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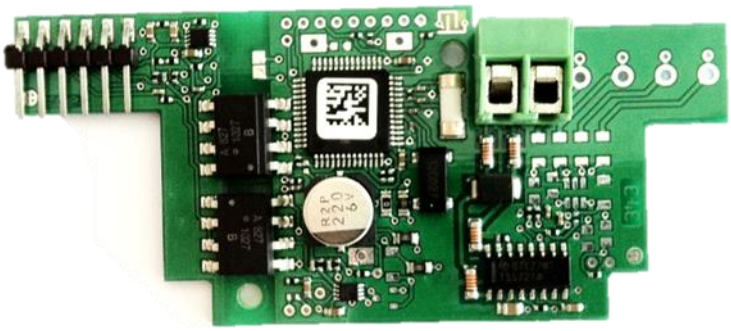
G4 M-Bus-Modul G4



Interface description

TKB3448_d EN
Datum: March 2017
Landis+Gyr GmbH

Contents

1 Changes

Version	Date	Author	Reason for change
	09.09.2008	Reißner	Return flow temperature with decimal place (table 8)
	11.09.2008	Reißner	Decoding of the device-specific error bits in addition (appendix D)
	17.09.2008	Reißner	“Customer number” changed to “Property number”
			Duplicate C- A- and CI- fields removed (table 7, 8, 9, 10);
			Variable “Log” inserted in the calling instruction instead of the value 00h (section 6.2.7)
			Explanation amended with “Log” variable (table 11 and 12)
	20.07.2009	Reißner	1st Telegram byte of the info byte line corrected to “1Bh”
	05.02.2010	Reißner	2nd “Display all values” command removed (table 14)
	26.02.2010	Reißner	Value storage expanded with the values for NTA (table 2.6);
			NTA functionality included (miscellaneous)
	05.04.2011	Reißner	Incorrectly quoted standard 13575 corrected to 13757 (miscellaneous);
			Leakage message for UW50 added
	10.10.2013	Illenseer	Changes for Qp150 (6.2.x)
2.1	18.10.2013	Kolk	Transfer to new layout
c	11.04.2014	Illenseer	Rework of content and error correction
c1	12.01.2015	Illenseer	Added appendix D
d	March 2017	Keitel / Clausen	new layout / NTA (DSMR) removed

2 List of abbreviations

Abbreviation	Explanation
G4	4th generation M-Bus
G2	2nd generation M-Bus
MI module	M-Bus module with pulse inputs
VM	Previous month
VJ	Previous year
DIF	**D**ata **I**nformation **F**ield
DIFE	**D**ata **I**nformation **F**ield **E**xtension
VIF	**V**alue **I**nformation **F**ield
VIFE	**V**alue **I**nformation **F**ield **E**xtension
ASB	Output control byte
TelBitCode	Binary number, 128 bits in length, with which permanent values for the M-Bus output can be selected in the meter

3 Overview

3.1 Reason

Description of the L+G 4th generation M-Bus modules

- Valid for M-Bus firmware versions from: 4.01
- Applicable to meter firmware from: 5.15, 6.01, 8.01

2nd generation M-Bus modules have the following firmware versions:

- FW 2.01
- FW 2.02
- FW 2.03
- FW 2.04
- FW 2.06
- FW 2.61

4th generation M-Bus modules have the following firmware versions:

- FW 4.01: Applicable to meter firmware from: 5.15, 6.01
- FW 4.02: Applicable to meter firmware from: 5.15, 6.01
- FW 4.10: Applicable to meter firmware from: 5.15, 6.01
- FW 4.11: Applicable to meter firmware from: 5.15, 6.01
  NTA functionality added
- FW 4.19: Applicable to meter firmware from: 5.15, 6.01
  AES encryption added
- FW 4.21: Applicable to meter firmware from: 5.15, 6.01, 8.01
  UC50 support added

3.2 Documents used

[1] EN 13757-2

[2] EN 13757-3

[3] Federal Information Processing Standards Publication 197
Announcing the ADVANCED ENCRYPTION STANDARD (AES)

3.3 Versions

The modules exist as the pure M-Bus module (referred to below as the “M-Bus module”) and as the M-Bus module with two integrated pulse inputs (referred to below as the “MI module”).

The current document only concerns the M-Bus interface.
This is independent of the module variant.

3.4 Properties

- Hardware and software according to DIN EN 1434-3, EN 13757-2 and EN 13757-3
- 300 / 1200 / 2400 / 4800 / 9600 Baud transmission rates (switchable via M-Bus)
- Automatic baud rate detection (can be disabled, enabled at power on)
- Update rate in fast readout mode every 4 seconds
- Adaptive update rate in normal readout mode:
  - Every 10 seconds when meter is operated with a power supply unit
  - Every 15 minutes when the meter is under battery operation or using the power reserve of the power supply unit.
  - In Eb or Pb meter operating modes, the operating conditions of the modules are configured at the meter; the M-Bus modules are not updated in this operating mode. Update of the meter measurement values in the M-Bus module only occurs in the normal operating mode of the meter (Nb).

3.5 Operation in G2 compatibility mode

The M-Bus output is controlled here in such a way that, in normal operation (except during firmware recognition in the manufacturer-specific part) and in fast readout mode, there is no difference in the value output on the M-Bus compared with the previous modules of the 2nd generation:

Transmission of all billing-relevant data in normal operation:

property number, meter number, energy, volume, flow rate, power, flow temperature, return flow temperature, temperature difference, previous year values, maxima, operating time, missing time, measurement period, error, set day, mounting place, system time, values of last previous month

Further features

- Data telegram configurable to individual requirements
- Support of addressing using secondary address
- Mode for rapid output with reduced data telegram content
- Application reset
- Enhanced selection
- Collision detection
- M-Bus primary address can be set
- M-Bus secondary address can be set (only possible on module slot 1)
- Date and time can be set
- Switching times of the tariff clock can be set
- Direct tariff control using M-Bus command

3.6 Display in modern mode (G4 compatible)

- Flow and return flow temperatures with one decimal place
- In addition to coding in the customer-specific component status bytes, negative values are represented according to EN 13757-3 appendix B2 (“F” at MSD).
- Example: The BCD value “F00123” should be read as “-00123”
- The unit of tariff registers can be set in the meter (energy or volume)

3.7 New functions of the generation 4

- Values can also be temporarily selected from a list with selection DIFs and VIFs for the output (see section 6.1.1: value storage), which are not part of the standard output.
- Using so-called TelBitCodes (can be parameterized at the meter) from a list of 63 currently possible values (see section 6.1.1: value storage), an individually constructed form of the M-Bus output can be permanently configured.
- Adaptive update rate in normal operation
  (15 minutes / 10 seconds depending on the voltage supply of the meter)
- Readability of all previous month values
  (in groups for each previous month)
- Readability of log book info telegram
  (so that the structure of the log book data is notified for reading and subsequent interpretation)
- Readability of datalogger info telegram
  (so that the structure of the datalogger archive is notified for reading and subsequent interpretation)
- Readability of EEPROM data
  (the raw data for the log book and datalogger can be read from the meter in steps using this command)

4 Hardware connection

- The module complies with the regulations EN 1434-3, EN 13757-2 and EN 13757-3
- The MI module can only be plugged into module slot 1;
  the M-Bus module can be plugged into both module slots (1 and 2).
- The meter automatically recognizes which module has been plugged in and displays this on the LCD (after being called via the loop and stepping button).
- The bus cables are passed through a grommet in the casing of the meter and connected to the M-Bus terminals of the module. The connections are reverse polarity protected. Any shielding cable present is clamped under the corresponding bracket in the terminal compartment. The shielding cable must not be electrically connected to the meter.
- With the MI module, the pulse inputs are connected to the corresponding terminals as required. If the pulse sender is an electronic component (e.g. an open collector), care must be taken that the connection is made with the correct polarity. The wiring is done according to the operating instructions for the meter.

5 Configuration der M-Bus-Module

5.1 Standard operating modes

The parameters for the M-Bus functionality of the module are stored in the EEPROM of the meter and can be changed using the service software and in part using M-Bus commands.

When M-Bus voltage is applied, these parameters are loaded from the meter into the module and are used there to control the M-Bus operating mode and the type of data output.

5.1.1 Operating mode

- Normal readout with a variable length frame of up to 261 bytes
- Fast readout with a variable length frame with up to 8 data values

5.1.2 Type of data output

- G2 compatibility mode:
  - Outputs data in the same way as the older 2nd generation M-Bus module if the TelBitCodes in the meter are set correspondingly (factory setting)
- Enhanced G4 mode with output according to EN 13757-3 (modern output):
  - Flow and return flow temperatures with one decimal place.
  - In addition to coding in the customer-specific component status bytes, negative values are represented according to EN 13757-3 appendix B2 (“F” at MSD).
  - Yearly set day with date and time.
  - Volumes are output in the tariff registers if the meter has stored volumes there.

5.1.3 Output with fixed frame

For compatibility reasons, the M-Bus module supports the output of fixed frames according to EN 1434-3:1997. In contrast to the modules of the 2nd generation, this type of output is no longer set by jumpers but by the service software at the meter or parameterized with the M-Bus command “Set readout control byte” and saved in the EEPROM of the meter.

5.2 Additional functions of the generation 4 (G4)

In addition to the standard operating modes mentioned above, the G4 M-Bus module has further special functions available. If the module is switched into one of these special functions, this changeover is not permanently stored in the EEPROM of the meter, instead it remains volatilely stored in the RAM of the M-Bus module. The respective special function is ended by:

- Switching the M-Bus voltage off and on.
- The command “Reset operating mode” (application reset).
- Using the command “Change back into the normal or fast readout mode” (table 1.3) to return to the standard operating mode which was active before the special function.
- Parameterization of the NTA operating mode.
- Calling another special function.

- Changing the output control byte
  (value output G2- or G4-compatible or fixed frame)
- Setting or removing the user lock.
- Changing the primary or secondary address
  (secondary address not to module interface 2)

5.2.1 Output of previous month values

The command “Load previous month values in module” (table 1.3) causes the module to be switched volatilely into previous month readout mode. At the same time, the data which belongs to each of the previous month calling variables “Mon” (Mon = 1 to Mon = 60) is loaded into the module by the meter.

When the command “Data request” (REQ_UD2) is issued, the data of the previous month block is output on the M-Bus as a variable frame.

For the readout of a further previous month block, the command “Load previous month data into module” with the appropriate calling variable “Mon” and a subsequent “Data request” should be sent to the module.

Previous month readout mode is ended by one of the events described in section 5.2.

5.2.2 Readout of log book and data logger

The log book and data logger information are stored in the EEPROM of the meter in a space-saving encoded form.

