionally or alternatively, the data logging can be made conditional on certain events detected during the monitoring of the process values:

- It is possible to link the data logging with one or more group(s) of single messages. In this case the logging takes place upon the beginning and end of each message contained in one of the involved groups.
- If the trend of a particular process value shall be logged in detail, a maximum change rate can be defined for an archive channel. Then the entire archive group is logged each time the difference between the current measurement and the value measured during the last data logging exceeds the maximum change rate. This way, the data is logged more often in case of quickly changing values.

This option is also available for counter archives, which means you may define that the data logging is to start each time a count value has increased by a defined difference.

Measurements and count values are always logged additionally if the input value has been identified as being disturbed.

It is possible to “freeze” process value archives. If an assigned message begins, the corresponding archive continues to log data and stops after a set number of entries has been reached. The point of time of the last entry will be marked with hint *PVA <no.> freeze begins* (PVA stands for **P**rocess**V**alue**A**rchive) in the error listing and logbook of the *Monitoring* module. The data logging will only be continued when the assigned message ends. Simultaneously, hint *PVA <no.> frozen* also ends.

The freezing of measurement archives is useful if you are interested in how a measurement behaves in case a certain event occurs. It may be possible, for instance, to link the freezing with a centralized message. Then, the freezing will be activated upon the first beginning of any message of the group. Normal data logging will not be continued after the end of the last message until the group has been accepted explicitly, for the centralized message only ends in this case. In addition, it is also possible to make the logging in a process value archive conditional on a message. In this case, data is only logged in the archive when the allocated message has been set, independent of all further conditions.

5.1.1.5 Measurements

A gas-net M1 captures measurements, among others, via analog inputs and partly also creates derived measurements. An example for derived measurements is the flow of a pulse input.

In addition to monitoring measurements for hint limits and gradients, the device may also file up to 32 measurements. For each defined measurement the minimum and maximum values measured since the last reset are indicated. You may view these values together with the associated time marks on the display.

5.1.1.6 Gas Meter Lubrication

The *Gas meter lubrication* functionality facilitates the controlling and monitoring of up to three lubricating systems for turbine gas meters via digital outputs. Different control configuration possibilities are available, so each of the up to three lubricating systems may be adjusted to different operating requirements.

The following modes are selectable (and combinable):

- Cyclic lubrication at fixed intervals; selectable intervals are: every day, every 2/3/4/5/6 days, every week, every 2/4/6/8/12 weeks, every six months, annually. It is also possible to set the starting time for the lubrication (on the hour⁴), as well as the desired weekday in case of lubrication cycles from once per week up.
- Lubrication depending on the flown gas volume (lubricate after ... m³ of gas). A volume or flow rate input value (e.g. V, Vn, Q or Qn) is required for a gas volume-dependent lubrication.
- Manual triggering of a lubrication process via the operator panel of the gas-net device.

It is also possible to specify that no lubrication shall take place until a parameterizable flow rate has been reached. This requires, however, that the corresponding flow rate is available.

The gas-net device provides a message (*Piston displacement*) that is signaled via a digital output and thus controls the lubricating system. The following settings define the details of the lubrication process:

- Number of piston strokes of the lubricating system per lubrication process (this is how often the gas-net device sets the *Piston displacement* message during each requested lubrication cycle)
- Duration of piston control via digital output ("Piston active" – *Piston displacement* message is set)
- Breaks between piston control operations ("Piston inactive" – *Piston displacement* message is not set)

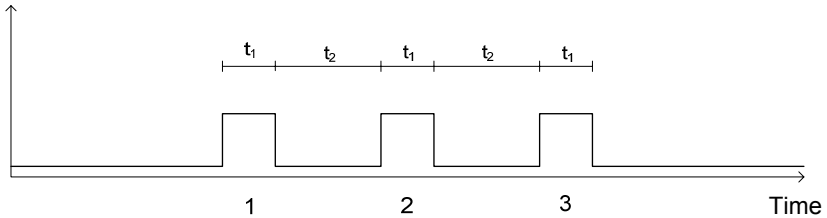
Following picture shows an example for a lubrication cycle with

t1: Duration of piston control (*Piston displacement* message is set)

t2: Duration of breaks between piston strokes (*Piston displacement* message is not set)

Number of piston strokes = 3

⁴ However, the lubrication only starts 30 seconds past the hour.



Note: As to all gas-net message outputs it also applies in this case that the reaction of the message output for the gas meter lubrication is selectable (*contact opens upon message or contact closes upon message*) and can also be made conditional on an output condition (message).

There is an internal message called *Cycle active*, which is set during an ongoing lubrication process.

The gas meter's lubricating system checks its own operating conditions and the lubrication process and provides the monitoring of the lubricating system with status information (messages or pulses via reed contact). Provided the gas-net device evaluates the information, lubrication errors result in internal messages that are also indicated on the device display. These internal error messages can also be processed by the *Monitoring* module (see ...) and, in particular, be output via digital output channels. However, they do not affect the actual control of the lubricating system via the gas-net device.

Error situation	Meaning / Evaluation in the <i>Monitoring</i> module
Output signal of lubricating system: <i>Oil level too low</i> (message)	The oil level of the reservoir is below the defined minimum level. If the gas-net device evaluates this signal, the internal message <i>Oil level too low</i> is set. The display indicates the error message <i>Oil</i> .
Output signal of lubricating system: <i>Overpressure</i> (message)	The piston drive of the lubricating system for injecting the oil is gas pressure operated. The gas pressure of the lubricating system is being monitored. If the pressure is too high, the system is being vented via a safety valve and an <i>Overpressure</i> contact signal is possibly set.

	<p>If the gas-net device evaluates this signal, the internal message <i>Overpressure</i> is set. The display indicates the error message <i>dp</i>.</p>
<p>Output signal of lubricating system: <i>Oil volume</i> (pulse)</p>	<p>Each stroke, i.e. each piston movement of the lubricating system that makes the oil flow, triggers a pulse; the number of pulses is therefore proportional to the flown lubricating oil volume.</p> <p>The lubrication process can be monitored by comparing the number of requested strokes with the number of actually performed strokes. If, after the end of a lubrication cycle, it turns out that the number of failed piston control operations has exceeded the parameterizable <i>Maximum stroke deviation</i>, the gas-net device generates the internal error message <i>Stroke deviations exceeded</i>. The 2nd line of the display indicates the error text <i>Piston</i>. The error ends as soon as a lubrication cycle has been finished without exceeding the maximum number of stroke deviations.</p>
<p>The message <i>Stroke deviations exceeded</i> is pending or a cable break has been detected at a parameterized input for the lubrication (V, Q, corresponding message inputs).</p>	<p>The gas-net device generates the centralized message <i>Disturbance</i>.</p>

5.1.2 Display and Operation

Meaning of Status LED

The status LED on the device front provides a first reference to the current status of the groups within the message processing of the gas-net M1:

LED status	Meaning
red, flashing	At least one of the groups in an <i>Alarm</i> status signals an acceptance request. (At least one of the messages linked within the group is considered as not accepted. However, it is impossible to discern whether a message is currently still pending.)
yellow, flashing	At least one of the groups in a <i>Warning</i> status signals an acceptance request.
green, flashing	A flashing green light only appears during the start-up phase of the device after a mains failure.
red, permanently illuminated	A message is pending in at least one of the groups in an <i>Alarm</i> status. None of the groups must be accepted.
yellow, permanently illuminated	A message is pending in at least one of the groups in a <i>Warning</i> status. None of the groups must be accepted.
green, permanently illuminated	The message processing signals that no message is pending in any of the groups and no acceptance is due.

Main Display (Monitoring Module)

The main display of the *Monitoring* module shows the error listing of the signaling system.

It is at the same time the basic display of any gas-net M1 device and will thus be invoked automatically after start-up.

The following messages are entered in the error listing:

- The following *system messages* are entered at the beginning of the error listing:
H1001 Restart performed
H1002 Supply voltage failure
H1003 New parameterization
H1004 Parameter changed

H1005 M-Switch open
H1006 Interface monitoring
H1007 Pulse buffer overflow
H1008 Lower hint limit output
H1009 Upper hint limit output
H1111 Clock set old
H1112 Clock set new
H1113 User switch open
H1115 Process value archive 1 frozen
H1116 Process value archive 2 frozen
H1117 Process value archive 3 frozen
H1118 Process value archive 4 frozen

The meaning of these messages is described in Section 11.2, page 11-34.

- Afterwards, all pending centralized messages of the groups 1 to 8 are listed.
- They are followed by pending single messages, being sorted based on their priority level.

In order to keep the error listing well-structured, only such single messages are entered in the error listing which have been parameterized explicitly for being entered.

In principle, all single messages and the *M-switch* message do not require acceptance. Only centralized messages of groups requiring acceptance have to be accepted. This means that all single messages, group messages and centralized messages of groups that do not require acceptance automatically disappear from the error listing as soon as they are no longer pending.

Centralized messages of groups requiring acceptance only end after they have been accepted and none of the single messages of the group is pending any longer.

Subordinate Menu Items (Monitoring Module)

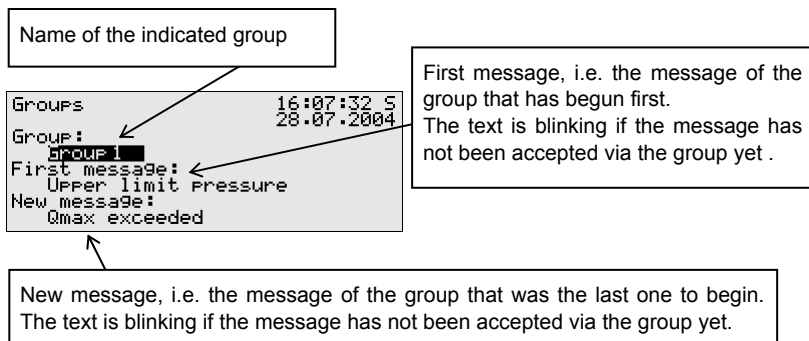
Accept all

By means of the *Accept all* menu item you can accept all messages that are meant for accepting (depending on the parameterized acceptance procedure). For the acceptance procedure to *DIN 19 235*, that comprises all pending single messages and single messages having ended that are belonging to groups requiring acceptance. In case of the *standard* acceptance procedure, all centralized messages that are listed in the error listing with information on their beginning and end are accepted. The main signaler (sounder) will be accepted simultaneously.

Accept all is crossed out if there is no need to accept any messages.

Groups

The *Groups* menu refers to the message processing of the *Monitoring* module. You may invoke the related display only if message groups have been created. The display facilitates an overview of the event status of the messages linked in a group. If you invoke the related display, you will see information on the first group. For switching to the display of another group, get into the edit mode (by pressing the Enter key) and select the name of the group you would like to view from the appearing listing. Confirm your choice by pressing the Enter key again.



If the centralized message of the invoked group is currently pending, the single message of the group that has begun first is indicated below *First message*. As this is always the message that has initially caused the beginning of the centralized message, this information helps to analyze the error

status. The message text is flashing if no message has been accepted yet after the beginning of the centralized message.

Below *New message* you can read off the most recent single message of the group to begin. As long as the centralized message itself is pending, the *New message* indication is updated upon each beginning of a new message of the group. A *New message*, too, is flashing on the display until an acceptance has been performed after its beginning.

Only if neither first nor new messages are indicated, a centralized message is not pending at that point of time.

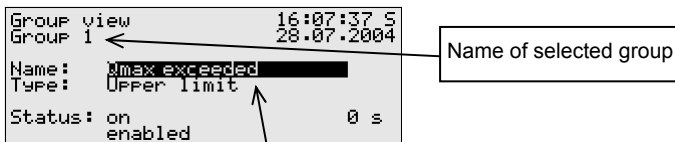
Activate the *View* submenu to check the status of all single messages contained in the group:

View

This display provides information on the single messages contained in the group invoked before. Besides, it provides information on the status of each contained single message. Due to the mass of information there is always only one single message indicated on the display at a time.

As the *Name* selection list contains all single messages of the corresponding group you can switch to the indication of any other single message of the currently selected group.

```
Group view          16:07:37.5  
Group 1            28.07.2004  
Name:  jmax exceeded  
Type:  Upper limit  
Status: on          0 s  
        enabled
```



Currently indicated single message of the group. A listing with all messages existing in this group opens up if you press the Enter key. You may also switch to the indication of another single message of the group via this selection list.

The following information is indicated for each individual message:

Name

Each message is identified via its parameterized name. You may change to the indication of any other single message of the group via the *Name* selection list.

Type

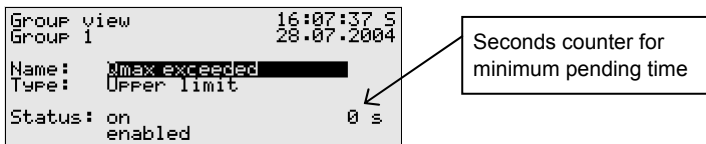
A single message can be derived from a *Message*, the monitoring of an *Upper* or *Lower limit value* or *Gradient monitoring*.

Status

The status of a single message is characterized by several specifications:

On or *Off* indicates whether the message is pending. Here, a possibly parameterized minimum pending time is taken into consideration: Even if the status to be signaled is currently pending, the related single message will only be set if this status is pending longer than the minimum pending time.

To be able to make out whether a single message would be pending if no minimum pending time were assigned to it, the display includes a seconds counter:



If the seconds counter starts counting backwards, the status to be signaled has already been pending. A minimum pending time is assigned to the single message, so the message itself will only be generated if its status is still pending after the minimum pending time has elapsed. Therefore, the counter constantly shows how many seconds of the minimum pending time are remaining. Only after the counter has reached 0, the status indication of the message will change from *Off* to *On*.

If the status to be signaled ends before the minimum pending time has elapsed, the counter will be set to 0, but the message will not begin.

The counter always shows 0 if a minimum pending time has not been assigned to a single message. In this case the message begins immediately after the status to be signaled has been detected.

Whether a single message is being routed at all depends on the fact whether the message is disabled or enabled: If a single message has been disabled, the entire subsequent message processing considers it as not pending.

Tip: The main advantage of the *Groups – View* menu described here is the possibility to analyze the status of a group and of the single messages contained therein. This menu only provides information but does not allow changing the properties of a single message, for instance to disable or enable a single message. For this purpose the *Single messages* menu must be invoked, the display of which is structured similar to the one described above.

Single messages

The *Single messages* menu refers to the message processing of the *Monitoring* module. It does not only serve to indicate basic information relating to single messages but also provides the possibility to disable such messages via the operator panel of the device and to change limit values for single messages of the measurement monitoring.

In order to switch to the display of another single message you have to get into the edit mode (by pressing the Enter key) and select the name of the message you want to view from the appearing listing. Confirm your choice by pressing the Enter key again.

The *Single messages* display is basically identical with the display of the *Groups – View* menu described above.

The parameterized limit value is indicated as additional information in case of a message derived from measurement monitoring:

Limit

The *Limit* menu item indicates the currently set limit value of the limit monitoring or the maximum permissible change of the measurement within a parameterized monitoring period when monitoring gradients.

```

Single message      16:08:37 S
                   28.07.2004
Name:      Inlet Pressure
Type:      Upper limit
Status:    off          30 s
Limit:     16.000      bar
  
```

Limit, here: upper limit value.
 Note: An additional hysteresis may have been parameterized via PC and with the parameterization program to avoid fluttering messages.

This dialog allows disabling single messages via the operator panel. It is also possible to change the limit value to be monitored in case of messages of the measurement monitoring directly at the device. However, the user locks must be open for such actions to be carried out.

Disabled messages

The *Disabled messages* menu refers to the message processing of the *Monitoring* module. The corresponding display lists all currently disabled single messages. Additional information indicated on the display comprises the type of the message, the real message status before the disabling, and possibly the counter for a monitored minimum pending time.

```

Disabled messages  16:16:37 S
                  28.07.2004
Name:      Inlet Pressure
Type:      Upper limit
Status:    on          0 s
  
```

Pressing the Enter key opens the selection list containing all currently disabled messages.

The *Disabled messages* menu described here merely provides information. Please switch to the *Single messages* menu (see above) if you would like to disable or enable a single message.

Measurements

A gas-net M1 may have up to 32 parameterized measurements for maximum/minimum indication on file. If you invoke the related display, the first measurement will be presented. You may switch to the display of another measurement via the name.

The display contains the following information in detail:

Name of the shown measurement. Pressing the Enter key opens up a selection list containing all measurement names. You may switch to the indication of another measurement via this listing.

Measurements	15:46:31 S
Pressure stream 1	28.07.2004
2.9581	28.07.2004 15:45:57
2.9583	28.07.2004 15:46:02

Line before last: Minimum value since last resetting, with time mark.
Last line: Maximum value since last resetting, with time mark.

Current measured value of the associated measurement, incl. unit. Blinks if the value is disturbed.

If the associated measurement is indicated as being disturbed, the display keeps showing the last valid value. In this case, however, the value is flashing.

The measurement display contains the following subordinate menu items:

Resetting

The *Resetting* menu item sets the minimum and maximum values of the indicated measurement to the current measurement.

Reset all

The *Reset all* menu item resets all filed measurements.

Meter Proving 1/2 (DSfG functionality)

The M1 may perform one or two *Meter provings* between two correction entities that are connected to the same DSfG bus. The comparison quantity is the base volume V_n , the energy E or the mass m .

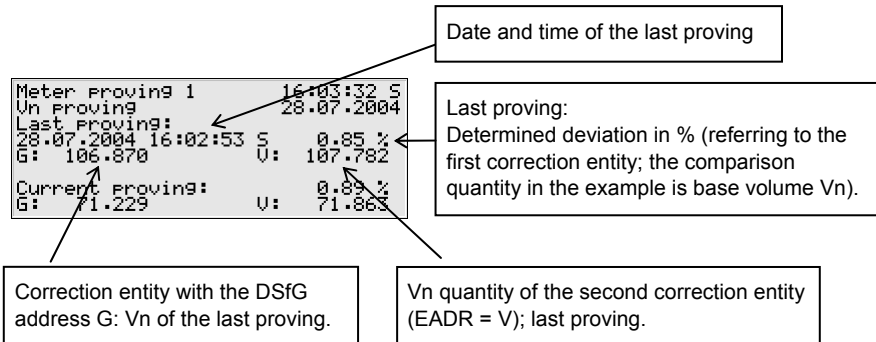
To facilitate a proving, the DSfG bus addresses of the two correction entities involved must be specified in the device parameterization.

