



### Contents

1	Introduction .....	3
2	Communication interfaces .....	3
2.1	Telegram formats .....	3
2.2	UART.....	3
Baud rates .....	3	
Parity detection .....	3	
2.3	Protocol layer .....	3
2.4	Connection set-up for M-Bus .....	3
2.5	Addressing.....	3
2.5.1	Selection (secondary address) .....	4
3	Reading the meter: .....	4
3.1	Standard data reading (Application Reset 0) .....	4
3.2	Request response .....	5
3.3	Interpretation of data .....	5
4	Customer telegram .....	5
5	Parametrization of meter .....	5
5.1	Structure of command set .....	5
5.2	Date and time .....	6
5.3	New primary address .....	6
5.4	Serial number / customer number .....	6
5.5	New reading date 1 .....	6
6	Appendix 1 Telegram data for Real Data Radio, Open Metering Radio and M-Bus Communication	7
7	Appendix 2 M-Bus units.....	10
8	Description of LC display .....	17

## 1 Introduction

The M-Bus (Meter Bus) is an European standard for remote reading of meters. It can be used for all types of consumption meters and for various sensors and actuators.

This document does not deal with the M-Bus protocol in detail. Further information about this can be found on the Internet at [www.m-bus.com](http://www.m-bus.com).

## 2 Communication interfaces

HYDRUS is equipped with an M-Bus communication interface:

- M-Bus communication is over a two-wire line.

### 2.1 Telegram formats

Communication complies with:

- IEC 870-5-1 Telecontrol equipment and systems; Transmission protocols; Section One – Transmission frame formats.

### 2.2 UART

#### Baud rates

- M-Bus: 300 and 2400 bauds (300 bauds: transmission in Interrupt Mode), no automatic baud rate switching

#### Parity detection

to IEC 870-5-1; 8 data bits; even parity; 1 stop bit (8E1)

### 2.3 Protocol layer

1. IEC 870-5-1 corresponding to EN 1434-3
2. Data output (RSP\_UD)
  - a) Variable protocol
  - b) Least Significant Byte first (mode 1) for multi-byte variables
  - c) All response telegrams also available for C1 errors

### 2.4 Connection set-up for M-Bus

After connection to the M-Bus, the MSP430 interface module needs max. 590 ms before it is ready for reliable communication. => A wait time of 590 ms must be observed between connection of the M-Bus and the start of communication.

### 2.5 Addressing

The meter can be addressed using two addressing variants: with a logic address (primary address) or by using a secondary address.

### 2.5.1 Selection (secondary address)

Request telegram: 68 0B 0B 68 53 FD 52 NN NN NN NN HH HH ID MM CS 16  
 Response: E5 (only if filter matches)

Structure of filter:

4-byte BCD	NN (serial number)	\$F digit joker
2-byte HST	HH (manufacturer code)	\$FF byte joker
1 byte ID (HYDRUS: \$24)	ID (ident. code)	\$FF joker
1-byte SMED	MM (medium code)	\$FF joker

After selection, the meter behaves as if it also had the primary address \$FD, and can therefore be operated via the primary address \$FD (response always with own primary address).