Reading out the info telegram for the log book and data logger

With the command “Load info telegram into module” (table 1.3), information on the structure of the log book or data logger data and their storage location in EEPROM is read from the meter and transmitted into the module.

The “Log” byte in the command decides which info telegram should be loaded:

- Log = 00 → Info telegram for the log book
- Log = 01 → Info telegram for the data logger hourly archive
- Log = 02 → Info telegram for the data logger daily archive
- Log = 03 → Info telegram for the data logger monthly archive
- Log = 04 → Info telegram for the data logger yearly archive

With the “Data request” command, the data of the info telegram is output on the M-Bus as a variable length frame.

An appropriately programmed master can interpret this info telegram and can use the command “Load EEPROM data in module” to read the data in portions with the M-Bus module as intermediary and create from it the log book or events list of the data logger.

The info telegram mode is ended by one of the events described in section 5.2.

Reading out the EEPROM

The command “Load EEPROM data into module” is used to transmit data starting from an EEPROM address specified in the command, for the number of EEPROM bytes given in the command, up to a maximum of 228 bytes (due to the structure of the variable length frame) into the M-Bus module. If more than 228 bytes is requested, the M-Bus module truncates the output to 228 bytes.

With the “Data request” command, the data read from the EEPROM is output on the M-Bus as a variable length frame.

The EEPROM readout mode is ended by one of the events described in section 5.2.

6 Software protocol

A complete and detailed description of the M-Bus protocol is provided by the standards EN 13757-2 and EN 13757-3.

This section should therefore serve as a specific supplement in relation to telegram support and data telegram structure.

For the data telegrams with variable structure, the lengths of the data telegrams and sequence of the individual data blocks (records) within the telegram are not assured properties.

For a more detailed explanation of the above functions, see “The M-Bus: A Documentation”. This document can be obtained from the M-Bus user group (Internet: http://www.m-bus.com).

In addition to DIN EN 1434-3, the module performs the following functions:

- Secondary addressing
- Collision detection
- M-Bus primary address can be set
- M-Bus secondary address can be set (not on module slot 2)
- Date and time can be set
- Automatic baud rate detection (can be disabled)
- Enhanced selection
- Tariff switching
- Operating mode can be selected
  (normal operation or fast readout mode)
- User lock (can be set and can be removed)
- Display type can be selected
  (compatible with generation 2, compatible with generation 4, fixed frame)
- Read previous month value groups
- Read logbook info telegram
- Read data logger info telegram
- Read EEPROM raw data for evaluation of logbook and data logger

Note: As soon as the meter has been switched back into normal operation (Nb), changed M-Bus addresses and parameters are transmitted into the module via the optical interface of the meter when there is also M-Bus voltage connected.

6.1 Supported command telegrams

The supported telegrams are summarized in table 1. The newly introduced commands for the G4 M-Bus module are identified with “yes” in the column “New in G4”. If execution of a command can be prevented by the user lock being set, this is identified by “yes” in the “Lockable” column.

Internal communication with the meter is set up after commands which change the operating parameters stored in the meter (primary or secondary address, normal or fast readout, set or remove user lock, set readout control byte, set tariffs, set date and time). Only after the changed data from the meter has been read back into the module can the M-Bus module be read again. A wait time of approx. 2 seconds must be expected for this.

Master request											Slave response	New in G4	Lock-able
		C	A	CS		Remarks							
Initialization (SND_NKE)	**10h**	**40h**	**A**	**CS**	**16h**						**E5h**		
Data request (REQ_UD2)	**10h**	**5Bh/ 7Bh**	**A**	**CS**	**16h**	Data telegrams in accordance with the section “Description of data telegrams”					**See comment**		
Deselection in case of secondary addressing	**10h**	**40h**	**FDh**	**CS**	**16h**	or selection of another secondary address					**E5h**		
		C	A	CS		Remarks							
Status request (REQ_SKE)	**10h**	**49h**	**A**	**CS**	**16h**	The response **RSP_SKE** has the form **„10h 0Bh A CS 16h“**					**RSP_SKE**	yes	
		L	L		C	A	CI	CS		Remarks			
Switchover to 300 Baud	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**B8h**	**CS**	**16h**	After power-on auto. baud rate detection	**E5h**		
Switchover to 1200 Baud	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**BAh**	**CS**	**16h**	After power-on auto. baud rate detection	**E5h**		
Switchover to 2400 Baud	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**BBh**	**CS**	**16h**	After power-on auto. baud rate detection	**E5h**		
Switchover to 4800 Baud	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**BCh**	**CS**	**16h**	After power-on auto. baud rate detection	**E5h**		
Switchover to 9600 Baud	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**BDh**	**CS**	**16h**	After power-on auto. baud rate detection	**E5h**	yes	

Master request													Slave response	New in G4	Lock-able
		L	L		C	A	CI			CS		Remarks			
Switchover to fast readout mode	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A1h**	**CS**	**16h**		**E5h**		yes
Switchover to normal operation	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A0h**	**CS**	**16h**		**E5h**		yes
Set user lock	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A2h**	**CS**	**16h**		**E5h**		
Remove user lock	**68h**	**L**	**L**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**Key**	**CS**	**16h**	L ≤ 32	**E5h**		
	The key to remove the user lock can be obtained from the manufacturer on request.														
		L	L		C	A	CI			CS		Remarks			
Automatic baud rate detection enabled	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A4h**	**CS**	**16h**	Automatically enabled after Power-On	**E5h**		
Automatic baud rate detection off	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A5h**	**CS**	**16h**		**E5h**		
		L	L		C	A	CI			CS		Remarks			
Switchover to tariff 1	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**B1h**	**CS**	**16h**		**E5h**		
Switchover to tariff 2	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**B2h**	**CS**	**16h**		**E5h**		
Switchover to tariff 3	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**B3h**	**CS**	**16h**		**E5h**		
Tariff function disabled	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**B0h**	**CS**	**16h**		**E5h**		
		C	A	CS		Remarks									
Alarm log	**10h**	**5Ah/ 7Ah**	**A**	**CS**	**16h**	The alarm log is not supported by the module.							**E5h**		

Master request																Slave response	New in G4	Lock-able
		L	L		C	A	CI	Extended secondary address						CS				
Selection of secondary address	**68h**	**0Bh**	**0Bh**	**68h**	**53h/ 73h**	**FDh**	**52h**	**SAdr 0-3**	**Man**	**Gen**	**Med.**			**CS**	**16h**	**E5h**		
Enhanced selection	**68h**	**11h**	**11h**	**68h**	**53h/ 73h**	**FDh**	**52h**	**SAdr 1-4**	**Man**	**Gen**	**Med.**	**0Ch**	**78h**	**Fab. 0-3**	**CS**	**16h**	**E5h**		
	Wildcards (F) are possible! Secondary address (e. g: 01234567 → SAdr0 = 67h, SAdr1 = 45h, SAdr2 = 23h, SAdr3 = 01h) Manufacturer identifier (Man = A7h 32h); Generation (Gen = 04h); Medium (e. g. Med. = 04h → heat, mounted in return flow) Meter number (e. g: 87654321 → Fab0 = 21h, Fab1 = 43h, Fab2 = 54h, Fab3 = 87h)																	
		L	L		C	A	CI	DIF	VIF	Data	CS							
Set primary address	**68h**	**06h**	**06h**	**68h**	**53h/ 73h**	**A**	**51h**	**01h**	**7Ah**	**Prim. addr.**	**CS**	**16h**				**E5h**		yes
	As-shipped state of heat meter: primary address 0																	
Set secondary address (only module slot 1)	**68h**	**09h**	**09h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Ch**	**79h**	**Sec. addr.**	**CS**	**16h**				**E5h**		yes
	As-shipped state of heat meter: secondary address = meter number																	
		L	L		C	A	CI	DIF	VIF	VIFE	Data		CS					
Set date and time	**68h**	**0Ah**	**0Ah**	**68h**	**53h/ 73h**	**A**	**51h**	**04h**	**EDh**	**00h**	**Date / time.**		**CS**	**16h**		**E5h**		yes
	Date and time according to data type F (4 bytes) in DIN EN 13757-3 Annex A																	
		L	L		C	A	CI	DIF	VIF	Data		CS						
Set date and time	**68h**	**09h**	**09h**	**68h**	**53h/ 73h**	**A**	**51h**	**04h**	**6Dh**	**Date / time.**		**CS**	**16h**			**E5h**		yes
	Date and time according to data type F (4 bytes) in DIN EN 13757-3 Annex A																	

Master request															Slave response	New in G4	Lock-able
Tariff function		L	L		C	A	CI	DIF	DIFE 1/2	VIF	VIFE	Data	CS				
Set changeover times	**68h**	**L**	**L**	**68h**	**53h/ 73h**	**A**	**50h**	**04h/84h**	**Tariff**	**FDh**	**30h**	**Date / time.**	**…**		**E5h**		
							…	**44h/ C4h**	**Tariff**	**FDh**	**30h**	**Date / time.**	**CS**	**16h**			
	Tariff: Tariff function disabled (no code), tariff 1 (20h), tariff 2 (30h) or tariff 3 (80h 10h)) Date and time according to data type F (4 bytes) in DIN EN13757-3 (Annex A). The date is ignored.																
		L	L		C	A	CI		CS		Content of data telegram						
Reset operating mode (Appl. reset)	**68h**	**03h**	**03h**	**68h**	**53h/ 73h**	**A**	**50h**		**CS**	**16h**	Response telegram in normal operation mode				**E5h**		yes
Normal operation mode (Appl. reset)	**68h**	**04h**	**04h**	**68h**	**53h/ 73h**	**A**	**50h**	**00h**	**CS**	**16h**	Response telegram in normal operation mode				**E5h**		yes
Fast readout mode (Appl. reset)	**68h**	**04h**	**04h**	**68h**	**53h/ 73h**	**A**	**50h**	**51h**	**CS**	**16h**	Response telegram in fast readout mode				**E5h**		yes
These commands are used to invoke the new modes in the M-Bus modules of the 4th generation:																	
		L	L		C	A	CI					CS					
Load previous month data into module (previous month readout mode)	**68h**	**06h**	**06h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A8h**	**Mon**		**CS**	**16h**		**E5h**	yes	yes
	Mon = requested prev. monthly value → 01h = 1st previous month … 3Ch = 60th prev. month																
Load Info telegram into module (Info telegram readout mode)	**68h**	**06h**	**06h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**AAh**	**Log**		**CS**	**16h**		**E5h**	yes	yes
	Log = 00h → info telegram for log book Log = 01h → Info telegram for data logger hourly archive Log = 02h → Info telegram for data logger daily archive Log = 03h → Info telegram for data logger monthly archive Log = 04h → Info telegram for data logger yearly archive																
	The data requested with the above commands is transmit on the M-Bus with **RQ_UD2** command																