Activating the *Meter proving 1* or *Meter proving 2* menu item at the device invokes the related display. If this function has not been used yet, the phrase *No last proving* is indicated on this display.

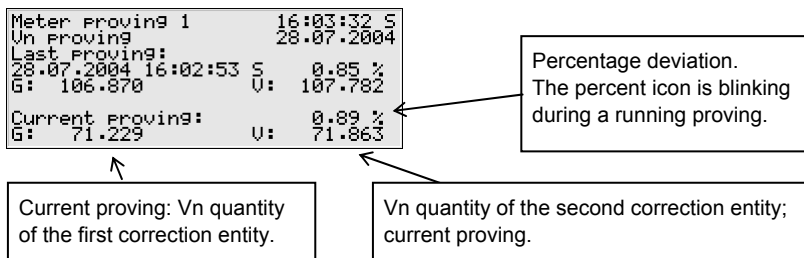
The second line shows via which quantity the proving is performed.

Up to two provings are indicated. The compared quantities of the two involved corrector entities are marked with the associated DSfG address (EADR).

Below *Last proving* the following information is indicated:



Below *Current proving* the values of the running proving or of the one that has been completed last are indicated:



If the meter proving has been activated, the totalizer of both correction entities will be polled cyclically via DSfG. If the DSfG communication is undisturbed, a response message will arrive approximately every 10 seconds. This means that the display of the meter proving is updated at intervals of 10 seconds and the

percentage deviation is determined. The percentage icon in the line before last is flashing as long as the proving is running.

It is possible to set an *automatic* proving mode via the parameterization. In this case, the meter proving starts automatically as soon as both correction entities are operating error-free. Whenever the parameterizable proving time has elapsed, the proving process is stopped and the deviation calculated. A new proving process is then initiated. The meter proving stops as soon as one of the two correction entities is in the alarm status.

In the automatic proving mode, a maximum deviation in % is defined when the device is parameterized. Each time a proving has been carried out, a check is made to ascertain whether the maximum deviation has been exceeded. If this is the case, there is an exclamation mark after the deviation data in the fourth line of the display. The internal message *maximum deviation meter proving 1 (or 2) exceeded* can additionally be issued via a digital output.

It is possible to abort a running proving via the *Stop* submenu. The next proving is started automatically afterwards.



In the *manual* proving mode you may start and stop the meter proving via the following submenus:

Start

The meter proving is started.

During a running proving the indication of the meter proving is updated approximately every 10 seconds and the percentage deviation is calculated. You recognize a running proving by a flashing percentage icon behind the calculated deviation.

Stop

The meter proving is stopped.

Back

Return to the main display (error listing).

The Stop and Back menu items also exist in the automatic proving mode.

Notes:

- There is no general rule of how long you have to wait until you receive a representative result of the meter proving. The current flow rate and the types of the meter inputs are influencing factors.

A proving of two volume correctors or flow computers that receive only HF pulses from the gas meter will indicate a constant deviation relatively fast as a high input frequency leads to a continuous increase of the totalizers. The compared quantities always correspond.

If, however, two volume correctors or flow computers are compared which are both connected to an encoder totalizer, for example, you have to wait for a larger comparison quantity. In this case the totalizers are increased less often, abruptly and not necessarily synchronously.

In the manual proving mode the simplest way is to observe the display until the percentage deviation has adjusted itself to a constant value and to stop the proving then.

Please also consider that no reliable results are possible if the flow at operating conditions is below the lower flow limit of the gas meter (Q_{min}).

- A totalizer difference of a volume corrector or flow computer caused by the manual setting of the totalizers cannot be distinguished via DSfG from an actual totalizer increase. Therefore, please refrain from adjusting the totalizers of the correction entities during a running proving.
- The meter proving will stop automatically in the following conditions:
 1. One of two involved volume correctors or flow computers indicates an alarm status.
 2. The flow of both corrector entities is less than a parameterizable minimum flow.
 3. The DSfG communication breaks off. This may only happen if the proving is performed with a volume corrector or flow computer that is externally connected via DSfG.
 4. The totalizer difference of a volume corrector or flow computer connected via DSfG is implausible.
 5. The accumulated quantities can no longer be indicated on the device display.

For your information: 8 numbers can be indicated on the display. The number of post-decimal digits is adjusted dynamically, i.e. if an accu-

mulated quantity has already 7 numbers in front of the decimal point, only one post-decimal digit will be indicated.

As soon as a meter proving has stopped, the percentage icon behind the calculated deviation will stop flashing.

Switches (Changing switch outputs and the revision status)

The function of the *Switches* menu is to display and change the states of the so-called *Switches*.

A switch is a message with a preset status (*on* or *off*). The status of the switch can be changed manually, i.e. via the operator panel of the device. Messages of the *Switch* type are routed to digital outputs (cf. Chapter 5.3.1) to trigger switching operations of any kind from the gas-net device.

Five switches are available (*Switch 1* to *Switch 5*). To change the status of a switch you need to invoke the *Switches* menu of the *Monitoring* module. It indicates the current switching status of each switch. Select the switch the status of which you would like to change and change to the edit mode. Select a different switch status now and confirm via **OK**. Changing switch states is subject to the user locks.

Note: Message outputs may be parameterized in such a way that they invert the output signal during operation. Please consider that this setting also applies to the output of switches.

Lubrication

After the *Lubrication* menu has been invoked, the status display of the first defined gas meter lubrication appears.

```

Lubrication                11:32:18.5
                          30.05.2007
Name:      Lubrication stream 1
Status:    Idle
U:         19.000 m3
Q:         1800.000 m3/h
Next:      31.05.2007 14:00:30
Strokes:   0020 OK / 0000 Errors

```

Display line	Meaning
<p>Line 2: Reserved for error indication</p>	<p>There are several lubrication errors that can be evaluated by the gas-net device (see above). If such an error message is pending, it will be indicated in the second line of the display. An error is also pending if the related input has been assigned in the parameterization of the gas-net device, but a cable break has been detected at the corresponding input channel.</p> <p>The following error messages may occur:</p> <p>Oil: The oil level is too low.</p> <p>dp: The pressure monitor of the lubricating system has tripped.</p> <p>Piston: The maximum stroke deviation has been exceeded.</p> <p>If such error messages are flashing on the display, the corresponding error is currently pending.</p> <p>The error message disappears when the error ends – unless it has been parameterized that the messages shall be held (individually parameterizable). In this case the error message is no longer flashing and remains on the display after the cause of the error has ceased to exist. Held messages end when the user accepts them via the <i>Accept</i> menu command (see below). At the same time, the corresponding error messages disappear from the display.</p> <p>Qmin: The flow is currently below the parameterizable minor flow, below which no lubrication shall be started. This error message is flashing when a lubrication process has been requested in parallel.</p>
Name	Name of gas meter lubrication (parameterizable)
Status	<p>Idle basic status</p> <p>Requested lubrication has been requested</p> <p>Piston back (left ...) During an ongoing lubrication: piston control is active, number of remaining piston displacements</p>

	<p>Piston forth (left ...) During an ongoing lubrication: piston control is inactive, number of remaining piston displacements</p> <p>Fault Fault due to an exceeding of the maximum stroke deviation during the last lubrication process or cable break of a defined input for the lubrication. If in this state a new lubrication is being requested, it will be performed as planned and instead of the text <i>Fault</i> the piston control operations are indicated (<i>Piston forth/back</i>, see above)</p>
<p>V:</p>	<p>The volume V count value can only be indicated if a volume or flow input has been defined for the gas meter lubrication. It counts the incoming quantities either directly via the assigned volume input or, as an alternative, derived from an assigned flow input. The count value is flashing when a cable break has occurred at the related input channel.</p> <p>Special feature: In case of a volume-dependent lubrication the volume V count value runs backwards and indicates how many cubic meters (m³) of gas still have to flow before the next volume-dependent lubrication will be requested.</p>
<p>Q:</p>	<p>The flow rate Q is only indicated if a flow input has been defined for the lubrication. It is flashing when a cable break has occurred at the related input channel.</p>
<p>Next</p>	<p>Time of the next lubrication request (only in case of cyclic lubrication).</p>
<p>Strokes</p>	<p>Number of strokes OK / Number of errors</p> <p>The number of strokes counts the number of piston displacements with a positive feedback from the lubricating system. Piston displacements are counted as errors when the feedback is missing, i.e. they are regarded as not having been performed.</p> <p>If, after the end of a lubrication cycle, it turns out that the number of errors exceeds the parameterized maximum number of stroke</p>

	<p>deviations, a message will be generated (<i>Piston</i>) and the error value is flashing on the display.</p> <p>The errors can only be determined if the <i>Oil volume</i> input has been assigned to the feedback of the piston movement. If this is not the case, the number of strokes function counts <u>all</u> requested piston displacements.</p>
--	--

Next

Changes over to the display of the next gas meter lubrication (up to three lubricating systems can be controlled).

Start

It is possible to trigger a manual lubrication process consisting of one stroke via the *Start* submenu item. Multiple activating of *Start* increases the number of requested strokes; the parameterized settings for *Piston active* / *Piston inactive* are being considered.

Accept

The monitoring of the gas meter lubrication can generate several messages ("Stroke deviations exceeded", "Oil level too low", "Overpressure" and "(Centralized) Disturbance"). You may parameterize individually for each of these messages whether it shall be held after the cause of the error has ceased to exist or whether it shall end immediately. Held messages can be acknowledged by the user via the *Accept* menu command. When being accepted the message ends and the related error text disappears from the display.

Reset

Activating the *Reset* menu item resets the lubrication control and restarts it. This means in detail that:

- the volume totalizer (if available) will be reset
- the number of strokes/errors will be set to 0
- an ongoing lubrication will be aborted
- held messages of the lubrication will be accepted.

5.2 Data Logging Module

5.2.1 Function

Each gas-net M1 device is always equipped with an integrated data logging function. The responsible *Data Logging* module, however, provides only the data logging *service*. The actual data to be logged is generated by other modules of the module group.

When parameterizing the *Data Logging* module, you only have to define *which* of the available archive groups shall actually be logged and which storage depth shall be applicable. All archives defined in that way are designed as ring storages. The data logging depth determines how many entries an archive is able to write at most. If an archive is full, the respective oldest entry will be overwritten by each new entry.

The following sections list the types of archive groups each module provides:

Monitoring module:

The *Monitoring* module facilitates the compilation of process value archives (archives with any measurements or count values). Moreover, it runs an error listing, which can be logged.

System module:

The *System* module keeps a parameter change archive (*changed settings archive*), in which changes of the parameterization are logged.

If individual parameters are modified, the old and new values will be logged in addition to the time mark. The module to which the changed parameter belongs is also displayed.

A completely new parameterization will be entered in the changed settings archive as *New parameterization*.

Note: The archive depth, exact composition and order of archives can largely be configured by the user himself via the parameterization. However, when changing the archive structure, you have to delete the old archives already existing in the device.

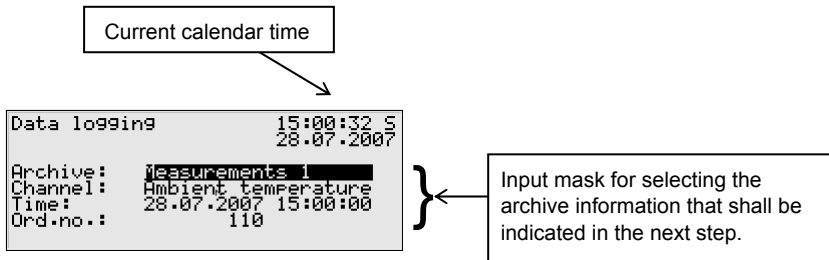
5.2.2 Display and Operation

Main Display (Data Logging Module)

All existing archive entries can be made visible at the operator panel.

The main display of the *Data Logging* module consists of a mask in which you may choose the data you want to view more closely.

The following illustration shows an example:



After the main display of the *Data Logging* module has been invoked, the most recent entry of the first channel of the first archive group is always indicated first.

Choose the archive information you would like to view:

- The archive group type is selected at the beginning, i.e. the background is black. Press the Enter key to get into the edit mode. A listing opens up from which you may choose the desired archive type via the arrow keys. Afterwards, confirm your choice by pressing the Enter key.
- Specify the archive channel you want to view in detail in the next selection field. Several possibilities are offered, depending on the archive group type you have selected in the first step.
- You may now specify the point of time to be filtered by changing day, month, year, and time one after the other. You get into the edit mode for each respective field by pressing the Enter key and are thus able to specify date and time step by step. Confirm your entry by pressing the Enter key.

- The next field is selected. Select the entry you want to view via the ordinal number⁵ in this field. As there is an unambiguous relation between date and ordinal number, the related ordinal number is indicated automatically after the date has been entered (see above). If you enter a different ordinal number, the date in the second line of the selection mask will be adjusted automatically.

Invoke the selected archive via the menu (see next section).



Subordinate Menu Items (Data Logging Module)

View

Activating the *View* menu item invokes the display of the archive channel you have selected in the main display.

The archive type and current time are shown in the first two lines. Each entry is always indicated with a time mark. Name, value and unit of the logged data are shown. Totalizers are logged without decimals.

For example:

The screenshot shows a terminal window with the following text:

```

Measurements 1      15:06:12 S
Ambient temperature 28.07.2007
28.07.2007 15:00:00 110
18,0 °C
Change: 0,5 °C
    
```

Callouts in the image:

- An arrow points from the text "Archive entry with ordinal no. 110" to the number "110" in the terminal output.
- An arrow points from the text "The 'up' and 'down' scroll arrows indicate that you may view even more archive entries (scroll with leftward and rightward arrow keys)" to the up and down arrow symbols in the terminal output.
- An arrow points from the text "Difference between last entry and currently displayed entry" to the "0,5 °C" value in the terminal output.

⁵ Each individual measured variable of an archive group, which is logged by a device, additionally has an ordinal number for reasons of unambiguity. The order of the ordinal numbers is arranged in such a way that the very first archive entry receives the number 1. The ordinal number for each further entry is increased by one. Ordinal numbers are needed for instance for the polling of archive data.

Next channel

Previous channel

The *next/previous channel* menu items serve to quickly switch over to another channel of the same archive group.

Back

Return to the main display, i.e. to the selection mask for viewing archives.

Tip: The archive representation on the display is limited due to a lack of space. To analyze larger archive areas it is much more practical to read the archives out of the device and into a PC or laptop before; for example via the data interface by means of the GAS-WORKS module GW-REMOTE+. It is possible to view the data afterwards in a table or as diagram by means of the GW-DATA+ program.



5.3 System Module

5.3.1 Functions

The *System* module comprises all basic functionalities of the gas-net device.

Inputs

One such basic functionality of the *System* module is the processing of the input information and the transfer of this information to other modules. The availability of input channels depends on the process board equipment of each individual device.

The *System* module's display offers a special menu for viewing the source and the raw and final values of an analog input signal or of a pulse input (see Chapter 5.3.2). There is also an own diagnosis display for protocol input channels (e.g. if the gas meter has been digitally connected or in case of measurement sensors being connected via HART protocol).

Detailed information on gas-net input boards is provided in chapters 7.2 and 10 (*Connecting the Lines* and *Technical Data*).

Outputs

There are several gas-net process boards providing output channels (see chapters 7.2 and 10 (*Connecting the Lines* and *Technical Data*)).

The gas-net M1 monitoring unit provides a special menu for viewing and checking outputs (cf. Chapter 5.3.2). Checking the outputs is only possible if the locks are open.

DSfG (optional)

DSfG is a digital interface especially developed for data communication between gas measurement devices (such as gas-net devices). The gas-net M1 is optionally equipped with a DSfG interface. The DSfG bus is connected via the connector labeled DSfG on the back of the device.

TCP/IP (optional)

The TCP/IP interface is used for integration into a standard network installation (for data exchange via Modbus TCP or time synchronization via NTP).

Locks

During the operation of a gas-net M1, there are several settings and operation possibilities that have to be protected against willful changes. To ensure this protection, there are two protection mechanisms:

- User switch (rotary switch on the device front)
- User locks (numerical codes; each of the two contract parties may define a lock of up to 6 digits)

The locks are defined within the device parameterization and are opened and closed via the keypad (see page 5-43). In particular, it is possible to open the user locks remotely via RDT by using the PC and the virtual operating panel of the GW-REMOTE+ program.

Due to security reasons, all locks are closed automatically after 30 minutes without an operating action.

After having opened one of the two existing security mechanisms (user switch or user locks), the user is able to change all parameters and to execute all actions that are protected by user lock.

Set Clock / Synchronize Clock

There are two possibilities to set the device-internal clock via the operator panel (provided that the user lock is open):

- 1) *Set clock* facilitates the free setting of the clock
- 2) *Synchronize clock* allows the setting of the clock within a fixed time frame of ± 20 seconds but not more than $\pm 3\%$ of the billing interval⁶

The following external synchronization sources are available:

- 1) synchronization by a host computer via digital protocol (Hardware requirements: COM2 or MSER2 interface)
- 2) synchronization by telephone time query⁷ (Hardware requirements: COM2 interface and a connected modem)
- 3) synchronization via NTP (Hardware requirements: TCP/IP interface, NTP server within the network)
- 4) synchronization via GPS (Hardware requirements: free MSER2 interface and a GPS receiver in the station)
- 5) synchronization via DSfG protocol (Hardware requirements: DSfG interface and a device in the DSfG bus system that itself is synchronized via one of the sources 1), 2), 3) or 4))

If the user switch is closed, only one setting of the clock is accepted within 2 minutes. The setting or synchronizing of the internal clock is possible without restrictions if the user switch is open.