## 3 Reading the meter:

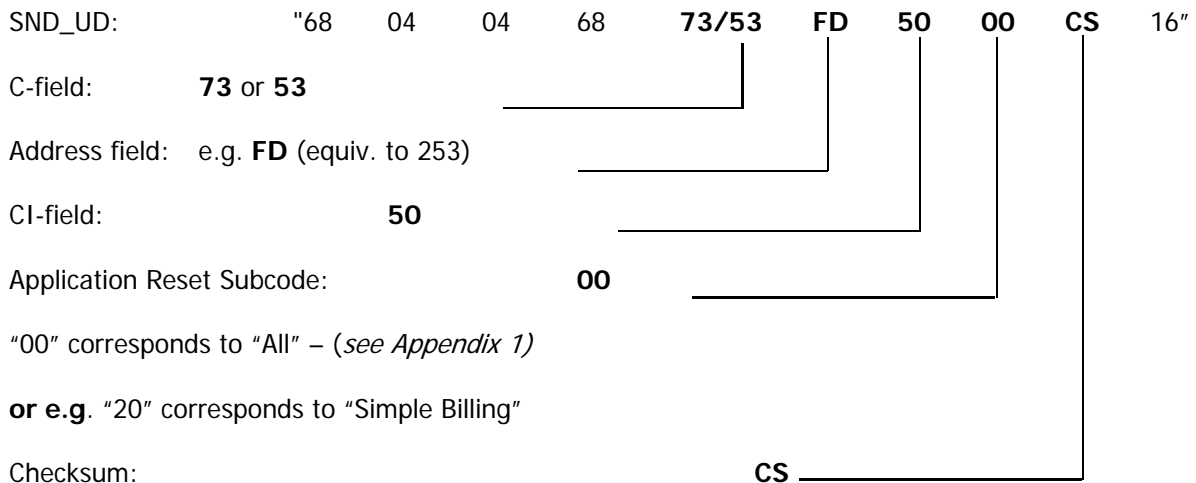
Procedure:

1. Define response – “Define response values”
2. Request response
3. Interpretation of data

### 3.1 Standard data reading (Application Reset 0)

Meter reading always uses a long frame with the following structure:

To make sure the default value “0” (All) is obtained, an Application Reset should be carried out with subcode “0”:



### 3.2 Request response

The following command must be sent to obtain a response from the meter:

Request telegram		Response
REQ_UD2	10 7B <i>FD*</i> CS 16	RSP_UD

*FD\** : Address

### 3.3 Interpretation of data

The data received basically corresponds to the protocol structure of EN1375-3.  
The units are defined in *Appendix 2*.

## 4 Customer telegram

Registers can be read or programmed direct in the meter using subtables.  
The customer telegram can be used for M-Bus, Open Metering Radio or Real Data Radio.

The IZAR@MOBILE 2 program from Diehl Metering can be used to set the customer telegram.  
This program can be downloaded at:

[www.diehl.com/metering](http://www.diehl.com/metering)

## 5 Parametrization of meter

The meter is equipped with a number of registers that can be set without breaking the verification seal.

### 5.1 Structure of command set

Byte	Meaning	Description/content/value
	Header Long Frame (HLF)	
HLF 1	1st start character	\$68
HLF 2	Long field	3 + x
HLF 3	Long field	3 + x
HLF 4	2nd start character	\$68
HLF 5	C-field	\$53 SND_UD
HLF 6	A-field	(Bus) address of meter
HLF 7	CI-field	\$51 data send mode 1
	Variable Data Blocks (VDB)	
VDB 1.. VDB x		
	End of Long Frame (ALF)	
ALF 1	Checksum	
ALF 2	Stop character	\$16

### 5.2 Date and time

The date and time can be changed with the following telegram:

Send:

\$68 \$09 \$09 \$68 \$53 \$ FE \$51 **\$04 \$6D [Date Time (4-byte Mbus type F)]** Check \$16

Example: (15.05.2006):

\$68 \$09 \$09 \$68 \$53 \$FE \$51 \$04 \$6D \$0F \$0A \$CF \$05 \$00 \$16

Read: \$E5

If PLEV = 1, the day, month and year can be changed.

### 5.3 New primary address

The new M-Bus address AI can be defined with the following telegram:

Send:

68 06 06 68 53 Adr 51 01 7A AI Check 16

Read:

E5

Special cases:

A-field	Function	Use
\$FD	Code for secondary addressing	Secondary addressing
\$FE	Broadcast (to all) with response	Only one meter connected
\$FF	Broadcast (to all) without response	System-wide control

### 5.4 Serial number / customer number

The new meter number NNUM can be defined with the following telegram:

Send:

68 09 09 68 53 Adr 51 0C 79 NNUM Check 16

Read:

E5

**Note: The NNUM is part of the secondary address.**

### 5.5 New reading date 1

The next reading date 1 ST1DATEZ can be changed with the following telegram:

Send:

68 08 08 68 53 Adr 51 42 EC 7E [Date (2-byte Mbus type G)] Check 16

Read:

E5

### 6 Appendix 1 Telegram data for Real Data Radio, Open Metering Radio and M-Bus Communication

Application Reset Subcode:

Application Reset Subcode	Telegram data
0 (0x00) "All"	Current total volume Current return volume Current forward volume Current flow rate Current operating hours Current medium temperature °C Current ambient temperature °C Current date and time Reading date (memory number = 1) <ul style="list-style-type: none"> <li>• Volume</li> <li>• Return volume</li> <li>• Forward volume</li> <li>• Date</li> <li>• Next reading date</li> </ul> Date next due date
1 (0x10) "User data"	As 0
2 (0x20) "Simple billing"	As 0
3 (0x30) "Enhanced billing"	As 0
4 (0x40) "Multi tariff billing"	As 0
5 (0x50) "Instantaneous values"	Current total volume Current return volume Current forward volume Current flow rate Current operating hours Current temperature °C Current ambient temperature °C
6 (0x60) "Load management values for management"	Proprietary data number: 4 -> \$0F \$04 SWVER READPTR <i>bytes (number = READLEN)</i> <ul style="list-style-type: none"> <li>• With Application Reset Subcode = 0x60, READPTR = 0x1A00 and READLEN = 128</li> <li>• READPTR is automatically incremented by READLEN for each REQ_UD2</li> </ul>
7 (0x70) "Reserved"	As 0
8 (0x80) "Installation and startup"	Other FW-Version FabricationNumber Metrological FW-Version Current date and time Next reading date

9 (0x90) "Testing"	Proprietary data number 7 (\$0F \$07) 1 byte USDFCNT 3 bytes USDIFFT 1 byte KOMMAKF 7 bytes for read time of volume accumulator BCD mode 1; unit 10 <sup>-6</sup> volume display unit 3 bytes volume quantum with binary fraction; unit 1/256 volume accumulator 2 bytes meter temperature 2 bytes time stamp 8 Hz after decimal point value 32768 Hz 2 bytes time stamp 8 Hz 1 byte EMPFZKOR 2 bytes USDSCAL calibration value dual slope 1 byte US4MCAL calibration value 4 MHz resonator 4 bytes phase1, phase2 raw values last US measurement 1 byte USMNEG measuring direction last US measurement 2 bytes USDS1US reference value 1 µs 1 byte KOMMAV 1 byte unit (VOLUNIT)
10 (0xA0) "Calibration"	Meter temperature Proprietary data number 8 (\$0F \$08) EICHAK, EICHCNT, EICHWERT, EICHSTAT, 0xFF, VIF
11 (0xB0) "Manufacturing"	Proprietary data number: 4 -> \$0F \$04 SWVER READPTR <i>bytes (number = READLEN)</i> <ul style="list-style-type: none"> <li>• With Application Reset Subcode = 0xB0,     READPTR = 0x200 and READLEN = 225 Bytes maximum possible length</li> <li>• READPTR is automatically incremented by READLEN for each REQ_UD2</li> </ul>
12 (0xC0) "Development"	As 11 without Init READPTR and READLEN
13 (0xD0) "Selftest"	Current total volume Current date and time
14 (0xE0) "Reserved"	As 0
15 (0xF0) "Reserved"	RAMTEL → (= customer telegram)

Registers can be read or programmed direct in the meter using subtables (Appendix 1).  
The IZAR@MOBILE 2 program from Diehl Metering can be used to set the customer telegram.  
This program can be downloaded at:

[www.diehl.com/metering](http://www.diehl.com/metering)



The following standard radio telegram is programmed (Application Reset Subcode 15) as default for **Real Data Radio and Open Metering Radio** (transmit interval min. 8s, battery lifetime up to 16 years with 2 batteries):

- 1) Radio telegram counter
- 2) Current volume (total)
- 3) Annual accounting date (volume, forward volume, return volume, date)
- 4) Current flow rate
- 5) Battery lifetime
- 6) Water temperature in °C
- 7) Flash log day and date
- 8) Flash log volume

The following standard M-Bus telegram is programmed (Application Reset Subcode 0) as default for **M-Bus** (battery lifetime up to 12 years with 1 battery):

- 1) Current volume (total)
- 2) Current reverse flow
- 3) Current forward volume
- 4) Current flow rate
- 5) Current operating hours
- 6) Water temperature °C
- 7) Ambient temperature °C
- 8) Current date and time
- 9) Annual accounting date (volume, forward volume, return volume, date)
- 10) Date next due date

To get the configured telegram via M-Bus, the customer has to send an Application Reset Subcode 15 (0xF0) to the meter.