Master request															Slave response	New in G4	Lock-able
		L	L		C	A	CI						CS				
Load EEPROM data into module (EEPROM readout mode)	**68h**	**09h**	**09h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**A9h**	**Blk0**	**Blk1**	**Blk2 Blk3**	**CS**	**16h**	**E5h**	yes	yes
	Blk0..Blk3 = address in EEPROM and number of bytes-1 to be read (aaaaannn) e.g. 01234h for EEPROM address 01234; 0E3h for 228 bytes to be read: Blk0 = 01; Blk1 = 23; Blk2 = 40; Blk3 = E3																
	The data requested with the above command is output on the M-Bus with the command **RQ_UD2.**																
		L	L		C	A	CI			CS							
Change back to normal or fast readout mode	**68h**	**05h**	**05h**	**68h**	**53h/ 73h**	**A**	**51h**	**0Fh**	**AFh**	**CS**	**16h**				**E5h**	yes	yes
	The module returns to the mode in which it was before the changeover to one of the above modes.																
		L	L		C	A	CI						CS				
Set readout control byte (Type of data output)	**68h**	**08h**	**08h**	**68h**	**53h/ 73h**	**A**	**51h**	**01h**	**FDh**	**8Bh**	**00h**	**ASB**	**CS**	**16h**	**E5h**	yes	yes
	ASB = 00h → modern data output G4 compatible ASB = 01h → downward compatible data output G2 compatible ASB = 02h → data output in fixed frame (EN 1434-3: 1997)																

Table 1: Listing of the commands supported by the 4th generation M-Bus module

6.1.1 Available values

With the 4th generation of M-Bus modules, all values from the following table are available for selection and output on the M-Bus interface. It is not possible to change the order of the transmitted values.

In normal readout mode, the number of values selected in this way is limited by the restriction in the length of the M-Bus response telegram for value output of 228 bytes net. If a telegram which results from a selection becomes too long, the G4 M-Bus module suppresses all value combinations (consisting of DIFs, VIFs and data) which exceed the maximum length.

In fast readout mode, the maximum number of value combinations (consisting of DIFs, VIFs and data) is limited to eight. If more than eight value combinations are selected with the command “Selected data”, only eight value groups are sent. Only values marked with „X“ in the last column are available for fast readout mode (no previous month or previous year values).

No.	Value	Source or code in option data	Value type		DIF / E Meaning	VIF / E unit or example	Dependence		S
			DIF / E	VIF / E			Flow rate UH50	Pulse value UC50	
127	Blocked for system								
126	Blocked for system								
125	Blocked for system								
124	Update time	Dynamic M-Bus parameters		09h 74h	2-digit BCD, instantaneous value	Seconds			X
123	Averaging time	Dynamic M-Bus parameters		09h 70h	2-digit BCD, instant. value	Seconds			X
122	Energy	6.8	0Ch	06h	8-digit BCD, instant. value	kWh	0,6 – 10 m³/h	≤ 2,5 l/p	X
			0Ch	07h		MWh/100	15 – 150 m³/h	> 2,5 l/p	
			0Ch	0Eh		MJ	0,6 – 2,5 m³/h	≤ 1 l/p	
			0Ch	0Fh		GJ/100	3,5 – 150 m³/h	> 1 – 100 l/p	
			0Ch	FBh 09h		GJ	-	> 100 – 2500 l/p	
121	Volume	6.26	0Ch	14h	8-digit BCD, instant. value	m³/100	0,6 – 15 m³	≤ 2,5 l/p	X
			0Ch	15h		m³/10	25 – 150 m³	> 2,5 – 25 l/p	
			0Ch	16h		m³	-	> 25 – 2500 l/p	

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
120	Power	6.4	0Bh 0Bh	2Dh 2Eh	6-digit BCD, instant. value	kW/10 kW	0,6 – 25 m³/h 40 – 150 m³/h	≤ 25 l/p > 25 – 2500 l/p	X
119	Flow rate	6.27	0Bh 0Bh	3Bh 3Ch	6-digit BCD, instant. value	l/h m³/h/100	0,6 – 150 m³/h -	≤ 25 l/p > 25 – 2500 l/p	X
118	Temperature hot side	6.29	0Ah 0Ah	5Ah 5Bh	4-digit BCD, instant. value	°C/10 °C	Modern data structure Downward compatible data structure		X
117	Temperature cold side	6.28	0Ah 0Ah	5Eh 5Fh	4-digit BCD, instant. value	°C/10 °C	Modern data structure Downward compatible data structure		X
116	Temperature difference	6.30	0Ah	62h	4-digit BCD, instant. value	°C/10			X
115	Volume previous year	6.26*01	4Ch 4Ch 4Ch	14h 15h 16h	8-digit BCD, instant. value, prev. year value	m³/100 m³/10 m³	0,6 – 15 m³ 25 – 150 m³	≤ 2,5 l/p > 2,5 – 25 l/p > 25 – 2500 l/p	
114	Energy previous year	6.6*01	4Ch 4Ch	06h 07h	8-digit BCD, instant. value, prev. year value	kWh MWh/100	0,6 – 10 m³/h 15 – 150 m³/h	≤ 2,5 l/p > 2,5 l/p	
			4Ch 4Ch 4Ch	0Eh 0Fh FBh 09h		MJ GJ/100 GJ	0,6 – 2,5 m³/h 3,5 – 150 m³/h -	≤ 1 l/p > 1 – 100 l/p > 100 – 2500 l/p	
113	Serial number	9.20	0Ch	78h	8-digit BCD, serial number				X
112	Averaging time for maxima	6.35	89h 10h 89h 10h	71h 72h	2-digit BCD, instant. value, maximum	Minutes Hours			X
111	Maximum power	6.6	9Bh 10h 9Bh 10h	2Dh 2Eh	6-digit BCD, maximum	kW/10 kW	0,6 – 25 m³/h 40 – 150 m³/h	≤ 25 l/p > 25 – 2500 l/p	X

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
110	Maximum power previous year	6.6*01	DBh 10h DBh 10h	2Dh 2Eh	6-digit BCD, maximum, prev. year value	kW/10 kW	0,6 – 25 m³/h 40 – 150 m³/h	≤ 25 l/p > 25 – 2500 l/p	
109	Time stamp to 110	9.36.1*01	D4h 10h	ADh 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			
108	Maximum flow rate	9.33	9Bh 10h 9Bh 10h	3Bh 3Ch	6-digit BCD, maximum	l/h m³/h/100	0,6 – 150 m³/h -	≤ 25 l/p > 25 – 2500 l/p	X
107	Max. temperature hot side	9.4	9Ah 10h 9Ah 10h	5Ah 5Bh	4-digit BCD, maximum	°C/10 °C	Modern data structure Downward compatible data structure		X
106	Max. temperature cold side	9.4	9Ah 10h 9Ah 10h	5Eh 5Fh	4-digit BCD, maximum	°C/10 °C	Modern data structure Downward compatible data structure		X
105	Operating time	6.31	0Ch 0Ch	22h 23h	8-digit BCD, instant. value	Hours Days			X
104	Missing time	6.32	0Ch 0Ch	22h 23h	8-digit BCD, error value	Hours Days			X
103	Missing time previous year	6.32*01	7Ch 7Ch	22h 23h	8-digit BCD, error value, prev. year value	Hours Days			
102	Yearly set day	6.36	42h	6Ch	Time stamp type G	e. g. 31.12.XX (without time)	G2 compatible		
101	Monthly set day	6.36*02	C4h 8Fh 0Fh	6Dh	Time stamp type F	e. g. 01.XX.XX 00:00 h / 31.XX.XX 23:59 h			X

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
100	Tariff register 1 Energy / Volume (Energy or Volume)	6.8.1/ 6.8.2/ 6.8.3	8Ch 20h	06h	8-digit BCD, instant. value	kWh	0,6 – 10 m³/h	≤ 2,5 l/p	X
			8Ch 20h	07h		MWh/100	15 – 150 m³/h	> 2,5 l/p	
			8Ch 20h	0Eh		MJ	0,6 – 2,5 m³/h	≤ 1 l/p	
			8Ch 20h	0Fh		GJ/100	3,5 – 150 m³/h	> 1 – 100 l/p	
			8Ch 20h	FBh 09h		GJ		> 100 – 2500 l/p	
			8Ch 20h	14h		m³/100	0,6 – 15 m³/h	≤ 2,5 l/p	
			8Ch 20h	15h		m³/10	25 – 150 m³/h	> 2,5 – 25 l/p	
			8Ch 20h	16h		m³		> 25 – 2500 l/p	
99	Tariff register 2 Energy / Volume	6.8.4	8Ch 30h	VIFs as tariff 1	8-digit BCD, instant. value				X
98	Tariff register 3 Energy / Volume	6.8.5	8Ch 80h 10h	VIFs as tariff 1	8-digit BCD, instant. value				X
97	Tariff register 1 previous year Energy / Volume	6.8.1*01/ 6.8.2*01/ 6.8.3*01	CCh 20h	VIFs as tariff 1	8-digit BCD, instant. value, prev. year value				
96	Tariff register 2 previous year Energy / Volume	6.8.4*01	CCh 30h	VIFs as tariff 1	8-digit BCD, instant. value, prev. year value				
95	Tariff register 3 previous year Energy / Volume	6.8.5*01	CCh 80h 10h	VIFs as tariff 1	8-digit BCD, instant. value, prev. year value				
94	Max. temperature hot side 1st previous month	9.4*02	9Ah 11h	5Ah	4-digit BCD, maximum, 1st prev. month value	°C/10	Modern data structure		
			9Ah 11h	5Bh		°C	Downward compatible data structure		
93	Time stamp to 94	9.36.3*02	94h 11h	DAh 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
92	Max. temperature cold side 1st previous month	9.4*02	9Ah 11h 9Ah 11h	5Eh 5Fh	4-digit BCD, maximum, 1st prev. month value	°C/10 °C	Modern data structure Downward compatible data structure		
91	Time stamp to 92	9.36.4*02	94h 11h	DEh 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			
90	Max. flow rate 1st previous month	6.33*02	9Bh 11h 9Bh 11h	3Bh 3Ch	6-digit BCD, maximum, 1st prev. month value	l/h m³/h/100	0,6 – 150 m³/h	≤ 25 l/p > 25 – 2500 l/p	
89	Time stamp to 90	9.36.2*02	94h 11h	BBh 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			
88	Max. power 1st previous month	6.6*02	9Ah 11h 9Ah 11h	2Dh 2Eh	6-digit BCD, instant. value	kW/10 kW	0,6 – 25 m³/h 40 – 150 m³/h	≤ 25 l/p > 25 – 2500 l/p	
87	Time stamp to 88	9.32*02	94h 11h	ADh 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			
86	Missing time 1st previous month	6.32*02	BCh BCh	22h 23h	8-digit BCD, error value, 1st prev. month value	Hours Days			
85	Energy 1st previous month	6.8*02	8Ch 8Ch	06h 07h	8-digit BCD, instant. value, 1st prev. month value	kWh MWh/100	0,6 – 10 m³/h 15 – 150 m³/h	≤ 2,5 l/p > 10 l/p	
			8Ch 8Ch 8Ch	0Eh 0Fh FBh 09h		MJ GJ/100 GJ	0,6 – 2,5 m³/h 3,5 – 150 m³/h -	≤ 1 l/p 2,5 – 100 l/p 250 – 2500 l/p	
84	Tariff register 1 1st previous month energy / volume	6.8.1*02/ 6.8.2*02/ 6.8.3*02	8Ch 21h	VIFs as tariff 1	8-digit BCD, instant. value, 1st prev. month value				