If the time is adjusted by more than $\pm 3\%$ of the billing interval or ± 20 seconds, two warnings⁸ will be generated.e

5.3.2 Display and Operation

Main Display (System Module)

The main display of the *System* module shows basic device information.

The following details are indicated:

⁶ The *Billing interval* mentioned here is a parameter of the *System* module.

⁷ The usability of these procedures in dependence on local conditions has to be clarified in advance with Elster.

⁸ According to DSfG Specification:

W811: Clock set new, W810: Clock set old

- Device name with software variant
- Product version of the device software
- Serial number of the relevant device
- Check sum for software authentication (will be calculated after the display has been invoked)
- Number of operating hours of the device.
- Supply voltage
- Operating temperature



Subordinate Menu Items (System Module)

Inputs

The *Inputs* display makes it possible to view detailed information of message, pulse, current or resistance inputs (name, board/channel, input value, etc.).

Name	Name of the input channel: serves to identify the channel and is parameterized.
Board	Board location, board type, version number of board software.
Channel	Channel number with operating mode.
Phys. Value	The final value of the respective physical variable with physical unit.
Input value	In case of current input: current value in mA. In case of resistance input: resistance in ohms. In case of message input: contact closed / open. In case of pulse inputs: frequency in Hz.

After you have activated the *Inputs* menu item, the first channel of the input board will always be indicated at board location 1. Following picture shows an example:

```

Inputs                               14:30:28 W
                                       22.01.2007
Name: 01 transmitter 1
Board: 1 EXMFE5 01.3
Channel: 2 Pulse
Phys.val: 00000001305.887 m3
Inf. val.: 1000 1/s
    
```

To switch to the display of another channel get into the edit mode (by pressing the Enter key) and select the name of the desired input value from the appear-

ing listing. After you have confirmed your choice by pressing the Enter key, the display of the selected board will be invoked.

Outputs

The *Outputs* system menu enables you, similar to the input channels' displays, to view the assignment and current status of the output channels.

After you have activated the corresponding menu item, details of the first defined output channel will be presented:





Name	Name of the output channel: serves to identify the channel and is parameterized.
Board	Board location, board type, version number of board software.
Channel	Channel number with operating mode.
Phys. value	The final value of the respective physical variable with physical unit.
Output value	In case of analog values: value for the current output (in mA) calculated on the basis of the final value. In case of messages: output contact closed / open. In case of pulse outputs: frequency in Hz, number of pulses retained in the pulse buffer.
Test value	Only for output testing (see below).

To change to the display of another channel, activate the edit mode (by pressing the Enter key). A listing with the names of all parameterized output channels appears. After you have chosen the desired output channel and pressed the Enter key, the display of the selected channel will be invoked.

Output testing

In addition to just viewing the current process values you may also test the output channels. This means that it is possible to output any current value between 0 and 20 mA via an analog output for testing purposes. A message output can be set to *Contact closed* or *open*. It is also possible to have pulses being output via a pulse output for testing reasons. However, only one output can be switched into the test mode at the same time.

Proceed as described below:

-  1) Select the desired output channel, and press the Menu key afterwards.
- 2) Select the *Test on* submenu.
 The *Test value* line is selected automatically. Press the Enter key to activate the edit mode. If you enter a new value now and confirm it by pressing the Enter key, this value will be output via the selected output.
 In the activated test mode the *Test value* indicated in the last line is no longer crossed out. The *Output value* menu item additionally indicates the output test value.
-  3) To quit the test mode, press the Menu key again and confirm the *Test off* menu item.

Note: You can also quit the test mode by quitting the current display, for instance via *Back* or by selecting a different channel.

Protocols

When measurement and signal transmitters are connected via digital protocols, the *Protocols* display offers an overview of the most important protocol data, for example data on pressure and temperature sensors connected via HART protocol, on gas meters with encoder totalizer, and on ultrasonic gas meters via Q.Sonic or SICK protocol. The *Protocols* display also supplies the most important information on the synchronization of the internal time via GPS or NTP for diagnostic purposes.

Note: The *Protocols* display is not intended for host protocols being processed by the *Data Exchange* module; please refer to the corresponding module display for information on these protocols.

The following table shows the display structure in case of HART/encoder/Q.Sonic or SICK protocols:

Line	Legend	Content
3	Name:	Name of protocol channel
4	I/O:	<p>Board / channel indication In case of HART protocol: Board / channel / HART address indication</p> <p>In brackets: Number of successful communication operations, counts continuously upwards when the communication is working. When an asterisk * appears between the board/channel indication and the number of successful communication operations, the data transmission is disturbed (this indication possibly considers a maximum number of admissible communication errors).</p> <p>For example:</p> <div style="display: flex; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;"> <pre>Q.Sonic Protocol 14:34:18 W 22.01.2007 Name: Q.Sonic 2, 1 I/O: 2/1 (236 Cgm.) Q: 3578,20069 m3/h</pre> </div> <div style="margin-left: 20px;"> <ul style="list-style-type: none"> - Name of protocol channel - Protocol input via board 2 / channel 1, already 236 successful communication operations - Input value: flow rate </div> </div> <p>When an asterisk * appears here, the communication is disturbed. At the same time the counter for successful communication operations (in brackets) stops.</p>

5	<p>Depending on the protocol type:</p> <p>Value: measurement (in case of HART protocol)</p> <p>ENC: encoder digit string and priority in digits/m3</p> <p>Q: flow rate supplied via Q.Sonic protocol</p> <p>Vf / Vr / Vfs / Vrs SICK gas meter: transmitted totalizers measuring volume undisturbed forwards (Vf), measuring volume undisturbed backwards (Vr), measuring volume disturbed forwards (Vfs), measuring volume disturbed backwards (Vrs)</p> <p>The shown value is only a valid and current value if the data communication is not disturbed, i.e. there is no asterisk in the fourth line between the board/channel indication and the number of successful communication operations (see above).</p>
---	---

All data shown in further lines are intended for diagnosis by experts; please refer to the documentations and specifications of the respective measuring instrument manufacturers or contact Elster.

In case of time synchronization via GPS or NTP the *Protocols* display is structured as shown below:

Legend	Content
Current UTC:	Universal Time, Coordinated: derived from the latest synchronization via GPS and counted upwards based on the device time.
Name / I/O or Socket	Name of the input channel to which the GPS receiver has been connected and board/channel indication. Name of the TCP/IP socket used for time synchronization.
Telegrams	Counter for incoming telegrams.
Sync. Data	Status indication, <i>valid</i> in undisturbed condition.
Syncr.	Counter for successful synchronizations transferred to the <i>System</i> module.
Last:	Device time of the last successful synchronization (considers time zone and daylight savings time adjustment)

Lat./Long. / Decl.	Position specification (only in case of GPS)
Stratum	The stratum value is a measure for the number of computers to the time reference in the NTP hierarchy.
Clk. Ident. Clk. Offset Rndtr. Delay	Only in case of time synchronization via NTP: Protocol-internal diagnostic information.

DSfG (only in case of DSfG interface)

Activating the *DSfG* submenu invokes a display that lists important DSfG settings as well as information on the status of the DSfG interface and on the bus activity.

```

DSfG                               16:44:34 5
                                   28.07.2004
Operating mode:                    19200 baud
Own stations:                      _AGU
Known stations:
AGGRV_
Bus activity:
_aA_aA_aA_aA_aA_aA_aA_aA_aA_aA

```

Operating mode:

The *operating mode*⁹ determines the transmission speed on the DSfG bus. Caution: If several devices are connected to the bus, you have to select the operating mode depending on the slowest station. If the bus communication does not work, the gas-net device may have been parameterized with a baud rate that is too high.

⁹ All DSfG-capable *gas-net* devices support the following operating modes:

0	9600 baud
1	19200 baud
2	38400 baud
3	57600 baud
7	115200 baud

Own stations:

Own stations lists the bus addresses (EADRs¹⁰) of the internal entities¹¹.

Known stations:

Known stations indicates the EADRs of all bus stations currently known to the device. If a general polling¹² has not yet taken place or there is no local DSfG bus available, only the stations within the device can be known as being connected to the bus.

Bus activity:

This line indicates the last activities on the bus. The last 32 activities can be shown, with the very last one always being indicated on the far right.

The abbreviations have the following meanings:

Upper case letters and special characters:

A, ..., Z, Ä, Ö, Ü, ^, _

The device has received a telegram from this DSfG address.

Lower case letters and special characters:

a, ..., z, ö, ö, ü, ß, ■

The device has sent a telegram to this DSfG address.

Upper case letters with black background:

B, F, H, I, L, M, P, W, Y, Z

¹⁰ *EADR* is the address by which a station identifies itself in the DSfG bus traffic. The upper case letters A to Z and some special characters are used as bus addresses. An unambiguous address assignment is required for a faultless data communication.

¹¹ 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. A monitoring unit *gas-net* M1 for instance contains one *Control* entity, one *Data logging* entity, and additionally a *Center via RDT* entity if the integrated RDT is used.


¹² Each DSfG bus system must contain one station that controls the data communication. This station is called *Bus master* and has the EADR “_”. *General polling* means addressing all permissible bus addresses to update the station list.

The device has received an attention telegram of this type¹³.

Lower case letters with black background:

b, f, h, i, l, m, p, w, x, z

The device has sent an attention telegram of this type¹³.

 The DSfG menu contains the following subordinate menu item in master operation:

General polling

If one of the entities within the device is the bus master (the station with the EADR “_”), you may trigger a general polling via this menu item. If there is no master operation, the menu cannot be activated.

Locks

After you have activated the *Locks* menu item, a display is invoked indicating the current status of the user locks. The display is empty if no lock has been defined. New lock digits must always be defined by parameterization.

¹³ 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

 The submenu contains the following items:

Open

This menu item is crossed out if all locks are open. If at least one lock is closed, you may activate the *Open* menu item by pressing the Enter key. A dialog will be invoked in which you may enter the numerical lock(s):

```
Open locks          16:50:31 S
                   28.07.2004

Lock 1:  *****
Lock 2:  *****
```

If only one lock has been defined, only one line will be shown here. Select the lock you would like to open in the first step. Activate the edit mode via the Enter key as usual and enter the lock's string of digits. Confirm the code by pressing the Enter key. If the entered string of digits is incorrect, it is not possible to quit the edit mode via the Enter key. You have to correct the code first (or quit the menu via the rightward arrow key).

It is also possible to change the status of just one of two locks. Press the Menu key after you have successfully entered the numerical lock(s). Open the locks with *OK* or leave them closed by confirming *Cancel*.

Close

All defined locks are closed.

This menu item appears being crossed out and is thus not selectable if all locks are closed. If the user switch is open, all locks are automatically open, too, and cannot be closed.

Set clock

A free setting of the device time is only possible if the user locks are open. The display of the *Set clock* menu looks as follows:

```

Set clock                               16:51:51 S
                                         28.07.2004

Time:      16:51:40
Date:      28.07.2004
Time zone: Summer time
  
```

You may re-enter time and date step by step via the numerical keypad in the edit mode, i.e. after having pressed the Enter key.

The time zone menu item offers a selection list (*summer/winter time*) for you to choose the seasonal time zone as soon as you are in the edit mode.

Note: In case of synchronization via NTP or GPS no current seasonal time information is supplied. It therefore has to be set manually at the operating panel once during the initial commissioning. All following changeovers from summer to winter time and vice versa will be performed automatically (according to the parameterized procedure).

However, it is also possible to operate the device throughout the year without a seasonal time change. The seasonal time change may be prevented by parameterization. In such a case, the phrase *not used* appears next to *Time zone*, and it is not possible to get into the edit mode here.

After having set the time correctly, invoke the menu. Return to the main display without accepting the new time adjustment via *Cancel*. Accept the new time by confirming *OK*. The phrase *Clock setting executed* appears in the last line of the display after the new time has been accepted.

Synchronize clock

The *Synchronize clock* menu item is protected by the user lock (numerical code). You may adjust the time by up to ± 20 seconds via *Synchronize clock* (and by a maximum of $\pm 3\%$ of the billing interval's length). Enter the desired time adjustment in seconds (with a positive sign for setting the clock forwards and with a negative sign for setting the clock backwards). Afterwards, invoke the menu and confirm via *OK*.

In principle, re-synchronizations must keep to specific intervals, which usually last 2 minutes, in order not to be rejected if the user switch is closed. This

regulation is independent of the synchronizing source (entry via operator panel, via DSfG, via NTP, via GPS, via telephone time query, via digital protocol). Therefore, if synchronization has been performed by any source, each further synchronization attempt, in particular manual synchronization, will be rejected for 2 minutes. In such a case the phrase *Clock synch. rejected* is indicated in the bottom line of the display for about 10 seconds.

Even if the entered adjustment is permissible, it will not be accepted immediately if the user switch is closed. Setting the clock forwards will only be performed at the 2nd second of a minute whereas setting the clock backwards at the 57th second of a minute. That is why the setting will possibly not be carried out before the following minute starts. This prevents the generation of a minute change caused by *Synchronize clock*, which may trigger an archive entry. As long as the time adjustment has not been carried out yet, the bottom line of the display shows the phrase *Clock synch. delayed*. This message will be replaced by *Clock synch. executed* at the moment the adjustment starts.

Display test

You may check whether or not the display and the status LED function correctly by performing the display test. After you have activated the *Display test* menu item, the pixels of the display are alternately switched on and off. At the same time the status LED shows all three colors after each other.

Finish the display test via *Back*.

5.4 Integrated RDT Module

5.4.1 Function

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 each of the up to four internal *Center via RDT* entities¹⁴.

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

- 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 types¹⁵.

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

¹⁴ See Footnote 11, page 5-41.

¹⁵ Please refer to Footnote 13 (page 5-42) for the attention telegram types.

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 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.

5.4.2 Display and Operation

Main Display (Integrated RDT Module)

The main display of the *Integrated RDT* module indicates the current status of the RDT.

```

Integrated RDT          14:42:55 W
                       22.01.2007

Mode:   Dial modem analog
Status: Basic status
not connected
  
```

The *Mode* menu item indicates the current operating mode of the RDT (TCP/IP connection, dial modem analog, dial modem GSM, null modem).

Status indicates the current RDT status:

Status	Explanation
RDT not in operation	The <i>RDT not in operation</i> status may have the following causes: <ol style="list-style-type: none"> 1. During start up it turned out that the TCP/IP interface is either not available or electrically defective. Additional message: <i>TCP/IP socket/module fault.</i> 2. Hardware error: wrong interface module. Additional message: <i>Module W3150 not recognized.</i>
TCP error (TCP/IP operation only)	During operation it turned out that the TCP/IP interface is electrically defective. Additional message: <i>TCP/IP socket/module fault.</i>
No modem (modem operation only)	The <i>No modem</i> status may have two causes: <ol style="list-style-type: none"> 1. No modem has been connected. 2. The modem initialization has failed. After some time the system will try to initialize the modem again, i.e. it changes in the <i>Modem initialization</i> status again (see below).

Modem initialization (modem operation only)	Directly after start-up, the RDT tries to initialize the modem. After a successful initialization the RDT status changes to <i>Basic status</i> .
Basic status not connected	The integrated RDT is ready for operation but is currently not connected to the center.
Calling (modem operation only)	The integrated RDT calls the center. Additional information is provided on the number of call attempts and the phone number being called.
Call attempt (TCP/IP only)	The integrated RDT tries to establish a connection to the center.
Call connection	An external call comes in. The telephone connection is established. The modems are setting up the connecting protocol.
Identification phase (not in case of a null modem)	During the <i>Identification phase</i> the center and bus identifiers are being exchanged and checked. The data connection has already been established. The operator is informed about when the telephone connection was established. Moreover, the telephone number of the station to which the connection has been established is indicated, provided the number is known. In case of a TCP/IP connection the display shows the host IP and the dynamically allocated port number instead.
Transparency mode	Connection set-up and login procedure have been completed successfully. Exchanging data is possible. The operator is informed about when the telephone connection was established. Moreover, the telephone number of the station to which the connection has been established is indicated, provided the number is known. In case of a TCP/IP connection the display shows the host IP and the dynamically allocated port number instead.
Call delay time	The RDT has attempted to call the center, but the connection could not be established. Now the dialing is interrupted by a parameterized <i>Call delay time</i> before a new call will be initiated. The display also indicates which call delay time is currently pending and how long it will last.
Long-term block (modem operation only)	The maximum number of call attempts can be parameterized. If the connection has not been established after this number was, the RDT is put into a <i>Long-term block</i> . Until the end of this block is reached, all attention telegrams are rejected.

Time query calling (modem operation and PTB time query only)	The integrated RDT calls the phone number for the telephone retrieval of the time standard. Additional information is provided on the number of call attempts and the telephone number of the time server. This status may only occur if time synchronization by time query calling has been set in the parameterization of the RDT.
Time query synch. (modem operation and telephone time query only)	The connection to the parameterized phone number for the telephone time query has been established. The time is now being enquired. This status may only occur if time synchronization by time query calling has been set in the parameterization of the RDT.

 **Subordinate Menu Items (Integrated RDT Module)**

History

The *History* display lists the last three completed center connections together with start time and duration.


RDT statistics

The *RDT statistics* submenu is a tool for trouble shooting in case of recurring connection errors. The display provides an overview of the reason for and the number of failed connections, sorted following incoming and going calls.

Scroll through the listing by means of the arrow keys.

```

RDT statistics          09:47:22 S
                        27.07.2004
incom.calls without login      1
incom.calls with login error  19
Unsuccessful after redialing   0
going calls without login     0
going calls with login error  17
                    
```



Number of failed calls (here:
 incoming calls with login error)

The meaning of the display texts and counters is described below:

Text	Meaning
incoming / going calls without login start	Those calls are counted during which the following error has occurred: The modems have established the connection logging. The login procedure, i.e. the checking of the access authorization by center and bus identifiers, has not started at all.
unsuccessful after redialing (only relevant in case of modem operation)	Counter for the occurred long-term blocks.

incoming / going calls with login error	Indicates the number of calls to which the following applies: The connection has been established, but the login procedure, i.e. the checking of the access authorization by center and bus identifiers, has failed.
incoming / going calls without transparency mode	Those calls are counted during which the following event has occurred: The participants have established the connection logging and the login procedure has been completed successfully. However, no data was exchanged as the center did not switch into the transparency mode.