Standard DMDE **M-Bus** telegram (Application Reset Subcode 15):

- 1) Radio telegram counter
- 2) Current volume (total)
- 3) Annual accounting date (volume, forward volume, return volume, date)
- 4) Current flow rate
- 5) Battery lifetime
- 6) Water temperature in °C
- 7) Flash log day and date
- 8) Flash log volume

**Please note the following:**

When sending an empty Application Reset, the HYDRUS versions behave as follows:

HYDRUS 1.0 (F03-003):

Current Application Reset Subcode persists.

HYDRUS 1.1 (F04-005) and newer versions:

Current Application Reset Subcode is automatically changed to Application Reset Subcode 0 (0x00).

Appendix 2 M-Bus units		
Value	DIF	VIF
Total volume m <sup>3</sup> ,0	0x0C	0x16
Total volume m <sup>3</sup> ,1	0x0C	0x15
Total volume m <sup>3</sup> ,2	0x0C	0x14
Total volume m <sup>3</sup> ,3	0x0C	0x13
Total volume ft <sup>3</sup> ,0	0x0C	0xFB 0xA1 0x77
Total volume ft <sup>3</sup> ,1	0x0C	0xFB 0x21
Total volume ft <sup>3</sup> ,2	0x0C	0xFB 0xA1 0x75
Total volume ft <sup>3</sup> ,3	0x0C	0xFB 0xA1 0x74
Total volume gal,0	0x0C	0x93 0x3D
Total volume gal,1	0x0C	0x92 0x3D
Total volume gal,2	0x0C	0x91 0x3D
Total volume gal,3	0x0C	0x90 0x3D
Total volume igal,0	0x0C	0x7C 0x04 0x6C 0x61 0x67 0x69
Total volume igal,1	0x0C	0xFC 0x75 0x04 0x6C 0x61 0x67 0x69
Total volume igal,2	0x0C	0xFC 0x74 0x04 0x6C 0x61 0x67 0x69
Total volume igal,3	0x0C	0xFC 0x73 0x04 0x6C 0x61 0x67 0x69
Total volume l,0	0x0C	0x13
Total volume l,1	0x0C	0x12
Total volume l,2	0x0C	0x11
Total volume l,3	0x0C	0x10
Return volume	0x8C 0x10	depends on unit (see total volume)
Forward volume	0x8C 0x20	depends on unit (see total volume)
Bacterial risc count	0x8C 0x10	BCRIVIF
Flow rate m <sup>3</sup> /s,2	0x0B	0x4F
Flow rate m <sup>3</sup> /s,3	0x0B	0x4E
Flow rate m <sup>3</sup> /s,4	0x0B	0x4D
Flow rate m <sup>3</sup> /s,5	0x0B	0x4C
Flow rate m <sup>3</sup> /s,6	0x0B	0x4B
Flow rate m <sup>3</sup> /min,0	0x0B	0x47
Flow rate m <sup>3</sup> /min,1	0x0B	0x46
Flow rate m <sup>3</sup> /min,2	0x0B	0x45
Flow rate m <sup>3</sup> /min,3	0x0B	0x44
Flow rate m <sup>3</sup> /min,4	0x0B	0x43
Flow rate m <sup>3</sup> /min,5	0x0B	0x42
Flow rate m <sup>3</sup> /min,6	0x0B	0x41
Flow rate m <sup>3</sup> /h,0	0x0B	0x3E
Flow rate m <sup>3</sup> /h,1	0x0B	0x3D
Flow rate m <sup>3</sup> /h,2	0x0B	0x3C
Flow rate m <sup>3</sup> /h,3	0x0B	0x3B
Flow rate m <sup>3</sup> /h,4	0x0B	0x3A
Flow rate m <sup>3</sup> /h,5	0x0B	0x39
Flow rate m <sup>3</sup> /h,6	0x0B	0x38
Flow rate l/s,0	0x0B	0x4E
Flow rate l/s,1	0x0B	0x4D
Flow rate l/s,2	0x0B	0x4C
Flow rate l/s,3	0x0B	0x4B
Flow rate l/s,4	0x0B	0x4A
Flow rate l/min,0	0x0B	0x44
Flow rate l/min,1	0x0B	0x43