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
83	Tariff register 2 1st prev. month energy / volume	6.8.4*02	8Ch 31h	VIFs as tariff 1	8-digit BCD, instant. value, 1st prev. month value				
82	Tariff register 3 1st previous month energy / volume	6.8.5*02	8Ch 81h 10h	VIFs as tariff 1	8-digit BCD, instant. value, 1st prev. month value				
81	Volume 1st previous month	6.26*02	8Ch 01h 8Ch 01h 8Ch 01h	14h 15h 16h	8-digit BCD, instant. value, 1st prev. month value	m³/100 m³/10 m³	0,6 – 15 m³/h 25 – 150 m³/h -	≤ 2,5 l/p > 2,5 – 25 l/p > 25 – 2500 l/p	
80	Date and time	9.36	04h	6Dh	Time stamp type F	e. g. 12.05.16 15:57 h			X
79	Meter flow time	9.31	0Ch 0Ch	26h 27h	8-digit BCD, instant. value	Hours Days			
78	Meter flow time previous year	9.31*01	4Ch 4Ch	26h 27h	8-digit BCD, prev. year value	Hours Days			
77	Meter flow time 1st previous month	9.31*02	8Ch 01h 8Ch 01h	26h 27h	8-digit BCD, 1st prev. month value	Hours Days			
76	Meter number pulse input 1	9.0.1	8Ch 40h	78h	8-digit BCD, meter number pulse input 1				X
75	Medium pulse input 1	9.5*04	81h 40h	FDh 09h	8 Bit integer, pulse input 1	Medium	e. g. 06: warm water / 07: water / 16: cold water		X

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
74	Meter reading pulse input 1	8.26.1	8Ch 40h 8Ch 40h	15h 16h	8-digit BCD, instant. value, pulse input 1	m³/10 m³			X
73	Meter reading pulse input 1 previous year	8.26.1*01	CCh 40h CCh 40h	15h 16h	8-digit BCD, prev. year value pulse input 1	m³/10 m³			
72	Meter reading pulse input 1 1st previous month	8.26.1*02	8Ch 41h 8Ch 41h	15h 16h	8-digit BCD, 1st prev. month value pulse input 1	m³/10 m³			
71	Meter number pulse input 2	9.0.2	8Ch 80h 40h	78h	8-digit BCD, meter number pulse input 2				X
70	Medium pulse input 2	9.5*04	81h 80h 40h	FDh 09h	8 Bit Integer, pulse input 2	Medium	e. g. 06: warm water / 07: water / 16: cold water		X
69	Meter reading pulse input 2	8.26.2	8Ch 80h 40h 8Ch 80h 40h	15h 16h	8-digit BCD, instant. value pulse input 2	m³/10 m³			
68	Meter reading pulse input 2 previous year	8.26.2*01	CCh 80h 40h CCh 80h 40h	15h 16h	8-digit BCD, prev. year value pulse input 2	m³/10 m³			
67	Meter reading pulse input 2 1st previous month	8.26.2*02	8Ch 81h 40h 8Ch 81h 40h	15h 16h	8-digit BCD, 1st prev. month value pulse input 2	m³/10 m³			

No.	Value	Source or code in option data	Value type DIF / E	Value type VIF / E	DIF / E Meaning	VIF / E unit or example	Dependence Flow rate UH50	Dependence Pulse value UC50	S
66	Error flags (device specific)	Dynamic M-Bus parameters	02h	FDh 17h	16 Bit integer	Error flags			X
65	Access counter	9.68	04h	FDh 08h	32 Bit integer	Access counter			X
64	Storage date 1st previous month	9.36.6*02	84h 01h	6Dh	Time stamp type F	e. g. 31.03.2015 23:59 h			
63	Max. temperature difference 1st previous month	9.40*02	9Ah 11h	62h	4-digit BCD, maximum, 1st previous month value	°C/10			
62	Time stamp to 63	9.36.70*02	94h 11h	E2h 6Fh	Time stamp type F	e. g. 12.05.16 15:57 h			
61	Yearly set day	6.36	42h 44h	6Ch 6Dh	Time stamp type G Time stamp type F	e. g. 01.01.2027 01.01.2027 00:00 / 31.12.2027 23:59	Modern data structure Downward compatible data structure		X
60	Reserve								
…	Reserve								
0	Reserve								

Table 2: Available values for transmission by 4th generation M-Bus modules ** since FW 4.19*

6.2 Description of the data telegram

6.2.1 Variation in the data structures (from module firmware 4.19)

The values are transmitted as they are shown on the display of the meter. The data fields in the telegram are therefore extended when required. The following cases can occur:

- The Value Information Fields (VIF) for the values of energy and flow rate may have a VIFE (Value Information Field Extension) in addition to the VIF. This is noted in the tables below.
- The BCD data fields for power may be extended by two positions to show any leading negative sign by the prefix F0. The change to the Data Information Fields is noted in the tables below.
- Because of the 1st and 2nd points, the frame length may be increased. If the maximum frame length is thereby exceeded, data records before the manufacturer-specific part of a frame are discarded so that the maximum frame length is complied with.

6.2.2 Assignment of tariff numbers, cell numbers and units (meters)

In the Data Information Fields (DIF or DIFE), among other things the tariff of a value output on the M-Bus is encrypted. The assignment of the tariff numbers to the tariffs is not specified in the standards in a compulsory manner.

The following applies for the M-Bus modules from Landis+Gyr:

- Tariff 1 corresponds to a maximum value.
- Tariff 2 corresponds to tariff register 1
- Tariff 3 corresponds to tariff register 2
- Tariff 4 corresponds to tariff register 3

The cell numbers in the Data Information Fields (DIF or DIFE) are also not specified in the standards in a compulsory manner.

The following applies for the M-Bus modules from Landis+Gyr:

- Cell number 1 corresponds to the previous year value
- Cell number >=2 corresponds to the previous month value (cell number – 1)
  e.g. cell number 2 is the value for the 1st. previous month, cell number 3 is the value for the 2nd. previous month ...

The unit numbers (meters) in the Data Information Field Extension (DIFE) for the 4th generation M-Bus modules have the following assignment during normal readout and fast readout:

- Data of unit 0 (meter 0) is assigned to the meter
- Data of unit 1 (meter 1) is assigned to pulse input 1
- Data of unit 2 (meter 2) is assigned to pulse input 2

6.2.3 Identification of the M-Bus function in the data telegram

In all readout modes except the fast readout mode with G2 compatible data output and in fixed frames, the M-Bus module includes an information byte in the manufacturer-specific part of the response telegram, in which the current readout mode is encoded in its low-order nibble and the output control byte is encoded in its high-order nibble:

	Readout mode/ output type	Value of information byte	Recognizable by
Readout mode	Normal readout mode	x0	Fourth byte in manufacturer-specific data record.
	Fast readout mode	x1	Fourth byte in manufacturer-specific data record (modern output) or not transmitted (compatible output); but there, single response telegram with CI=0x72 and without manufacturer-specific data record.
	Previous month readout mode	x8	Fourth byte in manufacturer-specific data record
	EEPROM readout mode	x9	Last byte in manufacturer-specific data record
	Info telegram readout mode	xA	Last byte in manufacturer-specific data record
Output control byte	G4 compatible output	0y	
	G2 compatible output	1y	
	Fixed frame	(2y)	Not transmitted in normal and fast readout modes; but there, single response telegram with CI=0x73

Table 5: Assignment of information byte to readout mode and output type

6.2.4 G2 compatibility mode

A 4th generation M-Bus module can be used in the same way as a predecessor 2nd generation M-Bus module.

6.2.5 Complete data telegram in normal readout mode

The telegram described below should be treated as an example, the sequence and form of the values output are not guaranteed characteristics.

Telegram bytes	Data telegram in normal readout mode **Explanation**	DIN EN 62056-21
68h **L L** 68h	Frame with fixed length, **L = length declaration**	
08h	Response with data	
A	**A = M-Bus address (1 Byte)**	9.6
72h	LSB first, header with length of 12 bytes	
78h 56h 34h 12h	**Secondary address** = **property number** e.g. 12345678	9.21
A7h 32h	**Identification number** for LUG ID = (ord('L')-64)*32*32+(ord('U')-64)*32+(ord('G')-64)	
04h	**4th generation M-Bus**	
04h	**Medium:** heat	
Z	**Z = access counter** (1 byte)	
S	**S = Status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	**Signature**	
09h	DIF: 2-digit BCD, no DIFE, **current value**	
74h	VIF: **update time** in seconds	
04h	4 **s**	
09h	DIF: 2-digit BCD, no DIFE, **current value**	
70h	VIF: **averaging time** in seconds	
08h	8 **s**	
0Ch	DIF: 8-digit BCD, no DIFE, **current value**	6.8
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (kWh, MWh/100, MJ, GJ/100, MWh, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
0Ch	DIF: 8-digit BCD, no DIFE, **current value**	6.26
14h / 15h / 16h	VIF: **volume** (**m^3/100**, m^3/10, m^3)	
78h 56h 34h 12h	123456.78 **m^3**	
0Bh	DIF: 6-stellig BCD, **current value**	6.4
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
0Bh	DIF: 6-stellig BCD, **current value**	6.27
3Bh / 3Ch	VIF: **flow rate** (**m^3/1000 ≙ l/h**, m^3/h/100)	
56h 34h 12h	123.456 **m^3/h**	
0Ah	DIF: 4-digit BCD, **current value**	6.29
5Bh	VIF: **flow temperature** (**°C**)	
23h 01h	123 **°C**	