GSM (only if a wireless modem is connected)

The *GSM* display indicates whether a connection to the radio network is currently established and, if so, it also indicates the measured data signal quality. The data signal quality is indicated as integer on a scale of 0 to 31 according to the convention of the modem manufacturers. The corresponding value is additionally indicated in dBm (see table below):

0	-113 dBm or less
1	-111 dBm
2-30	-109...-53 dBm
31	-51 dBm or more
99	Unknown

The minimum data signal quality level depends on the type of the connected wireless modem. Please refer to the corresponding modem manual for further information.

Synchronization (only if time synchronization is carried out via telephone time query)

In addition, a synchronization of the internal device time may be carried out via the integrated RDT if there is a server reachable by telephone and providing the time via telephone in accordance with a defined protocol. If this functionality is used, the *Synchronization* display contains additional information on the status of the time query.

5.5 Counters Module

5.5.1 Function

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.

5.5.1.1 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.

5.5.1.2 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.

5.5.1.3 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.

5.5.2 Display and Operation

Main Display (Counters Module)

The main display of the *Counters* module indicates the number of defined counters and totalizing counters and how many of these counters are currently disturbed.

```
Counters                00:46:41 S
                       17.09.2007
3 Counter(s)
1 Counter(s) disturbed
1 Totalizing counter(s)
1 Totalizing counter(s) dist.
```



Subordinate Menu Items (Counters Module)

Counters

After the *Counters* menu item has been activated, the display of the first defined counter is invoked. Scroll through all created counters via the subordinate menu items *Next* and *Previous*.

Fixed display lines are reserved for the following information:

Line 1 Menu name (here: *Counters*) and time (date: to the right of line 2)

Line 2 If a counter is marked as being disturbed, the reason(s) is (are) indicated here:

disturbed:

- I The source of the totalizer input is disturbed (digits to the left or right of the decimal point), e.g. due to a cable break.
- Q The flow rate source is disturbed.
- p The pressure input is disturbed.
- T The temperature input is disturbed.
- F The conversion factor cannot be calculated (e.g. due to errors in the k-ratio calculation).
- M The assigned error message is pending.

t In case of a protocol input: The parameterized maximum time without communication (timeout) has elapsed.

Line 3 Name of the counter

The rest of the display structure depends on the type of counter. For a simple counter which is derived from a pulse input and does not consider a conversion factor, only the counter itself is indicated. If a flow rate source has been specified, the flow rate will also be indicated on this display.

Page 1 (Example):

Counters	←	10:56:30 S	Line for disturbance information (here: empty, counter is therefore undisturbed)
U counter GM1	←	17.09.2007	Name of the counter
U:	←	00000000391.118 m3	Value of the counter
Q:	←	3598.658 m3/h	Flow rate input value (optional)

Further pages with current information can be invoked for more complex counters (e.g. with conversion factor consideration; input value via digital protocol; equipped with the *Intercalate totalizer* function) via the arrow keys.

Further page (Example for the use of a conversion factor with k-ratio calculation to SGERG-88):

Counters	←	11:12:25 S	Disturbance information (here: I for meter input disturbed)
disturbed: I	←	17.09.2007	
Un counter GM1	←		Name of the conversion factor used
CF:		GM1	Tabular values for Hs, Rho and possibly CO2 used for the correction
Hs:		10.300000 kWh/m3	
rho:		0.830100 kg/m3	
CO2:		1.290000 Mol %	

Further Page (Example for the use of a conversion factor with k-ratio calculation):

Counters	←	11:14:16 S	Pressure and temperature measurement (only in case of correction)
Un counter GM1	←	17.09.2007	
F:	←	12.300000 bar	k-ratio and Z-factor
T:	←	20.489647 °C	
k:	←	0.979386	
Z:	←	11.529787	

Further page (Example for the digital transfer of a totalizer; the screen shot shows the activated option *Intercalate totalizer*):

```

Counters                               11:17:16 S
                                       17.09.2007
U counter GM1
Inp.: 000000094226,478 m3
->: 000000094227,498 m3
Delta: 1,020 m3
Com.: 0530
Stat.: intercalating
    
```

Display	Meaning
Inp(ut):	Last totalizer received from external source.
- >	Only if the <i>Intercalate totalizer</i> option is activated: Continuously intercalated count value based on the input value, i.e. before a conversion factor has been considered.
Delta:	Only if the <i>Intercalate totalizer</i> option is activated: Currently calculated change rate per second.
Com.:	Counter for telegrams that have come in.
Stat(us):	
starting	No telegram has arrived yet.
restarting	Waiting for a second telegram (the first valid telegram after start-up or failure has already arrived).
intercalating	The totalizer is intercalated, i.e. the calculated change rate (see above under Delta) is added to the input count value (Inp.) every second to create an intercalated totalizer (see - >).
transfer from src (source)	The incoming totalizer is transferred. (Only if the <i>Intercalate totalizer</i> option is deactivated.)
disturbed	The counter is marked as being disturbed. Note on cause of the disturbance see display line 2.
timeout	The parameterized communication timeout has been exceeded.
stopped	Only if the <i>Intercalate totalizer</i> option is activated: The intercalated totalizer has been stopped because a comparison with the input totalizer has revealed that it has advanced too much.
> Qmax	The parameterized Qmax has been exceeded. The totalizer increment of the input totalizer is interpreted as

< Qmax/10	setting the totalizer. This means that the totalizer increments are rejected, i.e. they are not output and do not influence the totalizing counters.
	Only relevant if the <i>Intercalate totalizer</i> option is activated: The intercalation of the totalizer is stopped.

Totalizing counters

A gas-net M1 device is able to file up to 20 totalizing counters. If the related display is invoked, the first totalizing counter will be indicated. Change to the display of a different totalizing counter via the name.

The display contains the following information:

If the phrase *disturbed* appears in this line, the totalizing counter is marked as being disturbed.

Name of the totalizing counter

Totalizing counter: totalizer

Total flow rate (only if a flow rate input has been assigned to each of the involved counters)

Retained negative quantities will be subtracted at the first opportunity.

The *Totalizing counters* display comprises the following subordinate menu items:

Next / Previous

Menu items for scrolling within the totalizing counters.

Neg.=0 (only in case of open user locks)

Use the *Neg.=0* menu command to delete the retained negative quantities of all totalizing counters.

5.6 *Data Exchange Module, DSfG Module*

The DSfG protocol is a digital data protocol that has been particularly developed for communication between gas measurement devices in gas measuring and regulating stations. If the gas-net M1 is equipped with a DSfG interface, all important measurements and characteristics are provided via DSfG protocol. The contents of DSfG data elements can be internally queried and provided even without a physical DSfG interface.

A PLC (programmable logic controller) is installed in many gas measuring and regulating stations. Its tasks are the closed- and open-loop control of the station and telecontrol connection to a remote center.

A PLC usually uses digital communication protocols such as *3964R/RK512* (e.g. S5/S7 in case of Siemens) or *Modbus-RTU* (e.g. in case of Cegelec Modicon).

In addition, there are non-DSfG-capable external measuring instruments (e.g. for gas quality measuring), which can be connected to the gas-net device and provide their measurements via MODBUS protocol, for example.

Therefore, in practice an interfacing of proprietary protocols or a conversion between DSfG and proprietary protocols is often necessary (gateway functionality).

These tasks are accomplished by the *DSfG* and *Data Exchange* modules of the gas-net software.

As this rather complex functionality exists in several gas-net device types, it is described by a separate documentation.

6 GW-GNET+

All gas-net devices are parameterized with a PC or laptop computer and the GAS-WORKS software system, i.e. the GAS-WORKS module called GW-GNET+.¹⁶

The next two sections in general terms how to create or edit a complete gas-net parameterization using GW-GNET+ and how to export it to the device. It is rather easy to learn how to work with the parameterization 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. We therefore have enclosed a complete parameter list with additional information in the annex to the first volume of this documentation.

For a detailed description of the parameterization program, please refer to the context-sensitive online help of GW-GNET+ which is activated by the F1 key. It describes other editing methods the parameterization program offers as well.¹⁷

6.1 Creating and Exporting a gas-net Parameter Data Record: Brief Description

To create a completely new gas-net parameterization, proceed as follows:



1. Start GW-BASE from the Windows environment by double-clicking the lantern icon.
2. Invoke the GW-GNET+ module by clicking the **New – Create gas-net parameterization** tool in the toolbar. Alternatively, select the **Tools – New – Create gas-net parameterization** menu item from the main menu.



¹⁶ Please refer to the GAS-WORKS CD-ROM, which is part of the delivery scope of each device of Elster, 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.

¹⁷ It is possible to change the device parameterization or single parameters via an established data connection between the computer and the device. This is advantageous with respect to different situations: For instance, you may exchange operational parts of the parameterization in the GW-GNET+ **Edit parameterization** mode, even if the calibration switch is closed. In the **Change parameters** mode, parameters characterized as *online-changeable* can be edited without restarting the device.

3. Select the device type you would like to parameterize in the appearing dialog and the version number of the device software in the next step. Choose the existing standard parameterization on which the new parameter data record shall be based in the following dialog.

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 requirements.
6. Select **File – Save as** and enter the file name under which the parameter data record shall be saved in GAS-WORKS. Close GW-GNET+; for instance via **File – Exit**.
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 management¹⁸.
8. Connect the DSS data interface at the device to a COM interface of the computer using a parameterization 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.

¹⁸ To drag a data record from the worksheet into a hierarchy, proceed as described below:

1. Mark the target hierarchy (which must possibly be created before).
2. Drag the data record with the mouse from the worksheet into the right half of the configuration window.

Alternatively, drag the data record directly to a folder in the hierarchy (on the left side of the configuration window).

Refer to the GW-BASE online help for more detailed information.

11. The communication program starts.

The window appearing on your screen shows the information **Data transfer into gas-net device**.

As soon as the transmission has been completed, the device will be re-started. The message **Data transfer into gas-net device** vanishes from the communication window, and the type plate of the connected gas-net device is indicated instead, stating the most important device data.

Close the communication program now.

6.2 Importing and Editing a Parameterization: Brief Description

You may read out the current parameterization of a gas-net device via the data interface and edit it afterwards.

The reading in is accomplished as follows:

1. Connect the PC and the gas-net device by connecting the COM interface of the computer to the DSS interface at the gas-net device using a parameterization cable.



2. Start GAS-WORKS on your computer if you haven't done so before. 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 connected to the device as regards data technology. The window appearing on your screen contains some important basic device information.

3. Change to the **Content** tab.



4. Mark the **Parameterization** data record and click the lantern icon. A **Save as** dialog box appears asking for the file 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 starts.
5. As soon as the reading in has been finished, close the communication program via the **File – Exit** main menu item.

The parameter data record is filed in the GAS-WORKS worksheet under the specified file name. Before starting GW-GNET+, you have to file this data record away in the hierarchy, as worksheet data records cannot be processed further.¹⁹

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 parameterization according to your requirements.
4. Save your adjustments:
By clicking **Save** you save the data record under its old name.
If you select **Save As**, you may enter a new file name. The created data record is saved in the GW-BASE worksheet in this case and must be filed away in a suitable hierarchy.

Close GW-GNET+ and export the modified parameterization as described in Chapter 6.1, steps 8-11.

6.3 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 M1 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: For instructions, please refer to the GW-GNET+ online help.






Change parameters

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

Note: For instructions, please refer to the GW-GNET+ online help.

¹⁹ For brief instructions see Footnote 18, page 6-2.

	Totalizer setting	Facilitates the setting of single totalizers of the <i>totalizer</i> module if the user lock (numerical code) is open (for self-created totalizers only, not for original totalizers!).
	Delete archives	Facilitates the deletion of archives of the gas-net M1 device if the user switch is open.
	DSfG bus access XE "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 if a data connection is established via the DSS data interface.

Proceed as usual:

1. Start GW-BASE on your laptop computer.
2. Connect the DSS interface of the gas-net device to a COM interface of the laptop using a parameterization 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 the screen.
4. Select the **Tools** tab. The appearing tab lists all available service programs.
5. Start the desired program by double-clicking.



The functional range of the service programs is manageable and practical. The operation is thus rather easy. A comprehensive online help is also available for each program. It can be activated via the **Help – Content** menu item or by pressing the **F1** key.

7 Installation

7.1 Mounting the gas-net M1

The gas-net M1 device is designed for mounting in a 19"-cabinet with a mounting width of 1/2. Please pay attention to a mounting depth of 170 mm (with connectors: approximately 220 mm) to guarantee the accessibility of the terminals on the back. We recommend mounting the device in a swing frame.

gas-net devices must be installed in an ex-free installation area (electrical operating area) according to protection class IP 20.

7.2 Connecting the Lines

Ensure that the device is in de-energized conditions before connecting the transmitter, supply, signal and data lines.

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

Connect the transmitter and signal lines to the gas-net device using plug-in screw terminals, each of which is located in a cable terminal box. Connect the power supply via fixed screw terminals. Data lines have to be connected to the corresponding SUB-DB9 connector housings.

Please pay special attention to intrinsically safe circuits of the Ex-input boards EXMFE5 and EXDE6, if installed. Before switching on the supply, make sure that the connectors for the inputs are plugged in as only then a thread measure of 50 mm can be guaranteed, which is required by the relevant guidelines.

Please consider the relevant installation regulations 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 swing frame. Dimension the cable length in such a way that there is no tensile stress on the cable during the swinging of the swing frame.

We recommend conducting the lines coming from the transmitters on transfer terminals in a control cabinet and connecting them from there to the gas-net device. However, these terminals have to comply in part with the Ex-regulations.

7.2.1 Power Supply and Earthing

Operate the gas-net 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.

7.2.2 Process Boards

The process board equipment of a gas-net M1 depends on the tasks the device is supposed to accomplish. Generally, the device accommodates up to seven process boards.

Attention: Altogether, only up to four boards of the types EXMFE5, EXDE6 and MSER2 can be employed in one device.

7.2.2.1 EXMFE5 Input Board

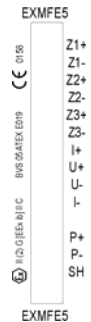
Important Note: The EXMFE5 input board is approved as an *associated electrical apparatus* of category *ib* according to DIN EN 50020 with intrinsically safe circuits. This is why sensors and signal transmitters located in hazardous areas (e.g. zone 1) can be connected to this board. A mixed operation of intrinsically safe and non-intrinsically safe circuits is not permissible for such an input board.

To the first three channels of an explosion-proof EXMFE5 input board, intrinsically safe pulsers in NAMUR technique can be connected. The channels of the EXMFE5 can also be used as message input channels. Alternatively, it is also possible to connect an encoder totalizer to the first one of these input channels for a digital transmission of original meter readings.

Connect the signals for channels 1 to 3 to terminals **Z1+**, **Z1-**, **Z2+**, **Z2-**, and **Z3+**, **Z3-**.

The inputs are intrinsically safe. Use shielded cables for a better interference suppression. The maximum cable length is 100 m at a cross section of 1.5 square mm. If the cables are longer, you have to ensure that the lines are installed separately from other conducting lines to avoid interferences.

Moreover, each EXMFE5 board has one intrinsically safe temperature sensor input in 4-wire technique to be connected to terminals **I+**, **U+**, **U-** and **I-** according to the Pt100 Specification.



The board is also equipped with an intrinsically safe input for measuring sensors (e.g. a pressure sensor) in 4..20 mA-two wire-technique (terminals **P+** and **P-**). This fifth channel of the EXMFE5 input board can also be used for the parallel connection of up to 4 measuring sensors using a HART interface (multi-drop procedure).²⁰ For the sensors, only the HART polling addresses from 1 to 4 are allowed; make sure that the address assignment is unambiguous and corresponds to the assignment in the parameterization of the gas-net device.

Important Note: In general, each modification of the wiring is only permitted after the supply has been disconnected. This means in particular in case of HART sensors that the HART polling addresses must be adjusted individually in the sensors *before* connecting them together to the corresponding input channel at the gas-net device in de-energized conditions. When the device starts up again afterwards, all connected HART sensors are polled once for the device to find out the current polling addresses.

If you would change the polling addresses later, the gas-net device would not be able to identify the individual sensors correctly.

The device supplies the measuring sensors with power. For this, shielded cables must be used with the shielding being fitted only at the device but not at the sensor. If the line cross section is 1.5 square mm, the line should not be longer than 100 m; otherwise, it must be guaranteed that the lines are installed separately from other conducting lines to avoid interferences.

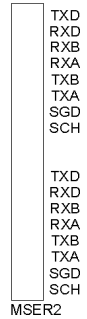
The cable shielding for all transmitter lines is placed on the **SH** terminal at the EXMFE5 input board.

7.2.2.2 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:

²⁰ Please consult Elster if you would like to connect sensors via HART protocol and the cable is longer than 50 m.

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.

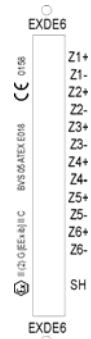
Notes:

- 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).

7.2.2.3 EXDE6 Input Board

Important note: The EXDE6 input board is approved as an *associated electrical apparatus* of category *ib* according to DIN EN 50020 with intrinsically safe circuits. This is why signal transmitters located in hazardous areas (e.g. zone 1) can be connected to this board. A mixed operation of intrinsically safe and non-intrinsically safe circuits is not permissible for such an input board.

To the channels of an explosion-proof EXDE6 input board, intrinsically safe pulsers in NAMUR technique can be connected, but the channels may also be used as message input channels. Alternatively, it is also



possible to connect an encoder totalizer to the first one of these input channels for the digital transmission of original meter readings.