Flow rate l/min,2	0x0B	0x42
Flow rate l/min,3	0x0B	0x41
Flow rate l/min,4	0x0B	0x40
Flow rate l/h,0	0x0B	0x3B
Flow rate l/h,1	0x0B	0x3A
Flow rate l/h,2	0x0B	0x39
Flow rate l/h,3	0x0B	0x38
Flow rate gal/s,0	0x0B	0x93 0xBD 0xA0 0x76
Flow rate gal/s,1	0x0B	0x93 0xBD 0xA0 0x75
Flow rate gal/s,2	0x0B	0x93 0xBD 0xA0 0x74
Flow rate gal/s,3	0x0B	0x93 0xBD 0xA0 0x73
Flow rate gal/s,4	0x0B	0x93 0xBD 0xA0 0x72
Flow rate gal/s,5	0x0B	0x93 0xBD 0xA0 0x71
Flow rate gal/s,6	0x0B	0x93 0xBD 0xA0 0x70
Flow rate gal/min,0	0x0B	0x93 0xBD 0xA1 0x76
Flow rate gal/min,1	0x0B	0x93 0xBD 0xA1 0x75
Flow rate gal/min,2	0x0B	0x93 0xBD 0xA1 0x74
Flow rate gal/min,3	0x0B	0x93 0xBD 0xA1 0x73
Flow rate gal/min,4	0x0B	0x93 0xBD 0xA1 0x72
Flow rate gal/min,5	0x0B	0x93 0xBD 0xA1 0x71
Flow rate gal/min,6	0x0B	0x93 0xBD 0xA1 0x70
Flow rate gal/h,0	0x0B	0x93 0xBD 0xA2 0x76
Flow rate gal/h,1	0x0B	0x93 0xBD 0xA2 0x75
Flow rate gal/h,2	0x0B	0x93 0xBD 0xA2 0x74
Flow rate gal/h,3	0x0B	0x93 0xBD 0xA2 0x73
Flow rate gal/h,4	0x0B	0x93 0xBD 0xA2 0x72
Flow rate gal/h,5	0x0B	0x93 0xBD 0xA2 0x71
Flow rate gal/h,6	0x0B	0x93 0xBD 0xA2 0x70
Flow rate ical/s,0	0x0B	0xFC 0xA0 0x76 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,1	0x0B	0xFC 0xA0 0x75 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,2	0x0B	0xFC 0xA0 0x74 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,3	0x0B	0xFC 0xA0 0x73 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,4	0x0B	0xFC 0xA0 0x72 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,5	0x0B	0xFC 0xA0 0x71 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/s,6	0x0B	0xFC 0xA0 0x70 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,0	0x0B	0xFC 0xA1 0x76 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,1	0x0B	0xFC 0xA1 0x75 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,2	0x0B	0xFC 0xA1 0x74 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,3	0x0B	0xFC 0xA1 0x73 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,4	0x0B	0xFC 0xA1 0x72 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,5	0x0B	0xFC 0xA1 0x71 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/min,6	0x0B	0xFC 0xA1 0x70 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,0	0x0B	0xFC 0xA2 0x76 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,1	0x0B	0xFC 0xA2 0x75 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,2	0x0B	0xFC 0xA2 0x74 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,3	0x0B	0xFC 0xA2 0x73 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,4	0x0B	0xFC 0xA2 0x72 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,5	0x0B	0xFC 0xA2 0x71 0x04 0x6C 0x61 0x67 0x69
Flow rate ical/h,6	0x0B	0xFC 0xA2 0x70 0x04 0x6C 0x61 0x67 0x69
Flow rate ft <sup>3</sup> /s,0	0x0B	0xFB, 0xA1, 0xA0, 0x77
Flow rate ft <sup>3</sup> /s,1	0x0B	0xFB, 0xA1, 0xA0, 0x76