Telegram bytes	Data telegram in normal readout mode **Explanation**	DIN EN 62056-21
0Ah	DIF: 4-stellig BCD, **current value**	6.28
5Fh	VIF: **return flow temperature** (**°C**)	
23h 01h	123 **°C**	
0Ah	DIF: 4-stellig BCD, **current value**	6.30
62h	VIF: **temperature difference** (**°C/10)**	
34h 12h	123.4 **°C**	
4Ch	DIF: 8-stellig BCD, **current value**, cell number 1 = **previous year value**	6.26*01
14h / 15h / 16h	VIF: **volume** (**m^3/100**, m^3/10, m^3)	
78h 56h 34h 12h	123456.78 **m^3**	
4Ch	DIF: 8-digit BCD, **current value**, cell number 1 = **previous year value**	6.8*01
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
0Ch	DIF: 8-digit BCD, **current value**	9.20
78h	VIF: **serial number**	
78h 56h 34h 12h	12345678	
89h 10h	DIF+DIFE: 2-digit BCD, **current value**, tariff 1 = **maximum**	6.35
71h / 72h	VIF: **averaging time** in **minutes** / hours	
60h	60 **min** → maximum averaging time	
9Bh 10h	DIF+DIFE: 6-digit BCD, tariff 1 = **maximum**	6.6
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
DBh 10h	DIF+DIFE: 6-digit BCD, cell number 1 = **previous year value**, tariff 1 = **maximum**	6.6*01
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
9Bh 10h	DIF+DIFE: 6-digit BCD, tariff 1 = **maximum**	6.33
3Bh / 3Ch	VIF: **flow rate** (**m^3/h/1000 ≙ l/h**, m^3/h/100)	
56h 34h 12h	123.456 **m^3/h**	
9Ah 10h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**	9.4
5Bh	VIF: **flow temperature** (**°C**)	
23h 01h	123 **°C**	
9Ah 10h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**	9.4
5Fh	VIF: **return flow temperature** (**°C**)	
23h 01h	123 **°C**	
0Ch	DIF: 8-digit BCD, **current value**	6.31
22h / 23h	VIF: **ON-time** (**hours** / days) = **Operating hours** / -days	
78h 56h 34h 12h	12345678 **h**	

Telegram bytes	Data telegram in normal readout mode **Explanation**	DIN EN 62056-21
3Ch	DIF: 8-digit BCD, **value during error**	6.32
22h / 23h	VIF: **ON-time** (**hours** / days) = **missing hours** / -days	
78h 56h 34h 12h	12345678 **h**	
7Ch	DIF: 8-digit BCD, **value during error**, cell number 1 = **previous year value**	6.32*01
22h / 23h	VIF: **ON-time** (**hours** / days) = **missing hours** / -days	
78h 56h 34h 12h	12345678 **h**	
42h	DIF: 16-bit integer, **current value**, cell number 1 = **previous year value**	6.36
6Ch	VIF: instant = **set day**; data type G	
01h 01h	Set day 01.01; year of set day always 0, because not present in meter	
8Ch 20h	DIF+DIFE: 8-digit BCD, **current value**, tariff 2 = **tariff register 1**	6.8.1/ 6.8.2/ 6.8.3
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 30h	DIF+DIFE: 8-digit BCD, **current value**, tariff 3 = **tariff register 2**	6.8.4
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 80h 10h	DIF+DIFE: 8-digit BCD, **current value**, tariff 4 = **tariff register 3**	6.8.5
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
CCh 20h	DIF+DIFE: 8-digit BCD, **current value**, cell number 1 = **previous year value**, tariff 2 = **tariff register 1**	6.8.1*01/ 6.8.2*01/ 6.8.3*01
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
CCh 30h	DIF+DIFE: 8-digit BCD, **current value**, cell number 1 = **previous year value**, tariff 3 = **tariff register 2**	6.8.4*01
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
CCh 80h 10h	DIF+DIFE: 8-digit BCD, **current value**, cell number 1 = **previous year value**, tariff 4 = **tariff register 3**	6.8.5*01
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
9Ah 11h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.4*02
5Bh	VIF: **flow temperature** (**°C**)	
23h 01h	123 **°C**	

Telegram bytes	Data telegram in normal readout mode **Explanation**	DIN EN 62056-21
9Ah 11h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.4*02
5Fh	VIF: **return flow temperature** (**°C**)	
23h 01h	123 **°C**	
9Bh 11h	DIF+DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	6.33*02
3Bh / 3Ch	VIF: **flow rate** (**m³/h/1000 ≙ l/h**, m³/h/100)	
56h 34h 12h	123.456 **m³/h**	
9Bh 11h	DIF: 6-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	6.6*02
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
BCh 01h	DIF+DIFE: 8-digit BCD, **value during error**, cell number 2 = **1. previous month value**	6.32*02
22h / 23h	VIF: **ON-time** (**hours** / days) = **missing hours** / -days	
78h 56h 34h 12h	12345678 **hours**	
8Ch 01h	DIF+DIFE: 8-digit BCD, **current value**, cell number 2 = **1. previous month value**	6.8*02
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 21h	DIF+DIFE: 8-digit BCD, **current value**, tariff 2 = **tariff register 1**, cell number 2 = **1. previous month value**	6.8.1*02/ 6.8.2*02/ 6.8.3*02
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 31h	DIF+DIFE: 8-digit BCD, **current value**, tariff 3 = **tariff register 2**, cell number 2 = **1. previous month value**	6.8.4*02
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 81h 10h	DIF+DIFE: 8-digit BCD, **current value**, tariff 4 = **tariff register 3**, cell number 2 = **1. previous month value**	6.8.5*02
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 01h	DIF+DIFE: 8-stellig BCD, **current value**, cell number 2 = **1. previous month value**	6.26*02
14h / 15h / 16h	VIF: **volume** (**m³/100**, m³/10, m³)	
78h 56h 34h 12h	123456.78 **m³**	
04h	DIF: 32-bit integer, **current value**	9.36
6Dh	VIF: **instant**; data type F	
00h 0Bh CCh 19h	**Date and time** of the meter	

Telegram bytes	Data telegram in normal readout mode **Explanation**	DIN EN 62056-21
0Fh	DIF: **manufacturer-specific data**	9.7
21h 04h	Firmware version 04.21	
00h	Reserved	
10h	Information-Byte: G2 compatible output, normal mode see table 5	
20h	Extension byte D0 with additional information D0.0 = 1 → F0 pre-warning D0.5 = 1 → automatic baud rate detection D0.6 = 1 → user lock set D0.7 = 0 → mounting in return flow / D0.7: = 1 -> mounting in flow	
CS	**CS = checksum** (1 Byte)	
16h	Stop character	

Table 6: Output of values (G2 compatible output) in normal mode

6.2.6 Complete data telegram in fast readout mode

The telegram described below should be treated as an example, the sequence and form of the values output are not guaranteed characteristics.

Telegram bytes	Data telegram in fast readout mode **Explanation**	DIN EN 62056-21
68h **L L** 68h	Frame with fixed length, **L = length declaration**	
08h	Response with data	
A	**A = M-Bus address** (1 byte)	9.6
72h	LSB first, Header with length of 12 bytes	
78h 56h 34h 12h	**Secondary address** = **property number** e. g. 12345678	9.21
A7h 32h	**Identification number** for LUG ID = (ord('L') - 64) × 32 × 32 + (ord('U') - 64) × 32 + (ord('G') - 64)	
04h	**M-Bus generation 4**	
04h	**Medium**: heat	
Z	**Z = access counter** (1 byte)	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	**Signature**	
09h	DIF: 2-digit BCD, **current value**	
74h	VIF: **update time** in seconds	
04h	4 **s**	
09h	DIF: 2-digit BCD, **current value**	
70h	VIF: **update time** in seconds	
08h	8 **s**	

Telegram bytes	Data telegram in fast readout mode **Explanation**	DIN EN 62056-21
0Ch	DIF: 8-digit BCD, **current value**	6.8
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
0Ch	DIF: 8-digit BCD, **current value**	6.26
14h / 15h / 16h	VIF: **volume** (**m^3/100**, m^3/10, m^3)	
78h 56h 34h 12h	123456.78 **m^3**	
0Bh	DIF: 6-digit BCD, **current value**	6.4
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
0Bh	DIF: 6-digit BCD, **current value**	6.27
3Bh / 3Ch	VIF: **flow rate** (**m^3/h/1000 ≙ l/h**, m^3/h/100)	
56h 34h 12h	123.456 **m^3/h**	
0Ah	DIF: 4-digit BCD, **current value**	6.29
5Bh	VIF: **flow temperature** (**°C**)	
23h 01h	123 **°C**	
0Ah	DIF: 4-digit BCD, **current value**	6.28
5Fh	VIF: **return flow temperature** (**°C**)	
23h 01h	123 **°C**	
CS	**CS = checksum** (1 Byte)	
16h	Stop character	

Table 7: Output of values (G2 compatible output) in fast readout mode

Special feature: In the G2 compatible output, the manufacturer-specific part of the data output is suppressed, in the G4 compatible output it is transmitted:

Telegram bytes	Data telegram in G4 compatible fast readout mode **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Frame with fixed frame, **L = length declaration**	
08h	Response with data	
A	**A = M-Bus address** (1 byte)	9.6
72h	LSB first, Header with length of 12 bytes	
78h 56h 34h 12h	**Secondary address** = **property number** e. g. 12345678	9.21
A7h 32h	**Identification number** for LUG ID = (ord('L') - 64) × 32 × 32 + (ord('U') - 64) ×32 + (ord('G') - 64)	
04h	**M-Bus generation 4**	
04h	**Medium**: heat	
Z	**Z = access counter** (1 byte)	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	**Signature**	
⋮		
0Ah	DIF: 4-digit BCD, no DIFE, **current value**	6.28
5Fh	VIF: **return flow temperature** (**°C/10**)	
34h 12h	123.4 **°C**	
0Fh	DIF: **manufacturer-specific data**	9.7
21h 04h	Firmware version 04.21	
00h	Reserved	
10h	Information byte: G2 compatible output, normal readout mode see table 5	
20h	Extension byte D0 with additional information D0.0 = 1 → F0-pre-warning D0.5 = 1 → automatic baud rate detection D0.6 = 1 → user lock set D0.7 = 0 → mounting in return flow / D0.7: = 1 → mounting in flow	
CS	**CS = checksum** (1 byte)	
16h	Stop character	

Table 8: Output of values (G4 compatible output) in fast readout mode

6.2.7 Data telegram in previous month readout mode

The command „**68h 06h 06h 68h 53h/73h A 51h 0Fh A8h Mon CS 16h**“ causes the M-Bus module to switch to previous month readout mode. At the same time, the module fetches from the meter the data for the previous month group described by the variable **“Mon”**.

With the **“REQ_UD2”** read command, the data of the previous month group is output on the M-Bus.