Connect the signals for channels 1 to 6 to terminals **Z1+**, **Z1-** to **Z6+**, **Z6-**.

The inputs are intrinsically safe. Use shielded cables for a better interference suppression. The maximum cable length is 100 m at a cross section of 1.5 square mm. If the cables are longer, you have to ensure that the lines are installed separately from other conducting lines to avoid interferences.

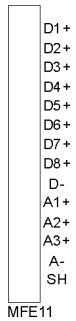
The cable shielding for all transmitter lines is placed on the **SH** terminal at the EXDE6 input board.

7.2.2.4 MFE11 Input Board

The multi-functional MFE11 input board is equipped with eight digital message inputs 0/24 V DC. However, it is also possible to use these channels as pulse inputs with a maximum input frequency of 25 Hz. Connect the inputs at terminals **D1+** to **D8+** with the common ground **D-**.

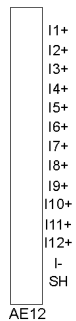
In addition, the MFE11 input board provides three analog inputs for the connection of measuring sensors with 0/4 to 20 mA output signals. Connect the inputs via terminals **A1+** / **A2+** / **A3+** with the common ground **A-**.

The analog inputs of the MFE11 board are electrically isolated from the digital inputs. Besides, all channels are electrically isolated from the rest of the system. Connect the cable shielding for the inputs to the **SH** terminal.



7.2.2.5 AE12 Input Board

The AE12 input board offers twelve analog inputs for the connection of measuring sensors with 0/4..20 mA output signals. Connect the inputs via terminals **I1+** to **I12+** with the common ground **I-**. Connect the cable shielding to the **SH** terminal.



7.2.2.6 MFA8 Output Board

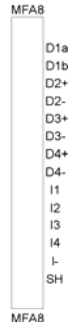
The multi-functional MFA8 output board contains one PhotoMos output for the output of a message as break contact (**D1a/D1b**). In addition, there are three PhotoMos outputs for the output of additional messages or volume pulses (**D2+/D2-**, **D3+/D3-**, **D4+/D4-**). The output assignment can be parameterized as desired within a certain range.

The MFA8 output board also provides four analog outputs for the output of measurements. Current limits can be parameterized in a range of 0 to 20 mA. The corresponding terminals are marked **I1 to I4**, with common ground **I-**.

The message and pulse outputs are electrically isolated from each other and from the rest of the system; the analog outputs are electrically isolated from the rest of the system but not from each other.

Connect the cable shielding for the outputs to the **SH** terminal of the board.

The analog output assignment can be parameterized as desired.



7.2.2.7 MFA6 Output Board

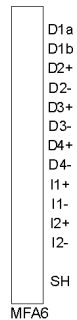
The multi-functional MFA6 output board contains one relay contact for the output of a message as break contact (**D1a/D1b**). In addition, there are three transistor outputs for the output of additional messages or volume pulses (**D2+/D2-**, **D3+/D3-**, **D4+/D4-**). The output assignment can be parameterized as desired within a certain range.

The MFA6 output board also provides two analog outputs for the output of measurements. The current limits can be parameterized in a range of 0 to 20 mA. The associated terminals are marked **I1+/I1-** or **I2+/I2-**.

The outputs are electrically isolated from each other and from the rest of the system.

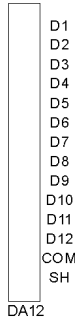
The analog output assignment can be parameterized as desired.

Connect the cable shielding for the outputs to the **SH** terminal of the board.



7.2.2.8 DA12 Output Board

The digital DA12 output board has 12 transistor outputs for the output of messages or pulses (to be connected to terminals **D1**,...,**D12** with the common reference point **COM**). Connect the cable shielding for the outputs to the **SH** terminal.



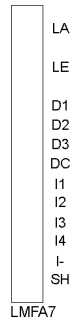
7.2.2.9 LMFA7 Output Board

The LMFA7 output board offers 3 digital outputs: one relay output (active break contact) for the output of a message and two transistor outputs for the output of messages or pulses. Connect the outputs via terminals **D1**, **D2**, **D3** with the common ground **DC**.

Furthermore, the LMFA7 board is equipped with 4 analog outputs 0/4..20 mA (terminals **I1**, **I2**, **I3**, **I4** with common ground **I-**).

The terminals named **LA** and **LE** right at the top of the board are reserved for later expansions (LA = fiber-optics output, LE = fiber-optics input).

Connect the cable shielding to the **SH** terminal of the board.



7.2.3 Further Connection Possibilities

7.2.3.1 Serial Interface DSS

The serial interface DSS in form of a SUB-DB 9 female connector on the front panel serves the connection of the gas-net M1 to other devices, such as a laptop computer or PC. The technical data is stated in the annex. An interconnecting cable to the computer can be delivered as accessory. A standard COM connection (one-to-one connection) is not permissible.

Important Note: The gas-net device can be equipped with up to two of the following three possible interfaces (DSfG, TCP/IP, COM2).

7.2.3.2 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.

7.2.3.3 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.

7.2.3.4 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	9-pin rectangular connector
1	DCD	Data Carrier Detect	--
2	RXD	Receive Data	for RK512/3964R and MODBUS
3	TXD	Transmit Data	for RK512/3964R and MODBUS
4	DTR	Data Terminal Ready	--
5	GND	Signal Ground	for RK512/3964R and MODBUS
6	DSR	Data Set Ready	--
7	RTS	Request to Send	--
8	CTS	Clear to Send	--
9	RI	Ring indicator	--
Shield	--	Chassis	Same potential as protective earth

If the functionality of the integrated RDT shall be used, connect the modem or null-modem cable to the interface named **COM2**.

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.

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 8.3 from page 8-5.

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:

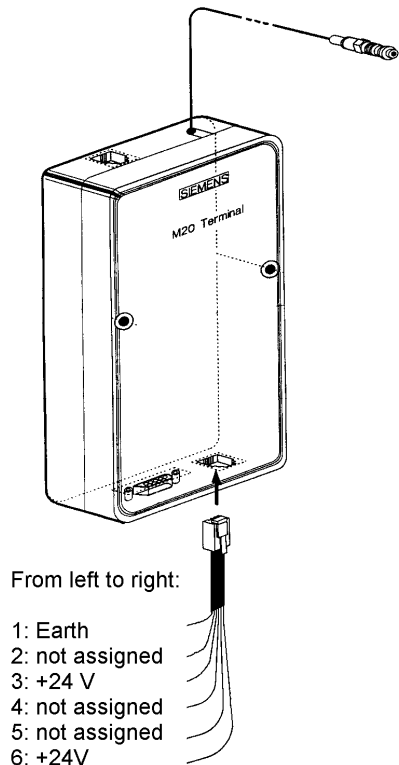
Connection of the Siemens M20 / TC35 Wireless Modem to 24 V

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.²¹

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.



²¹ The illustration shows a Siemens M20 wireless modem, but holds by analogy for the Siemens modem type TC35.

8 Commissioning

This chapter briefly describes the most important aspects of commissioning gas-net monitoring units.

All parameters are listed and explained in chapter 11.1.

8.1 Parameter Protection against Unauthorized Access

The functionality of a gas-net device can be completely configured via a parameter data record. Unauthorized persons must therefore be prevented from changing these parameters. In order to guarantee this protection, the device is provided with a two-level security system consisting of the *User switch* (sealable rotary switch) and the *Locks* (user locks, password protection).

8.1.1 User switch

The user switch physically consists of a sealable rotary switch on the front of the device. Open the user switch by turning it anticlockwise as far as it will go. For additional safeguarding, the device generates hint *H1113: User switch open* when the user switch is open.

Opening the user switch enables the operator to access all device parameters and facilitates actions that can be triggered directly via the operating panel of the device or via the GAS-WORKS software and an established data connection.

8.1.2 Locks

The user lock consists of one (numerical) lock for each of the two contract parties and is implemented via the software. This means that the locks are defined by the device parameterization and opened or closed via the operator panel. Generally, both locks are open if the user switch is opened.

Open locks allow the user to access specific parameters or actions that are editable directly at the device. All parameters being subject to the user locks can be modified when both locks are or the user switch is open.

8.2 Parameterization

Use a PC or laptop computer to create a complete parameterization or to modify existing parameters (except for a few). Create the parameter data record with

the GW-GNET+ parameterization software. The user switch has to be open during the import of a complete parameterization via DSS data interface.

Note: Please refer to Chapter 6 for brief instructions on the parameterization by means of GW-GNET+. For a comprehensive description of the parameterization program, the detailed GW-NET+ online help is available.

Checking the Settings

It is possible to check the complete set of parameter settings of gas-net devices by means of the GW-GNET+ parameterization program. For a brief instruction see chapter 4.6

A special menu is available for observing the currently incoming signals of the connected sensors and the status of the message inputs (cf. Section 4.4). It is also possible to view output signals per channel in a special menu. This way, the operational capability of the outputs can easily be checked by comparing them with the physical data.

8.3 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 “_”.²²

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.

- 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.

²² 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*.

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
“ „²³
—.
Invoke the *DSfG* menu (*System* module) at the gas-net device. You can

²³ If an entity of the *gas-net* device is the master, please refer to Footnote 22, for information on how to perform a general polling.

view the station list here and compare it with the planned bus configuration 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 " " ²⁴ " " _{..}.

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

²⁴ See Footnote 22.

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 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.

9 Maintenance

gas-net devices do not require much maintenance.

9.1 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) 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.

10 Technical Data: gas-net M1

Device Type

Electronic Monitoring Unit for universally monitoring, logging and transferring messages and measurements in gas measuring and regulating stations.

Housing

Plug-in unit in 19" design, 3 height units, 1/2 mounting width for swing frame mounting.

Mounting depth is about 170 mm without connectors and about 220 mm with connectors.

Process interfacing is on the back; operator panel, on the front.

Power Supply

24 V DC +/- 20 %; power input: up to 12 W. As an option: 230 V AC via external power supply.

Operation

16 input keys (12 for numerical entry and 4 for navigation) and one user switch. Easy-to-learn operation via invokable menus. The GAS-WORKS program system provides a remote control function via DSS data interface or optionally via modem and COM2 or TCP/IP network.

Display

Illuminated LCD; 8 lines with 32 characters each; status LED for the indication of pending messages.

Board Array

The board array depends on the tasks of the device and type of the input signals. The maximum number of boards depends on the housing size: The housings (1/2 mounting width) accommodates up to seven process boards.

The boards listed below can be combined freely. However, all in all no more than four boards of the EXMFE5, EXDE6 and MSER2 types can be used in one device.

EXMFE5 input board:

- Three pulse or message inputs [EEx ib] IIC. When being used as pulse input, the board is suitable for the connection of LF and HF pulsers similar to DIN 19234 for gas meters, with max. 10 kHz; automatic level adaptation by channel. The first channel is also suitable for connecting an encoder totalizer.
- Temperature sensor input for a PT100 in 4-wire technique; [EEx ib] IIC; the maximum measuring error is ± 0.05 % of the measurement in a range of -10 to +60°C and at an ambient temperature of 0 to 40°C.
- Measuring sensor input from 4 to 20 mA; [EEx ib] IIC; the maximum measuring error is ± 0.05 % of the measurement in a range of 4 to 20 mA and at an ambient temperature of 0 to 40°C.
This channel can alternatively be used for the connection of up to 4 measuring sensors with HART interfaces (multi-drop).

EXDE6 input board:

Six pulse or message inputs [EEx ib] IIC. When being used as pulse input, the board is suitable for connecting NF and HF pulsers similar to DIN 19234 for gas meters, with max. 5 kHz; automatic level adaptation per channel. The first channel is also suitable for connecting an encoder totalizer.

MSER2 process board:

- Two serial interfaces for one protocol channel each.
- Each interface may be configured to RS232, RS485 or RS422 by a suitable assignment of the interface terminals.
- Implemented protocols: Modbus RTU, Modbus ASCII, Siemens 3964R, Q.Sonic ultrasonic gas meter protocol of Elster. Furthermore, it is possible to connect a FLOWSIC ultrasonic gas meter of SICK/MAIHAK or a GPS receiver for time synchronization.

MFE11 input board:

- Eight digital inputs that can be used as message inputs 0/24V DC or pulse inputs with a maximum input frequency of 20 Hz.
- Three measurement inputs 0/4 to 20 mA; the maximum measuring error is ± 0.1 % of the measurement in a range of 0 to 20 mA and at an ambient temperature of 0 to 40°C.

AE12 input board:

- Twelve analog inputs (0/4 to 20 mA).

MFA6 output board:

- One relay output (break contact, max. 28.8 V 120 mA).
- Three transistor outputs (max. 28.8 V DC 90 mA) for messages or pulses of max. 25 Hz.
- Two analog outputs 0/4 to 20 mA for measurements; max. load impedance: 300 ohms. The error is ± 0.1 % of the output value in a range of 4 to 20 mA and at an ambient temperature of 0 to 40°C.

MFA8 output board:

- One PhotoMos output (break contact, max. 28.8 V 120 mA).
- Three PhotoMos outputs (max. 28,8 VDC 120 mA) for messages or pulses of max. 25 Hz.
- Four analog outputs 0/4 to 20 mA for measurements; max. load impedance: 300 ohms. The error is ± 0.1 % of the output value in a range of 4 to 20 mA and at an ambient temperature of 0 to 40°C.

DA12 output board:

- Twelve transistor outputs (max. 28.8 V DC 150 mA) for messages or pulses of max. 25 Hz.

LMFA7 output board:

- One relay output (break contact, max. 28.8 V 120 mA).
- Two transistor outputs (max. 28.8 V DC 90 mA) for messages or pulses of max. 25 Hz.
- Four analog outputs 0/4 to 20mA.

Other Interfaces

Optional DSfG interface for data transmission between gas-net devices. Data logging archives pollable via DSfG.

DSS data interface for the connection to the COM interface of a PC or laptop (for parameterization when commissioning and for archive polling).

Optional COM2 interface (serial interface to RS232C): Intended for connecting a modem with a maximum transmission rate to V.34 bis (33600 baud) and data

compression to V.42 or NMP5 when the integrated RDT is used. An integrated RDT is also possible via a serial direct connection (null-modem cable at COM2). Alternatively, the COM2 interface may be used as protocol channel for connecting a host computer.

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.

The device hardware may contain up to two of the optional digital interfaces DSfG, COM2 and TCP/IP.

Data Logging

Integrated data logging function for process value archives, max. 4 archive groups with up to 8 channels each. Besides, the monitoring functionality provides a logbook that can be logged in form of an archive group.

The archive structure is freely parameterizable.

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.

11 Annex

11.1 Parameters and their Meanings

The following parameter listing follows the order of the parameter listings for the individual modules as they are listed in the GW-GNET+ parameterization program.

11.1.1 *Monitoring Module*

Parameters

+ **Meter proving 1 / meter proving 2** (DSfG functionality)

If more than one corrector entity is connected to the DSfG bus, the gas-net device may retrieve correction data via DSfG – for example data on totalizer increases. This method facilitates a meter proving between two volume correctors or flow computers.

It is possible to activate up to two meter proving functionalities in the parameterization of the gas-net device. The following parameters are required:

Meter proving via...

The meter proving is usually carried out via the proving quantity base volume V_n ; if the meter proving is carried out between flow computers the proving may also be performed via mass m or energy E .

EADR first correction entity

EADR second correction entity

Under *EADR of the first correction entity* the bus address of the reference correction entity is chosen. *EADR of the second correction entity* is used to define which second correction entity is to participate in the meter proving.

The setting *EADR first correction entity = EADR second correction entity = unassigned* deactivates the *Meter proving* option.

Automatic proving yes/no

The meter proving can be carried out automatically. This means that the proving is repeated cyclically and checked for a parameterizable maximum deviation. The message *Maximum deviation meter proving 1* (or *Maximum deviation meter proving 2*) can be assigned to a digital output for monitoring this deviation.

An automatic meter proving is programmed for testing the station in case of a continuous series connection.

The setting *automatic proving=no* switches off the automatic operation. In this mode it is possible to start and stop a meter proving manually via the operating panel of the device. A manual proving is useful for instance in case of a revision during a plant test.

Proving time

Max. deviation

(only in case of automatic proving)

If the meter proving is performed in the automatic mode, a proving time is additionally parameterized in minutes. If both volume correctors or flow computers involved are in an error-free state, the proving starts automatically. After the proving time has elapsed, the percentage deviation is calculated and the proving is restarted.

If the parameterized maximum deviation in % is exceeded, an internal message is generated, which can be forwarded via a digital output.

Qn for comparison at least ...

A minimum base flow Q_n may be parameterized to avoid that minor quantities of flown gas result in a large the meter proving deviation. A meter proving will only take place if the base flow rate of both correction entities exceeds this minimum flow rate.

+ **Summation** (DSfG functionality)

If several corrector entities are connected to the DSfG bus, count values or flow data of two via DSfG connected correction entities can be summated; for instance, in order to output summated quantities via a pulse output.

EADR first correction entity

EADR second correction entity

To facilitate a summation, the DSfG bus addresses (EADRs) of the two participating correction entities have to be parameterized.

Setting *EADR first correction entity = EADR second correction entity = unassigned* switches the summation function off.

+ **Switches**

Name

Protection

Switches are messages the status of which (on/off) can be changed via the operator panel. They can be assigned, for instance, to digital outputs and used for triggering external switching processes. Five switches are available. One each is reserved per corrected stream as revision switch for the correction. The remaining switches are available and can be parameterized as desired with respect to name and access protection (independent / under calibration/user switch protection / under user lock protection).

Message processing

+ General

Holding time

The messages generated by the groups include messages called *held group messages*. These held group messages only differ from normal group messages by the fact that they always keep to a parameterized holding time. A held group message is pending at least as long as the holding time lasts, even if the normal group message ends during the holding time.

The telecontrol response times can be taken into account when a holding time has been parameterized.

M-switch input

The maintenance switch is set via a digital input assigned by parameterization. The reaction of each group of single messages to the setting of the M-switch is parameterized for each group separately.