Flow rate ft <sup>3</sup> /s,2	0x0B	0xFB, 0xA1, 0xA0, 0x75
Flow rate ft <sup>3</sup> /s,3	0x0B	0xFB, 0xA1, 0xA0, 0x74
Flow rate ft <sup>3</sup> /s,4	0x0B	0xFB, 0xA1, 0xA0, 0x73
Flow rate ft <sup>3</sup> /s,5	0x0B	0xFB, 0xA1, 0xA0, 0x72
Flow rate ft <sup>3</sup> /s,6	0x0B	0xFB, 0xA1, 0xA0, 0x71
Flow rate ft <sup>3</sup> /min,0	0x0B	0xFB, 0xA1, 0xA1, 0x77
Flow rate ft <sup>3</sup> /min,1	0x0B	0xFB, 0xA1, 0xA1, 0x76
Flow rate ft <sup>3</sup> /min,2	0x0B	0xFB, 0xA1, 0xA1, 0x75
Flow rate ft <sup>3</sup> /min,3	0x0B	0xFB, 0xA1, 0xA1, 0x74
Flow rate ft <sup>3</sup> /min,4	0x0B	0xFB, 0xA1, 0xA1, 0x73
Flow rate ft <sup>3</sup> /min,5	0x0B	0xFB, 0xA1, 0xA1, 0x72
Flow rate ft <sup>3</sup> /min,6	0x0B	0xFB, 0xA1, 0xA1, 0x71
Flow rate ft <sup>3</sup> /h,0	0x0B	0xFB, 0xA1, 0xA2, 0x77
Flow rate ft <sup>3</sup> /h,1	0x0B	0xFB, 0xA1, 0xA2, 0x76
Flow rate ft <sup>3</sup> /h,2	0x0B	0xFB, 0xA1, 0xA2, 0x75
Flow rate ft <sup>3</sup> /h,3	0x0B	0xFB, 0xA1, 0xA2, 0x74
Flow rate ft <sup>3</sup> /h,4	0x0B	0xFB, 0xA1, 0xA2, 0x73
Flow rate ft <sup>3</sup> /h,5	0x0B	0xFB, 0xA1, 0xA2, 0x72
Flow rate ft <sup>3</sup> /h,6	0x0B	0xFB, 0xA1, 0xA2, 0x71
Flow rate if error (ZVDUFLU = 0xEBBDDD)	0x3B	depends on flow unit
Date time (DTFZEIT)	0x04	0x6D
Operating hours (ONTIME)	0x0B	0x26
Medium temperature °C (ZTEMPC)	0x02	0x5A
Medium temperature °F (ZTEMPF)	0x02	0xDA 0x3D
Temperature if error	0x32	XX
Error status (ZVERRBI)	0x02	0xFD 0x17
Other-FW-Version	0x03	0xFD 0x0F Main Sub Patch
Metrological FW-Version	0x01	0xFD 0x0E MetrologicalFWVersion
Remaining battery life (REMABATD)	0x02	0xFD 0x74
Battery renewal date (BATDATE)	0x02	0xFD 0x70
Minimum flow rate	0x2B	depends on unit (see flow rate)
Maximum flow rate	0x1B	depends on unit (see flow rate)
Reading date total volume	0x4C	depends on unit (see total volume)
Reading date total volume if not yet available (reading date = 0x0000)	0x7C	depends on unit (see total volume)
Reading date return volume	0xCC 0x10	depends on unit (see total volume)
Reading date return volume if not yet available (reading date = 0x0000)	0xFC 0x10	depends on unit (see total volume)
Reading date forward volume	0xCC 0x20	depends on unit (see total volume)
Reading date forward volume if not yet available (reading date =	0xFC 0x20	depends on unit (see total volume)