Depending on the previous month read out, the length of the fixed frame varies:

- From the 1st to the 30th previous month, one DIF and one DIFE are enough for the representation of cell number 2 to cell number 31 (see table 9).
- Above the 31st previous month, one DIF and two DIFE are needed to represent cell number 32 to cell number 61 (see 2nd example in table 10).

Telegram bytes	Data telegram in previous month readout mode **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Header of long frame, **L = length declaration**	
08h	Response with data	
A	**A = M-Bus address** (1 byte)	9.6
72h	LSB first, header with length of 12 bytes	
78h 56h 34h 12h	**Secondary address** = **property number** e. g. 12345678	9.21
A7h 32h	Identification number for LUG ID = (ord(‘L’) - 64) × 32 × 32 + (ord(‘U’) - 64) ×32 + (ord(‘G’) - 64)	
04h	**Generation 4 meter**	
04h	**Medium**: heat	
Z	**Z = Selection meter** (1 byte), e. g.: 2	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	**Signature**	
9Ah 11h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.4*02
5Ah	VIF: **flow temperature** (**°C/10**)	
34h 12h	123.4 **°C**	
94h 11h	DIF+DIFE: 32-digit integer, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.36.3*02
DAh 6Fh	VIF+VIFE: **flow temperature,** **time / date** type F according to EN 13757-3 Annex A	
00h 00h 01h 1Bh	01.11.2008 00:00 → time stamp max. flow temperature 1. previous month	
9Ah 11h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.4*02
5Eh	VIF: **return flow temperature** (**°C/10**)	
34h 12h	123.4 **°C**	

Telegram bytes	Data telegram in previous month readout mode **Explanation**	DIN EN 62056-21
94h 11h	DIF+DIFE: 32-digit integer, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.36.4*02
DEh 6Fh	VIF+VIFE: **return flow temperature,** **time / date** type F according to EN 13757-3 Annex A	
2Dh 0Dh 04h 1Bh	04.11.2008 13:45 → max. return flow temperature timestamp 1. VM	
9Bh 11h	DIF+DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	6.33*02
3Bh / 3Ch	VIF: **flow rate** (**m³/h/1000 ≙ l/h**, m³/h/100)	
56h 34h 12h	123.456 **m³/h**	
94h 11h	DIF+DIFE: 32-digit integer, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.36.2*02
BBh 6Fh	VIF+VIFE: **flow rate**, **time / date** type F according to EN 13757-3 Annex A	
0Fh 02h 07h 1Bh	07.11.2008 02:15 → time stamp max. flow rate 1. previous month	
9Bh 11h	DIF+DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	6.6.*02
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
56h 34h 12h	12345.6 **kW**	
94h 11h	DIF+DIFE: 32-digit integer, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.36.1*02
ADh 6Fh	VIF+VIFE: **power, time / date** type F according to EN 13757-3 Annex A	
1Eh 07h 03h 1Bh	03.11.2008 07:30 → time stamp max. power 1. previous month	
BCh 01h	DIF+DIFE: 8-stellig BCD, **error value**, cell number 2 = **1. previous month value**	6.32*02
22h / 23h	VIF: **ON-time** (**hours** / days) = **missing hours** / -days	
78h 56h 34h 12h	12345678 **hours**	
8Ch 01h	DIF+DIFE: 8-digit BCD, **current value**, cell number 2 = **1. previous month value**	6.8*02
06h / 07h / 0Eh / 0Fh **/** FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 21h	DIF+DIFE: 8-digit BCD, **current value**, tariff 2 = **tariff register 1**, cell number 2 = **1. previous month value**	6.8.1*02 / 6.8.2*02 / 6.8.3*02
06h / 07h / 0Eh / 0Fh **/** FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 31h	DIF+DIFE: 8-digit BCD, **current value**, tariff 3 = **tariff register 2**, cell number 2 = **1. Previous month value**	6.8.4*02
06h / 07h / 0Eh / 0Fh **/** FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	
8Ch 81h 10h	DIF+2×DIFE: 8-digit BCD, **current value**, tariff 4 = **tariff register 3**, cell number 2 = **1. previous month value**	6.8.5*02
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
78h 56h 34h 12h	12345678 **kWh**	

Telegram bytes	Data telegram in previous month readout mode **Explanation**	DIN EN 62056-21
8Ch 01h	DIF+DIFE: 8-digit BCD, **current value**, cell number 2 = **1. previous month value**	6.26*02
14h / 15h / 16h	VIF: **volume** (**m^3/100**, m^3/10, m^3)	
78h 56h 34h 12h	123456.78 **m^3**	
8Ch 01h	DIF+DIFE: 8-digit BCD, **current value**, cell number 2 = **1. Previous month value**	9.31*02
26h / 27h	VIF: **flow rate time** (**hours** / days)	
78h 56h 34h 12h	12345678 **hours**	
8Ch 41h	DIF+DIFE: 8-digit BCD, **current value**, device (Unit) 1 = **pulse input 1**, cell number 2 = **1. previous month value**	8.26.1*02
16h	VIF: **volume** (**m^3**)	
78h 56h 34h 12h	12345678 **m^3**	
8Ch 81h 40h	DIF+2×DIFE: 8-digit BCD, **current value**, device (Unit) 2 = **pulse input 2**, cell number 2 = **1. previous month value**	8.26.2*02
16h	VIF: **volume** (**m^3**)	
78h 56h 34h 12h	12345678 **m^3**	
84h 01h	DIF+DIFE: 32-Bit Integer, **current value**, cell number 2 = **1. previous month value**	9.36.6*02
6Dh	VIF: **time / date** type F according to EN 13757-3 Annex A	
00h 00h 01h 1Ch	01.12.2008 0:00 → timestamp 1. previous month	
9Ah 11h	DIF+DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.40*02
62h	VIF: **temperature difference** (**K/10**)	
34h 12h	123.4 **K**	
9Ah 11h	DIF+DIFE: 32-Bit Integer, tariff 1 = **maximum**, cell number 2 = **1. previous month value**	9.36.7*02
E2h 6Fh	VIF+VIFE: **temperature difference**, **time / date** type F according to EN 13757-3 Annex A	
0Fh 05h 13h 1Bh	19.11.2008 05:15 → time stamp max. temperature difference 1. MV	
0Fh	DIF: **manufacturer-specific data**	9.7
01h 04h	Firmware version 04.01	
00h	Reserved	
08h	Information byte: G4-compatible output, previous month readout mode see table 5Table 5	
A0h	Extension byte D0 with additional information D0.0 = 1 → F0 pre-warning D0.5 = 1 → automatic baud rate detection D0.6 = 1 → user lock set D0.7 = 0 → mounting in return flow / D0.7: = 1 → mounting in flow	
CS	**CS** = **checksum** (1 byte)	
16h	Stop character	

Table 9: Output of the 1st previous month (G4 compatible output);

The data fields in the previous month storage are prefilled with “empty values” (e. g. 00h 00h 00h 00h). If a previous month group is read, for which there are not yet any values stored in the meter, these empty values are output. During interpretation of the type F time stamp according to EN 13757-3 Annex A, the following must be noted:

A day with the value “0” means: This instant in time will be repeated daily. If in a particular case, all four bytes of the timestamp read have the value “00h”, then this is an “empty value”. In the following example, no data has been saved for the 40th previous month.

Telegram bytes	Data telegram in previous month readout mode **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Header of long frame, **L = Length declaration**	
08h	Response with data	
A	**A = M-Bus address** (1 byte)	9.6
72h	LSB first, header with length of 12 bytes	
78h 56h 34h 12h	**Secondary address = property number** e. g. 12345678	9.21
A7h 32h	Identification number for LUG ID = (ord(‘L’)-64)*32*32+(ord(‘U’)-64)*32+(ord(‘G’)-64)	
04h	**M-Bus generation 4**	
04h	**Medium**: heat	
Z	**Z = selection meter** (1 byte)	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	Signature	
DAh 94h 01h	DIF+2×DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.4*02
5Ah	VIF: **flow temperature** (**°C/10**)	
00h 00h	000.0 **°C**	
D4h 94h 01h	DIF+2×DIFE: 32-digit integer, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.36.3*41
DAh 6Fh	VIF+VIFE: **flow temperature**, **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp max. flow temperature 40. previous month	
DAh 94h 01h	DIF+2×DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.4*41
5Eh	VIF: **return flow temperature** (**°C/10**)	
00h 00h	000.0 **°C**	
DAh 94h 01h	DIF+2×DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.36.4*41
DEh 6Fh	VIF+VIFE: **return flow temperature**, **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp max. return flow temperature 40. VM	

Telegram bytes	Data telegram in previous month readout mode **Explanation**	DIN EN 62056-21
DBh 94h 01h	DIF+2×DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	6.33*41
3Bh / 3Ch	VIF: **flow rate** (**m³/h/1000 ≙ l/h**, m³/h/100)	
00h 00h 00h	000.000 **m³/h**	
D4h 94h 01h	DIF+2×DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.36.2*41
BBh 6Fh	VIF+VIFE: **flow rate**, **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp max. flow rate 40. previous month	
DBh 94h 01h	DIF+2×DIFE: 6-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	6.6.*41
2Dh / 2Eh	VIF: **power** (**kW/10**, kW)	
00h 00h 00h	00000.0 **kW**	
D4h 94h 01h	DIF+2×DIFE: 32-bit Integer, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.36.1*41
ADh 6Fh	VIF+VIFE: **power**, **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp max. power 40. previous month	
FCh 84h 01h	DIF+2×DIFE: 8-digit BCD, **error value**, cell number 41 = **40. previous month value**	6.32*41
22h / 23h	VIF: **ON-time** (**hours** / days) = **missing hours** / days	
00h 00h 00h 00h	00000000 **hours**	
CCh 84 01h	DIF+2×DIFE: 8-digit BCD, **current value**, cell number 41 = **40. previous month value**	6.8*41
06h / 07h / 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
00h 00h 00h 00h	00000000 **kWh**	
CCh A4h 01h	DIF+2×DIFE: 8-digit BCD, **current value**, tariff 2 = **tariff register 1**, cell number 41 = **40. previous month value**	6.8.1*41 / 6.8.2*41 / 6.8.3*41
06h / 07h/ 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
00h 00h 00h 00h	00000000 **kWh**	
CCh B4 01h	DIF+2×DIFE: 8-digit BCD, **current value**, tariff 3 = **tariff register 2**, cell number 41 = **40. previous month value**	6.8.4*41
06h / 07h/ 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
00h 00h 00h 00h	00000000 **kWh**	
CCh 84h 11h	DIF+2×DIFE: 8-digit BCD, **current value**, tariff 4 = **tariff register 3**, cell number 41 = **40. previous month value**	6.8.5*41
06h / 07h/ 0Eh / 0Fh / FBh 09h	VIF: **energy** (**kWh**, MWh/100, MWh, MJ, GJ/100, GJ)	
00h 00h 00h 00h	00000000 **kWh**	
CCh 84h 01h	DIF+2×DIFE: 8-digit BCD, **current value**, cell number 41 = **40. previous month value**	6.26*41
14h / 15h / 16h	VIF: **volume** (**m³/100**, m³/10, m³)	
00h 00h 00h 00h	000000.00 **m³**	