Acceptance input

Centralized messages of groups requiring an acceptance as well as the main signaler (hooter triggering message) must be accepted explicitly before they can end. You may trigger such an acceptance, among others, via the operator panel, but you may also assign a digital input to the acceptance via the *Acceptance input* parameter.

Input for accepting sounder (main signaler)

You may define a separate acceptance input for accepting the main signaler (hooter/sounder message).

Acceptance technique

The *Acceptance technique* parameter only affects the acceptance technique and status of centralized messages of groups marked *Acceptance required*. There are two different procedures:

1) According to DIN 19 235

Single messages can be accepted even though they are still pending. A centralized message is pending when at least one of the group's single messages is pending or has been pending without having been accepted. The centralized message ends when all related single messages have ended and all single messages that were pending have been accepted.

If a centralized message is still pending after the last single message has ended, it means that after the last acceptance at least one of the related single messages has begun anew. In such a case this message just has to be accepted.

2) Standard

According to this procedure the centralized message results from the OR operation of the status of the related single messages. The centralized message consequently ends with the end of the last pending single message, totally independent of its acceptance. After the centralized message has ended, it can be removed from the error listing by accepting it.

+ **Single messages**

Monitoring type (message, limit value or gradient)

A single message can be derived in different ways:

- by monitoring message inputs or internal messages
- by monitoring measurements for limits (upper or lower limit value)
- by monitoring measurements for range limits (range between upper and lower limit values)
- by monitoring gradients of measurements
- by monitoring pulses/quantities for violations of hourly limits

The monitoring type must be specified during the creation of a new single message as the composition of the required parameters depends on it.

Name

The names of single messages serve to identify the message; for instance, on the device display. We recommend using rather expressive names to avoid mistakes. Up to 23 characters are available.

Source

Either messages or measurements are available here, depending on the monitoring type (see above).

When an hourly limit is monitored, usually a meter input value is used as source. If the quantity coming in via this input within an hour (i.e. for instance from 11:00 a.m. till noon) exceeds the parameterized limit value, the message will be generated. It is also possible to choose a derived count value as source.

Alternatively: flow rate (only in case of *Hourly limit*)

When an hourly limit is monitored and the original input value is a flow rate (e.g. in case of a Q.Sonic ultrasonic gas meter), you may directly choose the flow rate as data source for the *Monitoring* module instead of a count value. The corresponding quantity is continuously calculated based on the flow rate. If this quantity exceeds the parameterized limit value within an hour (i.e. for instance from 11:00 a.m. till noon), the message will be generated.

Logbook number

The logbook numbers serve to identify messages in the logbook and in the error listing. As certain logbook numbers are preset according to the DSfG regulations, an unassigned range (between 2,000 and 50,000) has been reserved for freely parameterizable logbook numbers. Please make sure that the logbook numbers are unambiguous and please consider that logbook numbers are also assigned to centralized messages (see below).

Disabled (yes/no)

Whether a message is disabled or enabled is preset by parameterization. During operation you may disable or enable a single message via the operator panel or with a DSfG setting telegram.

The entire message processing considers a disabled single message as not pending.

Minimum pending time

The minimum pending time determines how long a status to be signaled must be pending before the assigned single message begins, thus preventing fluttering messages.

Setting *Minimum pending time = 0* results in an immediate response by the single message.

Entry in logbook and error listing yes/no

To prevent the error listing and logbook from getting confusing, you may specify for each single message whether or not it shall be entered in the error listing and logbook.

Group assignment

Assign a single message to one or several group(s) via the group assignment. The states of all assigned single messages are linked for each group during operation to generate centralized and group messages (cf. Chapter 5.1.1.3, page 5-2).

DSfG representation board / channel

It is in principle possible to gather information on the status and characteristics of a parameterized single message via DSfG. If this functionality shall not be used, the two parameters *DSfG representation board / channel* are not required and set to <unassigned>.

However, the possibility to gather information on single messages via DSfG may be useful for certain applications.

The individual data that can be queried can be mapped to certain DSfG data elements in the data element tree of the DSfG entity called Control and Monitoring Unit. The parameters *DSfG representation board / channel* then define certain parts of these data element addresses for each single message.

Please contact Elster for further information on the data element addresses used, when required.

With respect to measurement monitoring:Limit value

As upper limit value yes/no (only in case of hint limit monitoring):

Monitoring period (only in case of gradient monitoring):

The meaning of the *Limit value* depends on the monitoring type:

Define the maximum permissible change value within an additionally defined *Monitoring period* when monitoring gradients.

If hint limits shall be monitored, enter the limit value to be monitored here. A separate parameter defines whether this limit value is an upper or a lower one.

Hysteresis

A hysteresis can additionally be parameterized to avoid fluttering messages when a measurement fluctuates around a limit value (cf. page 5-3).

+ Linkage of messages**++ Group no. 1..group no. 8**Type

You may choose between *Acceptance required* and *No acceptance required* to select the group type.

The *Acceptance required/No acceptance required*-property of a group only affects the reaction of the group's centralized message: If *Acceptance required* applies, an additional acceptance signal is included in the logic operation of the centralized message. Please refer to Chapter 5.1.1.3, page 5-2, for more details.

Setting *switched off* deactivates an entire group.

Name

All groups need to be given expressive names to simplify the identification of a group on the device display, for instance.

Logbook number

The centralized message of each group is entered in the error listing and logbook. The logbook number serves the identification of a centralized message. As certain logbook numbers are preset according to the DSfG regulations, an unassigned range (between 2,000 and 50,000) has been reserved for freely parameterizable logbook numbers. Please make sure that the logbook numbers are unambiguous and please consider that logbook numbers are also assigned to single messages (see above).

Trigger main signaler (yes/no)

The so-called *Main signaler* combines all messages of the assigned groups to one message that can be routed to a digital output.

The main signaler usually triggers a hooter or similar sounders. The functioning of the main signaler is described in Chapter 5.1.1.3 on page 5-9.

Attention type (alarm / warning / hint)

The group type defines the type of the attention telegrams it may generate towards the DSfG bus (see below).

Generate attention telegrams in case of ...

Each group may generate DSfG attention telegrams in case of particular events. Events available as triggers are: *Group message begins / Group message ends / Any message of the group begins / Any message of the group ends*. The parameterized group type (see above) thereby determines the type of the attention telegram (L = alarm, W = warning, H = hint).

M-switch function

The M-switch function refers to the reactions of the group to a setting of the M-switch.

Note: A set M-switch never affects single messages.

M-switch function	Group reaction to set M-switch
<i>none</i>	The message reactions of this group are not affected by the M-switch.
<i>suppress remote messages</i>	The held group message is suppressed if the M-switch is set. Besides, the group no longer generates DSfG attention telegrams.

<i>suppress all messages</i>	If the M-switch is set, all message reactions of the group are suppressed, such as held group messages, group messages, centralized messages, main signaler and DSfG attention telegrams. Entries in the logbook and error listing are still made to enable the operator to view the actual condition of the station on site.
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Data logging

The *Monitoring* module may log on up to 4 process value archive groups with up to 8 channels each. The actual data logging of the values, however, is performed by the data logging module. This means you have to set up an archive group in the data logging module for each process value archive defined in the monitoring module.

+ Process value archives 1..4

Name

The name of the process value archive is for identification. If you select expressive names here, the assignment in the *Data Logging* module will be easier.

Cyclic data logging

Define the data logging rhythm under *Cyclic data logging* if you want to log the process values cyclically. The following rhythms are available: *each second, every 2 (5, 10, 15, 30) seconds, each minute, every 2 (5, 6, 10, 15, 20, 30, 60) minutes, every 2 (3, 4, 6, 8, 12, 24) hours, at the gas day beginning (when the daily archives are logged), gas month beginning (when the monthly archives are logged on the first day of each month.*

Setting <none> deactivates the cyclic data logging.

Triggered by

The data logging process can be linked with results of one or more message group(s), alternatively to or in parallel with the cyclic data logging.

Each group generates a trigger upon *any single message of the group begins* or *... ends*. These triggers initiate entries in process value archives. It is also possible to assign several groups, and thus several triggers, to individual archives.

For instance, if you have selected *Triggered by: Group 1*, the process value archive will always start data logging when any single message of this group begins or ends.

Log only if...

Choose a message here. As soon as a message has been selected, archive entries are only logged when this message is pending.

Freeze on ...Freezing depth

Process value archives can be frozen with the result that the archive will only write a parameterized number of entries when an assigned message begins. As soon as this number has been reached the archive will stop logging data. The data logging will not be continued until the assigned message ends.

In the logbook and error listing of the *Monitoring* module the beginning and end of the freeze status are marked by the hints *PVA<no.> frozen begins/ends*.

Archive channels 1..8Name

The name of the archive channel is important for its identification.

Archive type (measurement or counter archive)

Each channel may either log a measurement or a count value.

Process value (assignment)

All measurements existing according to the current status of the parameterization data record are available for being assigned to a measurement archive. These values are measurements coming in via analog inputs as well as all internally available measurements, such as the flow rates of an internal correction entity.

All count values existing within the system may be assigned to the counter archive.

Generate mean value yes/no (only in case of the *Measurement* archive)

An archive channel may either log the arithmetic mean of the values measured since the last data logging or the current measurement.

Entry upon change by ...

You may also link the data logging with a process value change. By assigning a change value to data logging you achieve that archive entries are always made when the difference between the current process value and the value recorded during the last data logging exceeds this maximum change value. You may activate this procedure for measurements and count values.

Entry upon change by is a parameter referring to a particular archive channel. If data logging is performed due to this setting, not only the related channel but all channels of the related process value archive are logged simultaneously.

Data element of source

The data logging entity is able to supply particular information on each archive channel via DSfG when being queried. For instance, there is a data element for inquiring the data element address of the archive value.

The user may assign the channels of the process value archives as he pleases as they do not have a fixed source data element. As some processors face difficulties if the data element for the source is empty, it is possible to parameterize a source data element address for each archive channel of a process value archive as desired.

Measurements

Name

The name of a measurement is important as the device display refers to this name. A tried and tested method is to give the measurement the same name as the related measured data.

Source

All measuring dates existing according to the current status of the parameterization data record are available to be assigned to a measurement. These values consist of measurements coming in via analog inputs as well as all internally available measurements, such as the flow rates of an internal correction entity.

Post-decimal digits for display

The maximum number of post-decimal digits with which a measurement is indicated in the measurement display is parameterizable (1 to 8 decimals).

This way the number of decimals of a measurement may only be limited regarding the increase of decimals, as there are precisely 12 characters available for the indication of the values including sign and comma. If a measurement value is getting so large during operation that not all decimals can be shown on the display, the decimals that do not fit in will be cut off at the end.

+ Lubrication

++ Lubrication 1 / 2 / 3

Name

An unambiguous name for the gas meter lubrication functionality makes the identification of the messages provided by this functionality much easier later on.

Q

A flow input value must be specified if the lubrication control shall be suppressed below a certain minor flow volume (see below). Furthermore, the volume calculation for a volume-dependent lubrication (lubricate after ...m³) can be performed based on a flow value if a volume input is not available.

V

A volume input value is required if a volume-dependent lubrication shall be performed (as an alternative, the volume count value can also be derived from a flow rate; see above).

Oil level too lowOverpressureOil volume

The lubricating device checks itself and provides several output signals for the *Monitoring* module. If these signals shall be evaluated by the gas-net device, they must be assigned to device input channels and allocated correctly in the parameterization of the gas meter lubrication functionality.

Lubrication cycle (deactivated, every day, every 2/3/4/5/6 days, every week, every 2/4/6/8/12 weeks, every six months, annually)

Day of lubricationLubricate at...o'clock

Instead of or in addition to a volume-dependent lubrication it is possible to parameterize a cyclic lubrication at defined intervals (lubrication cycle). Another parameter defines the starting time of the lubrication process (*Lubricate at ...o'clock*). In case of lubrication cycles from once per week up, you may also select the desired weekday (*Day of lubrication*).

Lubricate after...m³

The parameter *Lubricate after ...m³* defines for a volume-dependent lubrication after how many flown m³ of gas a lubrication process shall be triggered.

Lubricate only if Q higher ...

By specifying a minor flow > 0 you achieve that lubrications are suppressed as long as the flow is below this minor flow. A lubrication that has already been started will not be aborted when the flow falls below Q_{min} .

Number of strokesPiston active for...secondsPiston inactive for...seconds

The gas-net device provides a message (*Piston displacement*) that is output via a digital output and thus triggers the lubricating system. The following settings define the details of the lubrication process:

Number of strokes: Number of piston strokes of the lubricating system per lubrication process (this is how often the gas-net device sets the *Piston displacement* message during each requested lubrication cycle)

Piston active for ... seconds: The duration of the piston control via the digital output – *Piston displacement* message is set

Piston inactive for ... seconds: Break between piston control operations – *Piston displacement* message is not set

Max. stroke deviation

The lubrication process can be monitored by comparing the number of requested strokes with the number of actually performed strokes. If, after the end of a lubrication cycle, it turns out that the number of failed piston control operations has exceeded the parameterizable *Maximum stroke deviation*, the gas-net device generates an internal error message: *Stroke deviations exceeded*.

Important: Each lubricating cycle is being monitored separately. Therefore, the parameter *Max. stroke deviations* must be smaller than the *Number of strokes*. The *Number of strokes* is the number of piston control operations per lubricating cycle.

Hold message "Stroke deviations exceeded" yes/no

Hold message "Oil level too low" yes/no

Hold message "Overpressure" yes/no

Hold message "Disturbance" yes/no

The gas-net device can generate several messages (if the necessary input signals are available) to monitor the operational capability of the lubricating system. It is possible to parameterize for each of these messages whether or not it shall be held when the cause of the error ceases to exist. Held messages only end after they have been accepted.

11.1.2 System Module

Board assignment

Board type

When the documentation on hand was printed, the following gas-net board types were available to be installed in a gas-net M1 device:

- EXMFE5, multi-functional explosion-proof input board, for instance for the process connection of the correction function (gas meter, pressure and temperature sensors). A further possibility is to connect p and T sensors the measurements of which shall be logged (as data logger replacement).
- EXDE6, explosion-proof input board with 6 message/pulse inputs
- MFA8 and MFA6, multi-functional output boards for the output of messages, quantity-proportional pulses and measurements.
- MFE11, multi-functional input board with 8 message/pulse inputs and 3 analog inputs.
- AE12, input board with 12 analog inputs.

- DA12, digital output board with 12 output channels for the output of messages and pulses.
- LMFA7, digital output board with 3 message/pulse outputs, 4 analog outputs and a fiber-optics process connection for an external I/O expansion.
- MSER2, serial 2-channel process board.

Important: The parameter data record imported into the device has to correspond with the physically existing boards regarding the board assignment.

The parameter description of the individual input and output channels does not depend on the type of the *board* providing the channel. It is rather the type of the *input* that determines the parameters necessary for describing the channel. Therefore, the following parameter listing is sorted on channel types and not on board types.

Note: Some input or output channels may be used in different operating modes.

Setting for all channel types:

Channel name

The names of input and output channels serve to identify them and are indicated for instance on the device display.

++ Message input

inverted no/yes

The standard setting for message inputs is *not inverted*. In this case the related message is regarded as being pending when the input contact is closed. You achieve the reversed evaluation by setting *inverted=yes*. In this case, the message is regarded as being pending when the input contact is open.

Cable break monitoring yes/no

If the cable break monitoring is activated, the related input value is considered disturbed in case of cable break (e.g. no cable connected).

++ Pulse input

Operating mode of channel (HF or LF)

It depends on the maximum output frequency of the pulse generator whether a pulse input of the EXMFE5 or EXDE6 board has to be configured as HF or LF input; up to an output frequency of 2 Hz LF is set, whereas an output frequency between 2 Hz and 5 kHz is regarded as HF.

The pulse inputs of an MFE11 board are automatically configured as NF inputs as in this case the maximum input frequency is 20 Hz.

Unit of value (only in case of pulse inputs)

The physical unit of the count value coming in via the pulse channel is set via the *Unit of value* parameter.

You have to select m^3 as physical unit for pulse inputs that are used as gas meter inputs for corrections performed inside the device.

cp value (number of pulses per cubic meter)

The cp value indicates the number of pulses generated by the relevant pulse generator per unit. In case of a gas meter in pulse technique this is the number of pulses generated by the gas meter per flown cubic meter of gas.

Cable break monitoring yes/no

An EXMFE5 or EXDE6 pulse input is able to physically detect a cable break. If the cable break monitoring signals a cable break, the related input value is considered disturbed.

++ Encoder input (possible operating mode for EXMFE5 and EXDE6, channel 1)Maximum number of communication errors

The maximum number of permissible communication errors defines how often the data communication between a gas meter that can be read out electronically and a gas-net device may fail in a row. If this number is exceeded during operation, the input value is regarded as being disturbed.

cp value

If an encoder totalizer is connected, the cp value indicates by how much the last drum of the gas meter's mechanical totalizer has incremented per flown cubic meter. In other words: $1/cp$ determines the value of the last position of the mechanical totalizer (in m^3).

++ Analog input (current)Operating mode of the channel

The operating mode of the channel denotes the current range to which the sensor maps the measuring range: 0..20 mA or 4..20 mA. The analog input of an EXMFE5 board is always a 4..20 mA input.

In case of an 4..20 mA input the measurement is regarded as being disturbed if the input current is below 3.8 mA or above 20.2 mA.

The upper limit value is also monitored in case of a 0..20 mA input. In this case, however, a wire breakage can of course not be detected.

Channel unit

The *Channel unit* is the physical unit of the measurement coming in via the channel.

Physical value 1 / physical value 2Current limit 1 / current limit 2

An analogously connected sensor performs a linear mapping of its measuring range to the output signal range, i.e. either to 0..20 mA or 4..20 mA.

In the parameterization of the analog input *Physical value 1* and *Physical value 2* stand for the limits of the physical measuring range whereas *Current limit 1* and *Current limit 2* stand for the corresponding current values.