0x0000)		
Reading date bacterial risc count	0xCC 0x10	BCRIVIF
Reading date bacterial risc count if not yet available (reading date = 0x0000)	0xFC 0x10	BCRIVIF
Reading date (!= 0x0000)	0x42	0x6C
Reading date if not yet available ( = 0x0000)	0x72	0x6C
Next reading date	0x42	0xEC 0x7E
Reading date last year total volume	0x8C 0x01	depends on unit (see total volume)
Reading date last year total volume if not yet available (reading date = 0x0000)	0xBC 0x01	depends on unit (see total volume)
Reading date last year return volume	0x8C 0x11	depends on unit (see total volume)
Reading date last year return volume if not yet available (reading date = 0x0000)	0xBC 0x11	depends on unit (see total volume)
Reading date last year forward volume	0x8C 0x21	depends on unit (see total volume)
Reading date last year forward volume if not yet available (reading date = 0x0000)	0xBC 0x21	depends on unit (see total volume)
Reading date last year bacterial risc count	0x8C 0x11	BCRIVIF
Reading date last year bacterial risc count if not yet available (reading date = 0x0000)	0xBC 0x11	BCRIVIF
Reading date last year (!= 0x0000)	0x82 0x01	0x6C
Reading date last year if not yet available (= 0x0000)	0xB2 0x01	0x6C
Flashlog-0 total volume	0xCC 0x01	depends on unit (see total volume)
Flashlog-0 total volume if not yet available (= 0xFF)	0xFC 0x01	depends on unit (see total volume)
Flashlog-0 return volume	0xCC 0x11	depends on unit (see total volume)
Flashlog-0 return volume if not yet available (= 0xFF)	0xFC 0x11	depends on unit (see total volume)
Flashlog-0 forward volume	0xCC 0x21	depends on unit (see total volume)
Flashlog-0 forward volume if not yet	0xFC 0x21	depends on unit (see total volume)

available (= 0xFF)		
Flashlog-0 bacterial risk count	0xCC 0x11	BCRIVIF
Flashlog-0 bacterial risk count if not yet available (= 0xFF)	0xFC 0x11	BCRIVIF
Flashlog-0 minimum flow rate	0xEB 0x01	depends on unit (see flow rate)
Flashlog-0 minimum flow rate if not yet available (= 0xFF)	0xFB 0x01	depends on unit (see flow rate)
Flashlog-0 maximum flow rate	0xDB 0x01	depends on unit (see flow rate)
Flashlog-0 maximum flow rate if not yet available (= 0xFF)	0xFB 0x01	depends on unit (see flow rate)
Flashlog-0 current flow rate	0xCB 0x01	depends on unit (see flow rate)
Flashlog-0 current flow rate if not yet available (= 0xFF)	0xFB 0x01	depends on unit (see flow rate)
Flashlog-0 operating hour (ONTIME)	0xCB 0x01	0x26
Flashlog-0 operating hour (ONTIME) if not yet available (= 0xFF)	0xFB 0x01	0x26
Flashlog-0 current medium temperature °C	0xC2 0x01	0x5A
Flashlog-0 current medium temperature if not yet available (= 0xFF)	0xF2 0x01	0x5A
Flashlog-0 error hours counter	0xCA 0x01	0xA6 0x18
Flashlog-0 error hours counter if not yet available (= 0xFF)	0xFA 0x01	0xA6 0x18
Flashlog-0 date	0xC4 0x01	0x6D (Type F)
Flashlog-0 date if not yet available (= 0xFF)	0xF4 0x01	0x6D (Type F)
Flashlog-1 total volume	0x8C 0x02	depends on unit (see total volume)
Flashlog-1 total volume if not yet available (= 0xFF)	0xBC 0x02	depends on unit (see total volume)
Flashlog-1 return volume	0x8C 0x12	depends on unit (see total volume)
Flashlog-1 return volume if not yet available (= 0xFF)	0xBC 0x12	depends on unit (see total volume)