Telegram bytes	Data telegram in previous month readout mode **Explanation**	DIN EN 62056-21
CCh 84h 01h	DIF+2×DIFE: 8-digit BCD, **current value**, cell number 41 = **40. previous month value**	9.31*41
26h / 27h	VIF: **flow rate time** (**hours** / days)	
00h 00h 00h 00h	00000000 **hours**	
CCh C4h 01h	DIF+2×DIFE: 8-digit BCD, **current value**, device (unit) 1 = **pulse input 1**, cell number 41 = **40. previous month value**	8.26.1*41
16h	VIF: **volume** (**m^3**)	
00h 00h 00h 00h	00000000 **m^3**	
8Ch 81h 40h	DIF+2×DIFE: 8-digit BCD, **previous month value**, device (unit) 2 = **pulse input 2**, cell number 41 = **40. previous month value**	8.26.2*41
16h	VIF: **volume** (**m^3**)	
00h 00h 00h 00h	00000000 **m^3**	
C4h 84h 01h	DIF+2×DIFE: 32-Bit integer, **current value**, cell number 41 = **40. previous month value**	9.36.6*41
6Dh	VIF: **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp 40. previous month value	
DAh 94h 01h	DIF+2×DIFE: 4-digit BCD, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.40*41
62h	VIF: **temperature difference** (**K/10**)	
00h 00h	000.0 **K**	
D4h 94h 01h	DIF+2×DIFE: 32-Bit integer, tariff 1 = **maximum**, cell number 41 = **40. previous month value**	9.36.7*41
E2h 6Fh	VIF+VIFE: **temperature difference**, **time / date** type F according to EN 13757-3 Annex A	
00h 00h 00h 00h	Empty value → timestamp max. temperature difference 40. MV	
0Fh	DIF: **manufacturer specific data**	
01h 04h	Firmware version 04.01	
00h	Reserved	
08h	Information byte: G4 compatible output, normal mode see table 5	
20h	Extension byte D0 with additional information D0.0 = 1 → F0 pre-warning D0.5 = 1 → automatic baud rate detection D0.6 = 1 → user lock set D0.7 = 0 → mounting in return flow / D0.7: = 1 → mounting in flow	
CS	**CS** = **checksum** (1 Byte)	
16h	Stop character	

Table 10: Output of 40th previous month (G4 compatible output);

6.2.8 Data telegram in logbook info telegram mode

The command "**68 06h 06h 68 53h/73h A 51h 0Fh AAh Log CS 16h**" with Log = 00h for logbook info causes the M-Bus module to switch to info telegram mode for the logbook.

At the same time, the module fetches the data for the logbook info telegram from the meter.

With the **REQ_UD2** read command, the data of the logbook info telegram is output on the M-Bus.

There follows a description of how this M-Bus output is to be interpreted.

Telegram bytes	Logbook info telegram **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Header of long frame, **L** = **length declaration** (e. g. 53h)	
08h	Response with data	
A	**A = M-Bus address** (1 byte), (e. g. 2Dh = 45)	9.6
72h	LSB first, header with length of 12 bytes	
44h 33h 22h 11h	**Secondary address = property number** e. g. 11223344	9.21
A7h 32h	Identification number for LUG ID = (ord('L')-64)*32*32+(ord('U')-64)*32+(ord('G')-64)	
04h	**M-Bus generation 4**	
04h	**Medium: heat**	
Z	**Z = Selection meter** (1 byte)	
S	**S = Status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	Signature	
0Fh	DIF: Start of manufacturer-specific data	
00h	Information byte about association of the info telegram, (variable "Log") e. g. 00h → log book	
30h 30h 3Ch 39h 30h 26h 30h 30h 3Ch 3Dh 3Fh 26h 30h 30h 3Ch 36h 30h 26h 30h 30h 3Ch 38h 37h 26h 30h 30h 38h 30h 30h 26h 30h 30h 38h 38h 34h 26h 30h 30h 38h 39h 30h 26h 30h 30h 3Bh 32h 3Fh 26h 30h 30h 3Bh 33h 30h 26h 30h 30h 3Bh 3Fh 37h 26h 30h 31h 26h 32h 30h	Block of data for the info telegram Length of the data block = length L (from line 1) – 12h bytes In this example: Length of data block = 53h -12h bytes = 41h bytes	
0Ah	Information byte: G4 compatible output, info telegram mode see table 5	
CS	**CS** = **checksum** (1 byte)	
16h	Stop character	

Table 11: Output of the info telegram for the logbook

When decoded, the block of data for the info telegram from the example above looks like this:

Addr.: 45 No.: 44332211 Manuf.: LUG Gen.: 4
Med.: heat (mounting in flow) Cnt.:3 stat.:0

Logbook info telegram:

00C90&00CDF&00C60&00C87&00800&00884&00890&00B2F&00B30&00BF7&01&20

The method for converting the received data block into plain text output is described in appendix B.

6.2.9 Data telegram in data logger info telegram mode

The command "**68h 06h 06h 68h 53h/73h A 51h 0Fh AAh Log CS 16h**"

causes the M-Bus module to switch to info telegram mode for the data logger.

- The variable "Log" is 01h for the data logger hourly archive.
- The variable "Log" is 02h for the data logger daily archive.
- The variable "Log" is 03h for the data logger monthly archive.
- The variable "Log" is 04h for the data logger yearly archive.

At the same time, the module fetches the data for the logbook info telegram from the meter. With the **REQ_UD2** read command, the data of the logbook info telegram is output on the M-Bus.

There follows a description of how this M-Bus output is to be interpreted:

Telegram bytes	Data telegram in previous month readout mode **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Header of long frame, **L = length declaration** (e. g. 50h)	
08h	Response with data	
A	**A = M-Bus address** (1 byte), (e. g. 2Dh = 45)	9.6
72h	LSB first, header with length of 12 bytes	
11h 22h 33h 44h	**Secondary address = property number** e. g. 44332211	9.21
A7h 32h	Identification number for LUG ID = (ord('L')-64)*32*32+(ord('U')-64)*32+(ord('G')-64)	
04h	Generation 4 meter	
04h	Medium: heat	
Z	**Z = selection meter** (1 byte)	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	Signature	
0Fh	DIF: Start of manufacturer-specific data	
01h	Information byte about association of the info telegram, (variable "Log") e. g. 01h → data logger hourly archive	

Telegram bytes	Data telegram in previous month readout mode **Explanation**	**DIN EN 62056-21**
0Fh 01h 30h 35h 3Ah 33h 38h 26h 30h 3Fh 3Eh 3Bh 3Fh 26h 30h 30h 30h 30h 26h 30h 33h 31h 34h 26h 30h 31h 30h 35h 30h 3Bh 30h 3Ch 30h 3Eh 30h 3Fh 30h 39h 30h 3Ah 26h 30h 38h 26h 30h 33h 26h 30h 3Ch 26h 30h 30h 26h 30h 26h 30h 26h 30h 26h 30h 26h 30h	Block of data for the info telegram Length of the data block = length L(from line 1) - 12h bytes In this example: Length of data block = 50h -12h bytes = 3Eh bytes	
0Ah	Information byte: G4 compatible output, info telegram mode see table 5	
CS	**CS = checksum** (1 byte)	
16h	Stop character	

Table 10: Output of the info telegram for the hourly archive of the data logger

When decoded, the block of data for the info telegram from the example above looks like this:

Addr.: 45 No.: 44332211 Manuf.: LUG Gen.:4
Med.: heat (mounting in flow) Cnt.:3 Stat.:0

Data logger hourly archive info telegram:

05A38&0FEBF&0000&0314&01050B0C0E0F090A&08&03&0C&00&0&0&0&0&0&0

The method for converting the received data block into plain text output is described in appendix C.

6.2.10 Data telegram in EEPROM readout mode

The command

"**68h 09h 09h 68h 53h/73h A 51h 0Fh A9h Blk0 Blk1 Blk2 Blk3 CS 16h**"

causes the M-Bus module to switch to EEPROM readout mode.

- The variables **Blk0**, **Blk1**, **Blk2** and **Blk3** contain 5 characters for the starting address from which EEPROM should be read and 3 characters for the number of bytes -1byte to be transmitted, in the hexadecimal form "aaaaannn".
- Example: EEPROM should be read from the address **"1BCDEh"** for **"228 Bytes"**.The address is already in hex format. One byte must be subtracted from the 228 bytes → **227 Bytes**; this is **"3Eh"** in hex format. The address parameter **aaaa** becomes **"1BCDE"**, the number parameter **nnn** becomes **"0E3"**. Therefore:
- **Blk0 → "1Bh"**
- **Blk1 → "CDh"**
- **Blk2 → "E0h"**
- **Blk3 → "3Eh"**

Example:

"68h 09h 09h 68 53h 2Dh 51h 0Fh A9h 1Bh CDh E0h 3Eh CS 16h"

At the same time, the module fetches the required EEPROM data from the meter.

With the **REQ_UD2** read command, the EEPROM data is output on the M-Bus.

There follows a description of how this M-Bus output is to be interpreted.

Telegram bytes	EEPROM readout data telegram **Explanation**	**DIN EN 62056-21**
68h **L L** 68h	Header of long frame, **L = length declaration** (e. g. 54h)	
08h	Response with data	
A	**A = M-Bus address** (1 byte), (e. g. 2Dh = 45)	9.6
72h	LSB first, header with length of 12 bytes	
11h 22h 33h 44h	**Secondary address = property number** e. g. 44332211	9.21
A7h 32h	Identification number for LUG ID = (ord('L')-64)*32*32+(ord('U')-64)*32+(ord('G')-64)	
04h	Generation 4 meter	
04h	Medium: heat	
Z	**Z = selection meter** (1 byte)	
S	**S = status** (1 byte) Bit 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	(F)
00h 00h	Signature	
0Fh	DIF: start of manufacturer-specific data	
1Bh CDh E0h 3Eh	Information bytes of calling parameter aaaaannn (**Blk0** to **Blk3**)	
01h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 01h FFh 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 01h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 01h FFh 00h 00h 00h 00h 00h	Block of EEPROM data Length of the data block = length L (from line 1) - 15h bytes In this example: Length of data block = 54h -15h bytes = 3Fh bytes	
09h	Information byte: G4 compatible output, EEPROM output mode see table 5	
CS	**CS = checksum** (1 byte)	
16h	Stop character	

Table 11: Output of the info telegram for the hourly archive of the data logger

When decoded, the block of data for the info telegram from the example above looks like this:

Addr.: 45 Nr.:44332211 Manuf.: LUG Gen.: 4
Med.: heat (mounting in flow) Cnt.:3 Stat.: 0

EEPROM data **03Eh** + 1 byte from address **1BCDEh**

01h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h
01h FFh 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h
00h 00h 00h 00h 00h 01h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h 00h
00h 00h 00h 00h 00h 01h FFh 00h 00h 00h 00h

To save power and time, the EEPROM data is transmitted in a packed format.