For example: The lower measurement limit *pmin* is parameterized under *Physical value 1* for a pressure sensor connected via a 4..20 mA current interface. This is the measurement that corresponds to the lower output signal (4mA = current limit 1) of the pressure sensor. The upper limit of the measuring range, *pmax*, is parameterized under *Physical value 2* - that corresponds to a 20 mA-output signal of the pressure sensor (current value 2).

The current limits of analog inputs of other boards (e.g. MFE11, channels 9 to 11) can be parameterized freely between 0 and 20 mA. Please pay attention to the fact that the order has to be ascending: current limit 1 must be lower than current limit 2.

++ HART input

(possible operating mode for EXMFE5, channel 5, max. 4 HART sensors)

Parameters for each of the up to 4 HART sensors being connected:

used yes/no

The parameter structure offers four HART addresses 1..4 for one HART input channel as only sensors with these polling addresses can be connected. The address assignment must, of course, be clear and correspond to the addresses adjusted in the sensors.

Selecting *used=no* deactivates a particular address in the parameterization of the gas-net device.

Unit of the value

The *Unit of the value* is the physical unit of the measured variable coming in via the HART channel.

upper limit value / lower limit value

The physical final value of the measured variable is directly supplied via HART protocol.

The upper and lower limit values determine the sensor's measuring range.

The device may also monitor the measurement supplied via HART protocol for a violation of these limit values (see below).

Check limit values yes/no

If a HART measurement is monitored for the violation of limit values, it is regarded as being disturbed when it falls below the lower or exceeds the upper limit value.

++ Resistance input (EXMFE5, channel 4)

The resistance input on the EXMFE5 board (channel 4) is used for connecting a Pt100 temperature sensor. The evaluation of the input signal is determined by the Pt100 characteristic that is defined in the parameterization by three value pairs (temperature in °C / resistance in Ω). The standard setting consists of the three value pairs ($-187.44^{\circ}\text{C} / 24.8 \Omega$), ($0^{\circ}\text{C} / 100 \Omega$) and ($61.97^{\circ}\text{C} / 124 \Omega$) and is based on the calculation according to the Pt100 characteristic to DIN EN 60751.

If a calibration of the temperature sensor is desired in the course of a recalibration measure, the temperature characteristic can be adjusted by specifying three suitable measured value pairs (temperature in °C / resistance in Ω).

++ Message output

Please pay attention to the fact that the first channel of an MFA8 or MFA6 and the first digital output on an LMFA7 react like relay outputs and are thus closed when the device is de-energized. These outputs can only be operated in the *Message output* operating mode and are thus not suitable for the output of pulses.

Operating mode:

- *contact opens upon message*
- *contact closes upon message*

Assignment:

For the assignment of a message output all messages are offered which are available depending on the respective parameterization.

Output only if

Reverse output condition

The output of a message may be made conditional on another message. This condition / message can additionally be reversed.

++ Pulse output

Pulse value

The *Pulse value* defines how many output pulses will be generated per volume, energy or mass unit.

Pulse width

Parameterize the length of the pulses to be output with *Pulse width*. As the ratio between pulse and interpulse period is always 1:1, the pulse width also determines the maximum output frequency.

Generate H700 (yes/no)

When parameterizing pulse outputs, you define a pulse value and the pulse width (and thus the maximum output frequency, see above). If the number of volume pulses to be output exceeds the maximum output frequency, the gas-net device retains up to 1,000 pulses. These pulses will be output as soon as possible.

Only if this pulse buffer is also full, further pulses to be output will be dismissed. In case of a flow computer, this situation is indicated by hint H700 *Pulse buffer overflow*. In case of a monitoring unit this hint exists as well, but is called H1007. The hint *Pulse buffer overflow* will only be generated if the parameter *generate H700* has been set to *yes*. Setting *generate H700 = no* deactivates the generation of hint H700 (or H1007, respectively) for this output.

Assignment

All count values available within the system may be assigned to the pulse output.

Output only ifReverse output condition

The output of a message may be made conditional on another message. This condition / message can additionally be reversed.

++ Analog outputCurrent limit 1 / Physical value 1Current limit 2 / Physical value 2

The *lower Physical value 1... Physical value 2* interval specifies the measuring range which is output via the analog output. Physical value 1 is mapped on the parameterized *Current limit 1* whereas the physical value 2 is mapped on the parameterized *Current limit 2*. A straight-line interpolation is carried out in-between.

The parameters *Current limit 1* and *Current limit 2* can be parameterized with any value between 0 and 20 mA.

generate H706/710 (yes/no)

Hints H706 and H710 are usually generated by flow computers when the current output value calculated on the basis of the current measurement cannot be output because it is outside the range of the lower and upper current limits. In case of a monitoring unit, these hints exist as well but are numbered H1008 and H1009.

However, these hints will only be generated if *generate H706/710* is set to *yes*. Setting *H706/710 = no* deactivates the hint generation.

Assignment:

All measurements available within the system may be assigned to an analog output.

Output only ifReverse output condition

The output of a message may be made conditional on another message. This condition / message can additionally be reversed. If the output condition does not apply, the parameterized lower current limit will be output instead of the calculated value.

++ Protocol channelOperating mode (channel type)

When creating a protocol channel you have to select the operating mode:

1. If the protocol channel shall be used as serial channel for connecting a host computer (gateway functionality), the *serial channel* operating mode must be selected. In this case only the channel name is parameterizable here. All other specifications (protocol type, etc.) are to be made in the *Data Exchange* module. The *serial channel* operating mode must also be selected if a GPS receiver for time synchronization shall be connected.
2. If an ultrasonic flow gas meter of Instromet shall be connected to this channel, you have to select *Q.Sonic* as operating mode. In this case the following parameters may be set in addition to the channel's name:

Maximum number of communication errors

The maximum number of permissible communication errors defines how often the data communication between the gas meter and gas-net device may fail in a row. If this number is exceeded during operation, the input value is regarded as being disturbed.

Hysteresis for flow reversal

A Q.Sonic gas meter may be flown through in two flow directions. The flow direction information can be directly deduced from the protocol. In this case it may happen that a fluttering flow reversal is performed for the correction totalizers due to fluctuations of the gas column, even if the station is actually standing still. In order to prevent this misleading reaction, a hysteresis flow may be defined. If the current flow falls below this hysteresis flow, the flow direction will no longer be reversed.

3. For the connection of a FLOWSIC ultrasonic gas meter of SICK/MAIHAK the *FLOWSIC* operating mode has to be selected for the protocol channel.

Slave ID

The slave ID is the bus address of the gas meter for communicating with the gas-net device.

Maximum number of communication errors

The maximum number of permissible communication errors defines how often the data communication between the gas meter and gas-net device may fail in a

row. If this number is exceeded during operation, the input value is regarded as being disturbed.

Parameters

+ Interface configuration

DSfG bus exists / Serial interface exists / TCP/IP interface exists

Each M1 may be equipped with up to two of the three optional digital interfaces DSfG, serial interface COM2 and TCP/IP.

Note: It is important to correctly parameterize which of these interfaces actually exist; otherwise the device rejects the parameterization.

+ General parameters

Parameterization editor

Lock 1

Lock 2

The *User lock* consists of one numerical lock for each of the two contract parties. The locks are optional. Open locks allow the user to access specific parameters or actions that can be edited directly at the device.

Plant signature

The *Plant signature* is the character string that clearly tells the measuring point apart from all the others. For instance, the archive data is clearly assigned to a device with the plant signature.

Units for energy, upper heating value, power, density

The units of the physical values energy, upper heating value, power and density are separately adjustable:

- energy in kWh, MJ, GJ or BTU
- upper heating value in kWh/m³, MJ/m³, GJ/m³, BTU/scf, kcal/m³
- power in kW, MJ/h, GJ/h or BTU/h
- density in kg/m³ or lb/scf

If you change the unit selection in GW-GNET+, the units of the dependent variables will change automatically.

Do not filter HF pulses yes/no

In case of a pulse input the device software always applies a smoothing filter algorithm to the incoming pulses to be able to calculate a flow that does not fluctuate too much. This is particularly necessary for downstream controls or other procedures, such as the Qmin monitoring of the *Correction* modules.

This smoothing function may be switched off for all HF pulse inputs (do not filter HF pulses = no) for testing purposes.

Billing interval

The billing interval determines the data logging rhythm of the *Billing archive* (for gas-net flow computers only).

+ DSfGOperating mode

The *Operating mode* determines the transmission speed on the DSfG bus.

The M1 supports the following operating modes:

0	9600 baud
1	19200 baud
2	38400 baud
3	57600 baud
7	115200 baud

General polling time (in master operation only)First general polling after.. (in master operation only)

If the EADR '_' has been assigned to one of the device entities, this entity represents the bus master within the bus communication. The *general polling time* then defines, at which intervals (specified in minutes) a cyclic general polling is performed. A general polling is a multi-address call of the master to all connected entities to update the station listing.

In addition, a period of time is indicated explicitly, after which the first general polling shall be carried out after start-up.

Ts (in bit times)

The Ts transport timeout time is always set to 240,000 bit times. This value should only be changed for special applications; please contact Elster before.

Permit timesynch telegrams yes/no

Permit timesynch telegrams yes/no must be set to yes if the device shall accept incoming DSfG timesynch telegrams.

Send timesynch telegrams yes/no

Explicitly define via *Send timesynch telegrams yes/no* whether or not timesynch telegrams shall be sent to all other DSfG bus stations, too.

Synch telegrams every ... minutes

This parameter determines at which intervals synch telegrams shall be sent to the DSfG bus. We recommend setting intervals of at least 20 minutes.

Prevent synch via DSfG at the full hour yes/no

To reduce the load of the DSfG bus at the full hour, set the *Prevent synch via DSfG at the full hour* parameter to *yes*. This delays the synch telegrams being generated at the full hour.

++ DSfG entityEADR correction 1/2/3EADR data loggingEADR monitoringEADR integrated RDT

EADR is the address by which a station identifies itself in the DSfG bus traffic.

Bus addresses are the upper case letters A to Z and some special characters. Without a clear address assignment a faultless data communication is impossible.

Each bus station must receive an unambiguous bus address (*EADR*).

Data with CRC (yes/no)CRC start value

The CRC start value is the initial value for a check sum calculation according to the CRC polynomial. This procedure serves to control the data transmission.

The setting *Data with CRC = no* switches the check sum calculation off.

Routing I telegrams yes/noRouting L telegrams yes/noRouting W telegrams yes/noRouting H telegrams yes/noRouting P telegrams yes/no

The parameterization of the gas-net device explicitly defines the types of attention telegrams to be routed to the DSfG bus.

Please refer to Footnote 13 on page 5-42 for the meaning of the different telegram types.

+ Time synchronization

Daily archives at ... (gas day beginning)

Daily archives at ... (gas day beginning) defines at which change of the hour the data is entered in the archives every day.

Daylight savings time (none / Central European Time CET)

If the *Daylight savings time* parameter is set to *none*, it is not possible to switch between winter and summer or daylight savings time. *CET* stands for the EU regulations concerning the daylight savings time: On the last Sunday of March the time is set to daylight savings time; on the last Sunday in October it is set back.

Time zone

Specify the time zone of the station in which the device to be parameterized is installed. The time zone is indicated as deviation from GMT (Greenwich Mean Time).

TCP/IP socket for NTP

IP address NTP server

If the device is equipped with a TCP/IP connection and an NTP server can be reached within the network, it is also possible to synchronize via NTP (Network Time Protocol). The TCP/IP socket and IP address of the NTP server must then be specified.

Ser. channel for GPS

If the time shall be synchronized via GPS, a GPS receiver is connected to a free channel of an MSER board. This channel must be assigned to the *Ser. channel for GPS* parameter. The GPS protocol's baud rate usually is 4800 baud, 8 data bits, 1 stop bit, no parity (default settings).

Timesynch interval

It is possible to assign a timesynch signal to a message output, with the signal being set at regular intervals. This interval is defined by the *Timesynch interval* parameter.

external synchronization

Time zone information

A synchronization of the internal device time may also be performed by means of an external data source. When using this option, you should deactivate all other possible time sources in the parameterization.

The time information may be delivered either in Unix format or as individual values. In the first case, you only have to choose the data source of the Unix time; for instance, an import value via a communication channel.

In the second case, you have to specify the data source for each individual time datum (year, month, day, hour, minute, second). It must be ensured that the individual dates are always updated at the same time.

It is also possible to perform a summer time/winter time switch in this way. For this, a bit string must be available that supplies the time zone information on bit position 0 (0=winter time, 1=summer time) and an announcement bit to be set one hour before a switch on bit position 1. This bit string is assigned under time zone information in the *System* module.

Show main display after ... (minutes)

If the parameter *Show main display after ... (minutes)* is set to 0, there is no automatic switching back to the basic display during operation. Nevertheless, the display's background illumination switches off automatically after 30 minutes.

If the parameter *Show main display after ... (minutes)* is set to a value unequal 0 and the user switch is closed, the basic display will be invoked automatically after the parameterized duration. At the same time, the display's background illumination is switched off. In case of an opened user switch, there is no switching back of the display and no switching off of the display's background illumination.

+ TCP/IP

IP address

Subnet mask

Gateway address

Name socket 1..3

The IP address of the gas-net device and the related subnet mask and gateway address have to be specified for TCP/IP communication.

Three sockets are available and may be used for different purposes. For instance, if the device is equipped with a *Data Exchange* module, one of these sockets may be used for a Modbus/TCP channel. It is advisable to name the three sockets unambiguously for an easier identification later on.

11.1.3 *Data Logging* Module

The *Data logging* module provides the integrated data logging function. The data being logged in this module has been generated by other modules of the module group.

When parameterizing the *Data Logging* module, you only have to define which of the available archive groups shall actually be logged and which storage depth shall be applicable.

Attention:

A re-parameterization of the archive structure requires the deletion of all old archives existing in the device!

+ Archive group <number>

Assignment

All assignments possible for an archive group are offered under *Assignment*. The assignment possibilities depend on the module composition of the gas-net device in each individual case.

Archive depth

All archives are designed as ring storage. The archive depth defines the number of entries an archive is able to write at most. If an archive is full, the respective oldest entry will be overwritten by each new entry.

11.1.4 *Integrated RDT Module*

+ General parameters

Connection type

Select *RDT disconnected* if the RDT shall not be used. *Modem* means that the public telephone network shall be used via a dial-up or wireless modem for data communication. The modem is connected to the serial interface (COM2) in this case.

Serial direct connection or *Null modem* is the operating mode in which the gas-net device and host computer are directly connected by means of a special null-modem cable at COM2.

Select the *TCP* connection type if the RDT uses a network connection.

Use serial port

If you select *Modem* or *Serial direct connection*, the COM2 interface is the only option for the RDT functionality; choose one of the three available TCP sockets for a connection via TCP/IP.

Bus identifier

The *Bus identifier* is the unambiguous designation (data unit) by means of which the DSfG bus identifies itself towards the center.

+ RDT parameters

Extension grade

The DSfG specification has been continuously developed further. The extension grade defines the standard version to be supported (extension grade 0: older version / extension grade1: later version). Further extension grades are possible in the future. The extension grade to be parameterized must be coordinated with the center, as for instance the login procedure also differs slightly.

Answer delay (seconds) (only for the *Modem* connection type)

The *Answer delay (seconds)* defines the time that is supposed to elapse between the arrival of a call at the integrated RDT and its acceptance.

If you don't accept the standard setting here, pay attention to the timeout times of the center.

max. quantity of call attempts (only for the *Modem* connection type)Call delay times between individual call attempts (only for the *Modem* connection type)

The *maximum quantity of call attempts* defines the number of call attempts made by the integrated RDT if a connection has not been established immediately. You may also parameterize the call delay times in-between.

The call delay time stays the same after the fifth call attempt, i.e. until the maximum quantity of call attempts has been reached.

Call delay time after max. quantity of call attempts (long-term block)

(only for the *Modem* connection type)

The *Long-term block* is the call delay time after the maximum quantity of call attempts has been reached. It will rarely be activated, as many call attempts must have failed before.

It is generally preset with a duration of 7200 seconds, i.e. 2 hours, and is thus much longer than the other call delay times (this is why it is called *long-term block*).

The reason for the call, i.e. the telegram that triggers the call, is dismissed during a pending long-term block. All attention telegrams that occur in the meantime and must normally be routed according to the RDT's parameterization are also rejected during the long-term block.

Telephone number for time query (only for the *Modem* connection type)

If the phone number for the telephone time query has been parameterized, the integrated RDT will call this number at calculated points of time to collect the time standard. The internal device time can be synchronized with this time information.

This option is deactivated if no telephone number has been specified.

Preset PIN?PIN

The parameters *Preset PIN* and *PIN* are only relevant if a GSM wireless modem is connected. *Preset PIN* must be set to *yes* if the chip card belonging to the modem has a PIN number. In this case, the PIN number itself must also be parameterized for a successful connection.

Single numbering scheme (yes/no)

There are different services that are provided via mobile network (telephony, fax and data service). To deal with these various services, different providers are embarking on different communication strategies.

It is possible that the provider offers an own telephone number for each of these services. In that case, you have to set the parameter *single numbering scheme* to *no*. Please make sure, that the RDT uses the correct number, i.e. the number for the data service.

The other method is called single numbering scheme and uses for all services the same number. In that case, please select the setting *single numbering scheme = yes*. Whether your provider uses the so-called single numbering scheme or not, may be checked up in the contract. Please ask your provider if you are not sure.

Null modem baud rate (only for null-modem operation)

Handshake in case of null modem (only for null-modem operation)

The special parameters needed for a null-modem operation, i.e. the *Baud rate* (transmission speed) and *Handshake in case of null modem yes/no*, have to be coordinated with the center.

TCP Source Port (only for the *TCP* connection type)

The *TCP Source Port* is the TCP port via which the center connects the call. Usually, port 8000 is used as standard. (The device's IP address is defined in the TCP/IP settings of the *System* module.) For the call connection to be successful, the device's IP address and the port must be known in the center.