Note: During reading, the EEPROM works with a “wrap around”, this means: if the largest EEPROM address is reached during reading and further data is read in the same command, the reading is continued from the EEPROM address “00000”.

Note: For syntax reasons, the M-Bus module can transmit a maximum of 228 bytes of read EEPROM data in a variable frame. If more data is requested in a read command, the module reduces the number of data bytes output to 228 bytes.

7 Appendices

7.1 Appendix A: Explanation of pseudo-hex

The hexadecimal numbers in the range 0h to 9h are represented as normal by the ASCII values 30h to 39h.
The hexadecimal numbers in the range Ah to Fh are conventionally represented as the ASCII values 4Ah to 5Ah. To simplify the data transmission of the meter, we transcribe these characters into pseudo-hex code: 3Ah to 3Fh (corresponding to the following ASCII characters:

Hex-character	0..9	A	B	C	D	E	F
Pseudo-hex character	0..9	:	;	<	=	>	?

Table 22: Explanation pseudo-hex

7.2 Appendix B: Decoding the info telegram for the log book

Decoding of the data block takes place in the following steps:

The undecoded block is:
30h 30h 3Ch 39h 30h 26h 30h 30h 3Ch 3Dh 3Fh 26h 30h 30h 3Ch 36h 30h 26h 30h 30h 3Ch 38h 37h 26h 30h 30h 38h 30h 30h 26h 30h 30h 38h 38h 34h 26h 30h 30h 38h 39h 30h 26h 30h 30h 3Bh 32h 3Fh 26h 30h 30h 3Bh 33h 30h 26h 30h 30h 3Bh 3Fh 37h 26h 30h 31h 26h 32h 30h

First, all the separator characters (&= ASCII character 26h) are decoded:
30h 30h 3Ch 39h 30h **&** 30h 30h 3Ch 3Dh 3Fh **&** 30h 30h 3Ch 36h 30h **&** 30h 30h 3Ch 38h 37h **&** 30h 30h 38h 30h 30h **&** 30h 30h 38h 38h 34h **&** 30h 30h 38h 39h 30h **&** 30h 30h 3Bh 32h 3Fh **&** 30h 30h 3Bh 33h 30h **&** 30h 30h 3Bh 3Fh 37h **&** 30h 31h **&** 32h 30h
The characters between the separator characters (“&”) are now in pseudo-hex code (see appendix A) encrypted hex numbers.

Hex numbers shown as digits:
0h 0h Ch 9h 0h **&** 0h 0h Ch Dh Fh **&** 0h 0h Ch 6h 0h **&** 0h 0h Ch 8h 7h **&** 0h 0h 8h 0h 0h **&** 0h 0h 8h 8h 4h **&** 0h 0h 8h 9h 0h **&** 0h 0h Bh 2h Fh **&** 0h 0h Bh 3h 0h **&** 0h 0h Bh Fh 7h **&** 0h 1h **&** 2h 0h

Resulting in the plain text:

00C90&00CDF&00C60&00C87&00800&00884&00890&00B2F&00B30&00BF7&01&20

Structure of the logbook info string:

Data		
aaaaa&bbbbb&eeeee&fffff&ggggg&hhhhh&iiiii&kkkkk&lllll&mmmmm&nn&xx, **where:**		
aaaaa, bbbbb	=	Start and end address of the Q area
eeeee, fffff	=	Start and end address of the meter properties (MLFB)
ggggg, hhhhh	=	Start and end address of the logbook previous month area
iiiii, kkkkk	=	Start and end address of the logbook shift register
lllll, mmmmm	=	Start and end address of the logbook circular buffer
nn	=	The meter internal month index
xx	=	Type of EEPROM used

Table 33: logbook info-string

The data from ggggg to nn is important for the pure logbook information. From this information, a suitably programmed M-Bus master can use a read EEPROM command to read the EEPROM data from the meter and hence decode the logbook of the meter.

7.3 Appendix C: Decoding the info telegram for a data logger archive

Start: The undecoded block is:

30h 35h 3Ah 33h 38h 26h 30h 3Fh 3Eh 3Bh 3Fh 26h 30h 30h 30h 30h 26h 30h 33h 31h 34h 26h 30h 31h 30h 35h 30h 3Bh 30h 3Ch 30h 3Eh 30h 3Fh 30h 39h 30h 3Ah 26h 30h 38h 26h 30h 33h 26h 30h 3Ch 26h 30h 30h 26h 30h 26h 30h 26h 30h 26h 30h 26h 30h 26h 30h

Step 1: Decode the separator characters (&= ASCII character 26h):

30h 35h 3Ah 33h 38h **&** 30h 3Fh 3Eh 3Bh 3Fh **&** 30h 30h 30h 30h **&** 30h 33h 31h 34h **&** 30h 31h 30h 35h 30h 3Bh 30h 3Ch 30h 3Eh 30h 3Fh 30h 39h 30h 3Ah **&** 30h 38h **&** 30h 33h **&** 30h 3Ch **&** 30h 30h **&** 30h **&** 30h **&** 30h **&** 30h **&** 30h **&** 30h

The characters between the separator characters (“&”) are now in pseudo-hex code (see appendix A) encrypted hex numbers.

Step 2: Show hex numbers as digits:

0h 5h Ah 3h 8h **&** 0h Fh Eh Bh Fh **&** 0h 0h 0h 0h **&** 0h 3h 1h 4h **&** 0h 1h 0h 5h 0h Bh 0h Ch 0h Eh 0h Fh 0h 9h 0h Ah **&** 0h 8h **&** 0h 3h **&** 0h Ch **&** 0h 0h **&** 0h **&** 0h **&** 0h **&** 0h **&** 0h **&** 0h

Result in plain text:

05A38&0FEBF&0000&0314&01050B0C0E0F090A&08&03&0C&00&0&0&0&0&0&0

Structure of the data logger info string:

Data		
SSSSS&XXXXX&ssss&xxxx&aabbccdeeffgghh&mm&nn&MS&TT&k&j&z&x&y&t, **where:**		
SSSSS	=	EEPROM start address for the archive;
XXXXX	=	EEPROM end address for the archive;
ssss	=	Start pointer in the requested archive;
xxxx	=	Pointer to the current entry in the requested archive;
aa	=	Data source for channel 1;
bb	=	Data source for channel 2;
…	=	…
hh	=	Data source for channel 8;
mm	=	Data logger width (number of channels);
nn	=	Averaging time in yearly archive;
MS	=	Measurement section;
TT	=	Tariff type;
k	=	Flag EP_Kilo;
j	=	Flag EP_Joule;
z	=	Flag EP_BZeitStd;
x	=	Decimal place – pulse input 1;
y	=	Decimal place – pulse input 2;
t	=	Flag TF_VolReg;

Table 44: Structure of the data logger info string

From this information, a suitably programmed M-Bus master can use a Read EEPROM command to read the EEPROM data from the meter and hence decode the data logger archive of the meter.

7.4 Appendix D: Decoding of the manufacturer-specific error flags

The output of manufacturer-specific error flags can permanently be selected with the service software in UH50.

Telegram bytes	Explanation	DIN EN 62056-21
68h **L L** 68h	Header of long frame, **L = length information**	
08h **A** 72h	Variable structure, LSB first, **A = M-Bus address** (1 byte)	9.6
A7h 32h	Identification number for LUG ID=(ord('L')-64)*32*32+(ord('U')-32)*32+(ord('G')-64)	
04h	Version 4	
04h	Medium: heat	
Z	**Z = access counter** (1 byte)	
S	**S = status** (1 byte) BIT 0..4: according to EN 13757-3 telegram bytes Bit 5: 1 = negative power Bit 6: 1 = negative flow rate Bit 7: 1 = negative temperature difference	F
⋮		
02h	DIF: manufacturer-specific data	
FDh 17h	VIF+VIFE: **error flags (binary) (manufacturer-specific)**	
00h 07h	00h 07h (msb – 0000 0000 0000 0111 –lsb) In example: F0, F1, F2 For exact allocation of the 16 bits see table 16.	
0Fh	Separator	9.7
01h 04h	Firmware version 04.01	
00h	Reserved	
01h	Information byte: G4 compatible output, fast readout mode; see Table 55	
21h	Extension byte D0 with additional information D0.0 = 1: F0-prewarning D0.5 = 1: automatic baud rate detection D0.6 = 1: user lock set D0.7 = 0/1: mount in return/flow	
CS	**CS = checksum** (1 byte)	
16h	Stop character	

Table 15: Example output of error bits on the M-Bus

Bit-No.	Name	Explanation
0	F0	Flow measurement fault (e. g. air in measuring tube)
1	F1	Interruption in the hot side temperature sensor
2	F2	Interruption in the cold side temperature sensor
3	F3	Electronics for temperature evaluation defective
4	F4[1]	Problem with the power supply; Battery flat
5	F5	Short circuit in the hot side temperature sensor
6	F6	Short circuit in the cold side temperature sensor
7	F7	Fault in the internal memory holding (ROM or EEPROM)
8	F8	F1, F2, F3, F5 or F6 for longer than 8 hours
9	F9	Fault in the electronics (ASIC)
10	Contamination prewarning	Contamination prewarning in the easuring tube
11	EEPROM prewarning[2]	Solvable fault in EP range of the EEPROM or fault in the non-EP range of the EEPROM
12	EP_NTA_DIFF	Set in NTA mode, when the device time (meter) differs from the NTA-time set command more than 60 seconds
13	Leakage	UW50: mirrors bit No. 1, otherwise 0
14	-	Always 0
15	-	Always 0

Table 16: Mapping of device-specific error bits

[1] In the UH50 firmware FW5.15 the error bit of F5 is duplicated.
From UH50 firmware version ≥ FW5.16 the error doesn't occur anymore.
[2] In the UH50 firmware FW5.15 the error "EEPROM prewarning" is always displayed wrongly.
From UH50 firmware version ≥ FW5.16 the error doesn't occur anymore.

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