TCP connection timeout (only for the *TCP* connection type)

The *TCP connection timeout* is the time in seconds after which the connection attempt shall be aborted. A useful specification heavily depends on the network used. When it's quite a distance, it may take some time until a connection attempt is successful. A value of 20 seconds is specified as default value; in general, this should be long enough.

+ Stations 1..4 (for up to 4 centers)

Center identifier

The *Center identifier* is the data unit via which the center identifies itself during a call connection.

The center identifier facilitates together with the *Bus identifier* (see above) a check of the access authorization during call connections.

Phone number centre (only for the *Modem* connection type)

The telephone number of the center. This phone number is required when a call to the center shall be triggered in case special attention telegrams occur in the DSfG communication.

alternative phone number centre (only for the *Modem* connection type)

It is possible to specify a second (alternative) phone number for the centre. If a number cannot be reached (e.g. because the line is busy), the RDT entity will try to call the centre via the alternative number.

DSfG stations at the busAttention telegram masks

Attention telegram masks indicate in form of a table in case of which attention telegrams of which DSfG stations the center shall be called.

Routing masks can be defined for all bus addresses selected under *DSfG stations at the bus*. Only those bus addresses are important for the RDT's mode of operation that actually exist during operation.

TCP target port / TCP target address (only for the *TCP* connection type)

The *TCP target port* is the port via which the connection to the center shall be set up.

The *TCP target address* is the IP address under which the center is reachable.

+ ModemModem name

The *Modem name* defines the connected modem. All other modem settings (call commands, etc.) are fixed, depending on the selected modem.

Maximum time till online

The *Maximum time till online* parameter defines a monitoring time for the connection of the modems. If this maximum time is exceeded, the connection set-up or the momentary call will be aborted. The *Maximum time till online* parameter is preset with a standard value, depending on the modem type.

11.1.5 Counters Module

+ CountersName

The name of a counter serves to identify it. We recommend using unambiguous names to simplify the allocation on other occasions, for instance when defining totalizing counters.

Input units

Counters may count different physical values; therefore the units for count value and flow rate must be specified in the definition of a counter.

Totalizer

Choose the totalizer source here.

This may be a transmitter directly connected to the device (encoder totalizer, Q.Sonic ultrasonic gas meter, FLOWSIC ultrasonic gas meter or a totalizer via pulse input) or a count value coming in from an external source via digital protocol (e.g. via DSfG or MODBUS).

If no totalizer is available, it is also possible to just indicate a flow rate input value (see below). In this case, the count value is determined based on the flow rate.

Totalizer fractional parts (only relevant in case of an external totalizer source)

Via some protocols, totalizers are supplied divided in digits to the left and right of the decimal point; for instance, flow computer totalizers via DSfG protocol. In such a case it is possible to specify the source of the digits to the right of the decimal point in the parameterization of a totalizer. These will then be considered when intercalating the totalizer or in case of corrected totalizers.

Flow rate input

The source that supplies the flow rate.

If a totalizer source has been determined (see above), the specification of an additional flow rate source is optional. In this case the flow rate is used for monitoring Q_{min} in case of intercalated totalizers and is possibly included in the creation of total flow rates for totalizing counters.

Only if no totalizer is available, the count value of a counter will be derived from the incoming flow rate.

Disturbance information

Signal indicating that the totalizer input value is *disturbed*. If the error message is pending, the counter and any totalizing counter that is influenced by this counter are marked as being disturbed.

Correction type

Use conversion factor

The target value of a totalizer may be the same as the input value. This means that the totalizer input data is not multiplied by a factor to create the counter to be defined. It is possible to multiply volumes by a *conversion factor*. For instance, a counter for the base volume, energy or mass can be created based on the input value of the volume at operating conditions. A base volume input can be used to create an energy or mass totalizer.

The following table shows useful combinations:

Input value	Target value	Internal conversion	k-ratio calculation method
V or Q	V	$V_b \cdot Z$	k=const or SGERG
	E	$V_b \cdot Z \cdot H_s$	k=const or SGERG
	m	$V_b \cdot Z \cdot \rho$	k=const or SGERG
V or Q	E	$V \cdot H_s$	No correction
	m	$V \cdot \rho$	No correction

The multiplication factor is allocated together with a *conversion factor* parameterized separately (see below). The definition of a conversion factor contains all necessary specifications for the multiplication to be performed (correction method, sources for pressure and temperature, as well as fixed values for required gas quality data).

Important: The user is responsible for choosing an input value with a suitable unit for the desired target value. The parameterization program is not able to check the congruence here!

max. time without communication

This parameter is only relevant if the totalizer input value is supplied via a digital protocol. If the communication timeout has been exceeded, the original totalizer is regarded as being disturbed.

The *maximum time without communication* should always be longer than the job timeout of the data generating source!

The monitoring can be switched off by setting the *maximum time without communication* = 0.

Important: In case of a counter being created from a pulse input the *maximum time without communication* must be set to 0!

A counter which is intercalated between two incoming protocols due to the currently calculated change rate will be stopped in case of a communication timeout. As soon as the next valid totalizer arrives, it will be transferred to the intercalated totalizer. (The intercalation of the totalizer is started anew as soon as a second valid value has arrived.) If the counter influences a totalizing counter, the difference between these two totalizers will be rejected for creating the total.

Max. flow rate

If an original totalizer is supplied by an external source via digital protocol, a totalizer difference which has been caused by setting the totalizers can principally not be distinguished from a true totalizer increment.

However, there is one criterion for checking the plausibility of the original totalizer:

A maximum flow rate Q_{max} can be defined via the parameterization of a counter. This maximum flow rate must not be exceeded by the original totalizer. An implausible totalizer increment which violates the defined maximum flow rate is interpreted as setting. The new totalizer is transferred. The difference, however, is rejected, in particular in case of totalizing counters being influenced by the counter. The intercalation of the counter will be stopped until a new change rate can be calculated and used after another valid totalizer has arrived.

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

The setting *Max. flow rate = 0* stops the monitoring.

Important: In case of a counter being created from a pulse input the *Max. flow rate* must be set to 0!

Number of digits

The *Number of digits* defines the number of digits to the left of the decimal point of the counter. It should be the same as the number of digits to the left of the decimal point of the mechanical totalizer in case the original totalizer is transferred digitally.

The number of digits to the right of the decimal point is not parameterizable and is always 3.

Way of creating totalizers (create own totalizer / transfer totalizer from source)

If the original totalizer is transferred digitally, it is possible to either transfer the original totalizer to the counter or to create an own totalizer. Self-created totalizers can be set via the data interface and GW-GNET+ when the user locks are open.

Intercalate totalizer yes/no

The *Intercalate totalizer yes/no* parameter is only released for editing if the communication timeout (*Max. time without communication*, see above) is unequal 0 as this means that the input value of the counter is supplied via a digital protocol. If, for example, the totalizer information arrives at intervals of 10 seconds, it may be useful to intercalate the totalizer. This procedure determines an average change rate based on the last two telegrams that is continuously added to the counter. As soon as the next totalizer arrives, the change rate is calculated anew. This way the difference

between created totalizer and original totalizer will be balanced in the course of time. For further information on the intercalation of totalizers please refer to Section 5.5.1.2.

DSfG counter type

DSfG representation of counter

The totalizers and flow rates of up to 25 counters can be queried via DSfG by means of the data element branch *fda*.

In order to clearly define the allocation you have to set the meaning of the counter (*mapping to...V, Vn, E or m*) under *DSfG counter type*. This determines the 5th letter of the data element address. The *DSfG representation of counter* which needs to be specified (between 1 and 25) determines the 4th letter of the data element address of the counter. Only if these two specifications are available, a gas meter can be queried via the related DSfG data elements.

If a meter shall not be queried via DSfG, leave the presetting at *DSfG counter type=no mapping*.

+ Totalizing counters

Name

The name of a totalizing counter serves to identify it, e.g. on the device display.

Unit of sums

The physical units of the counters and flow rates that shall be included in the totalizing counter are to be specified here.

Hold on disturbance yes/no

A totalizing counter is regarded as being disturbed if at least one of the counters influencing the totalizing counter is disturbed.

The reaction of a totalizing counter in case of a disturbance is parameterizable: It can either stop or continue to use all totalizer information coming in despite the disturbance for increasing the totalizing counter.

Number of digits

The *Number of digits* defines the number of digits to the left of the decimal point of the counter.

The number of digits to the right of the decimal point is not parameterizable and is always 3.

DSfG counter type

DSfG representation of counter

The totalizers and flow rates of up to 25 counters can be queried via DSfG by means of the data element branch *fda*.

In order to clearly define the allocation you have to set the meaning of the counter (*mapping to...V, Vn, E or m*) under *DSfG counter type*. This determines the 5th letter of

the data element address. The *DSfG representation of counter* which needs to be specified (between 1 and 25) determines the 4th letter of the data element address of the counter. Only if these two specifications are available, a gas meter can be queried via the related DSfG data elements.

If a meter shall not be queried via DSfG, leave the presetting at *DSfG counter type=no mapping*.

Signs 1 to 10 (+ or -)

Each addend of a totalizing counter may be added with a positive or negative sign. It is important to make sure that the overall increment of the totalizing counter is physically useful, i.e. usually positive. (Please refer to page 5-54 on how to deal with transient negative quantities.)

Counters 1 to 10

Choose those counters under *Counters 1 to 10* that shall be added by the totalizing counter. All counters being available according to the current state of the parameterization are offered for selection.

+ **Conversion factors**

A counter with a *Volume* input value is able to perform a multiplication by using a *conversion factor*. This way, a counter can be created for the base volume, energy or mass based on the input value of the volume at operating conditions. A base volume input can be used for creating an energy or mass totalizer.

The definition of a conversion factor contains all data necessary for the multiplication to be performed (correction method, sources for pressure and temperature, as well as fixed values for the required gas quality data).

Name

The name serves to identify the conversion factor.

Under this name, the conversion factor may be assigned to one or several counters.

Pressure, Temperature (only if the correction has been activated)

The sources for the measurements for pressure and temperature must be specified if the input count value shall be corrected, i.e. if the Z-factor influences the factor for creating the counter. This is the case if the input value is V and the target value of the counter is Vn, m or E.

k-ratio calculation method

The following k-ratio calculation methods are available for the correction of a V input totalizer:

- *k=const*; additionally required data: constant k-ratio
- *SGERG-88 with H2=0*; additionally required data: Hs, Rho, CO2

The option *No correction* must be selected if the input value is already the base volume and the target value of the counter is E or m.

11.1.6 *DSfG* Module

The *DSfG* module is responsible for controlling the *DSfG* side of the communication between host and gas-net M1.

The parameterization defines the data to be polled on the part of the *DSfG* bus. The data being collected through *DSfG* queries is converted into individual data points by the *DSfG* module. These data points are made available as export values to the *Data Exchange* module, if necessary after a format conversion.

In addition, setting telegrams towards *DSfG* can be defined.

Due to the subject's complexity we refer to the corresponding separate document or GW-GNET+ online help for the parameter description of the *DSfG* module.

11.1.7 *Data Exchange* Module

The *Data Exchange* module controls the host side of the gateway functionality.

All data points that are available during operation (e.g. through *DSfG* data element queries, see above) and shall be routed to a host must be positioned on registers or data blocks/data words for the host. Depending on the data type, it is also possible to scale the value in a suitable way before routing it.

Due to the subject's complexity we refer to the corresponding separate document or GW-GNET+ online help for the parameter description of the *Data Exchange* module.

11.2 Error Listing: System Messages

The M1 device generates hints with fixed message numbers in case of certain system events. These hints are also entered in the logbook of the *Monitoring* module, which can be logged by the *Data Logging* module.

H1001 Re-start performed

The hint *Re-start performed* is generated after a software update. If this message occurs during normal operation, however, a software problem has occurred in the device. In this case a faultless operation of the device is no longer guaranteed.

H1002 Supply voltage failure

The M1 device generates the *Supply Voltage Failure* hint in case of a mains failure. It is pending until the device starts up again after the mains has returned.

H1003 New parameterization

Each time a complete parameterization is imported the *New parameterization* hint is generated.

H1004 Parameter changed

Hint H1004 is generated if one or several individual parameters of the *Monitoring* module are changed via the GW-GNET+ option *Change parameters* during a direct connection to the device.

H1005 M-switch open

The *M-switch* is used for suppressing group and/or centralized messages during maintenance. Hint H1005 is generated if the M-switch function has been enabled.

H1006 Interface monitoring

If the *Interface monitoring* hint is pending, the device software is not able to recognize an interface or a board. This occurs, for example, if a board is defective. A faultless operation of the device is no longer guaranteed.

H1007 Pulse buffer overflow

The parameterization of the pulse outputs defines a pulse value as well as a maximum output frequency. If more volume pulses come in than can be output with the maximum output frequency, the M1 will retain up to 1000 pulses. These pulses are output as soon as possible.

Only if this pulse buffer is full, too, further incoming pulses are rejected. This situation is indicated by hint H1007 Pulse buffer overflow.

Note: In order to avoid that pulses are lost, you should make sure during the parameterization that the pulse value and maximum output frequency are in correct proportion to the maximum flow.

H1008 lower hint limit output**H1009 upper hint limit output**

Pending hints H1008 and H1009 indicate an error in the parameterization of an analog output. The output range was probably set larger by the limit values than the measuring range of the measured variable to be output actually is. If, for example, the pressure range of an analog input is 14..70 bar and an analog output for the corresponding measurement is parameterized to a range of 14..50 bar, the *upper limit value output* hint will be generated, if the pressure rises higher than 50 bar.

H1111 Clock set old**H1112 Clock set new**

Each time the internal device time is adjusted by more than ± 20 seconds or by $\pm 3\%$ of the billing interval (parameter of the system module), two hints will be generated. This way you may see by how much time the clock has been adjusted.

H1113 User switch open

An opening of the user switch is marked by hint H1113. If the user switch is open, it is possible to adjust all parameters by means of a PC and the GAS-WORKS software. In case of an open user switch only, it is possible to transfer a complete new parameterization via PC and GW-GNET+ into the device. By opening the user switch you open the user locks as well (see below).

H1114 User lock open

The *User lock* consists of one numerical lock for each of the two contract parties. The locks are optional and are defined via the device parameterization. They are opened and closed via a special operator panel menu. The *User lock open* hint is generated if all defined locks are open.

Open locks facilitate an access to special parameters or actions – either via the operator panel of the device or by means of GAS-WORKS via the data interface.



H1115 Process value archive 1 frozen**H1116 Process value archive 2 frozen****H1117 Process value archive 3 frozen****H1118 Process value archive 4 frozen**

The *Monitoring* module can create up to 4 process value archives.

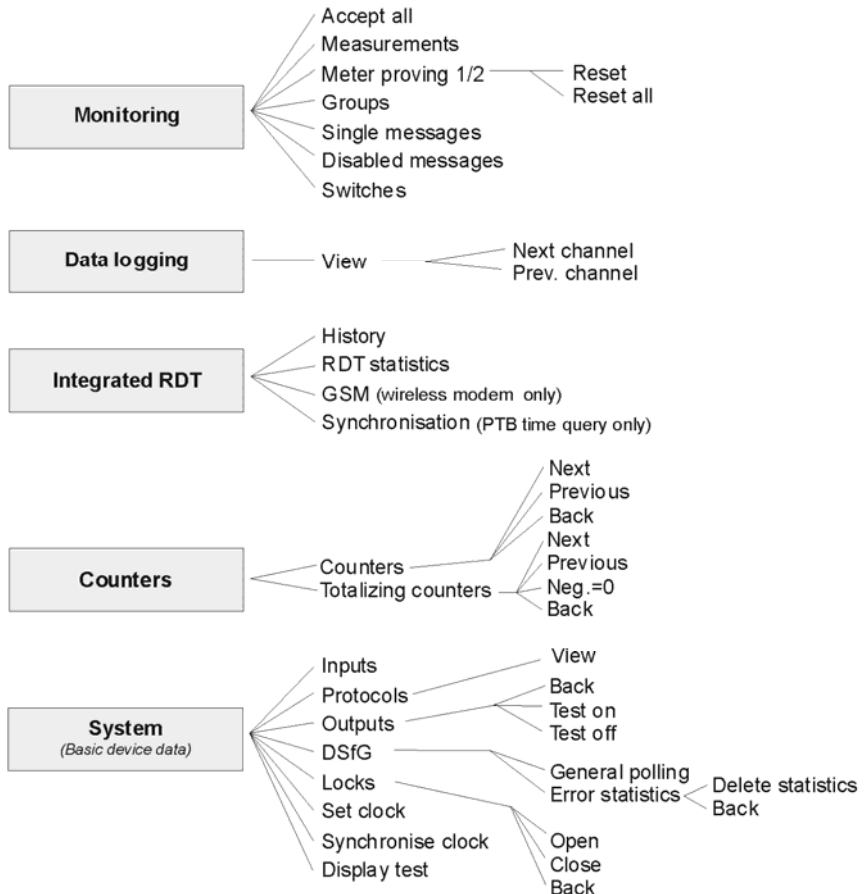
These process value archives can be frozen. This means that as soon as an assigned message begins the archive only keeps logging until it has logged the parameterized number of entries. After that it stops data logging. The data logging is not continued until the assigned message has ended.

Beginning and end of such a freeze condition are marked by the hints *PVA <no.> frozen begins / ends* in the logbook and error listing of the *Monitoring* module.

11.3 Menu Structure

Within the main display of a module, you may open the listing of the subordinate menu items by pressing the menu button . By pressing the button  again, the menu with the listing of all available modules is opened.

Modules:



Menu items for functionalities that are not parameterised are not displayed at the device.

Note: The modules **DSfG(-Requester)** and **Data exchange** (Host communication) for the gateway functionality are not listed in the menu overview shown above. The corresponding displays are meant for diagnosis by experts only.

12 Bibliography

- DIN EN 50014, DIN EN 50020 and DIN EN 50029
- DIN 19 235: Measurement and control; signaling of operating conditions

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