Flashlog-1 forward volume	0x8C 0x22	depends on unit (see total volume)
Flashlog-1 forward volume if not yet available (= 0xFF)	0xBC 0x22	depends on unit (see total volume)
Flashlog-1 bacterial risk count	0x8C 0x12	BCRIVIF
Flashlog-1 bacterial risk count if not yet available (= 0xFF)	0xBC 0x12	BCRIVIF
Flashlog-1 minimum flow rate	0xAB 0x02	depends on unit (see flow rate)
Flashlog-1 minimum flow rate if not yet available (= 0xFF)	0xBB 0x02	depends on unit (see flow rate)
Flashlog-1 maximum flow rate	0x9B 0x02	depends on unit (see flow rate)
Flashlog-1 maximum flow rate if not yet available (= 0xFF)	0xBB 0x02	depends on unit (see flow rate)
Flashlog-1 current flow rate	0x8B 0x02	depends on unit (see flow rate)
Flashlog-1 current flow rate if not yet available (= 0xFF)	0xBB 0x02	depends on unit (see flow rate)
Flashlog-1 operating hour (ONTIME)	0x8B 0x02	0x26
Flashlog-1 operating hour (ONTIME) if not yet available (= 0xFF)	0xBB 0x02	0x26
Flashlog-1 current medium temperature °C	0x82 0x02	0x5A
Flashlog-1 current medium temperature °C if not yet available (= 0xFF)	0xB2 0x02	0x5A
Flashlog-1 error hours counter	0x8A 0x02	0xA6 0x18
Flashlog-1 error hours counter if not yet available (= 0xFF)	0xBA 0x02	0xA6 0x18
Flashlog-1 date	0x84 0x02	0x6D (Typ F)
Flashlog-1 date if not yet available(= 0xFF)	0xB4 0x02	0x6D (Typ F)
Flashlog-2 total volume	0xCC 0x02	depends on unit (see total volume)
Flashlog-2 total volume if not yet available (= 0xFF)	0xFC 0x02	depends on unit (see total volume)
Flashlog-2	0xCC 0x12	depends on unit (see total volume)

return volume		
Flashlog-2 return volume if not yet available (= 0xFF)	0xFC 0x12	depends on unit (see total volume)
Flashlog-2 forward volume	0xCC 0x22	depends on unit (see total volume)
Flashlog-2 forward volume if not yet available (= 0xFF)	0xFC 0x22	depends on unit (see total volume)
Flashlog-2 bacterial risk count	0xCC 0x12	BCRIVIF
Flashlog-2 bacterial risk count if not yet available (= 0xFF)	0xFC 0x12	BCRIVIF
Flashlog-2 minimum flow rate	0xEB 0x02	depends on unit (see flow rate)
Flashlog-2 minimum flow rate if not yet available (= 0xFF)	0xFB 0x02	depends on unit (see flow rate)
Flashlog-2 maximum flow rate	0xDB 0x02	depends on unit (see flow rate)
Flashlog-2 maximum flow rate if not yet available (= 0xFF)	0xFB 0x02	depends on unit (see flow rate)
Flashlog-2 current flow rate	0xCB 0x02	depends on unit (see flow rate)
Flashlog-2 current flow rate if not yet available(= 0xFF)	0xFB 0x02	depends on unit (see flow rate)
Flashlog-2 operating hour (ONTIME)	0xCB 0x02	0x26
Flashlog-2 operating hour (ONTIME) if not yet available (= 0xFF)	0xFB 0x02	0x26
Flashlog-2 current medium temperature °C	0xC2 0x02	0x5A
Flashlog-2 current medium temperature °C if not yet available (= 0xFF)	0xF2 0x02	0x5A
Flashlog-2 error hours counter	0xCA 0x02	0xA6 0x18
Flashlog-2 error hours counter if not yet available (= 0xFF)	0xFA 0x02	0xA6 0x18
Flashlog-2 date	0xC4 0x02	0x6D (Type F)
Flashlog-2 date if not yet available (= 0xFF)	0xF4 0x02	0x6D (Type F)
Error hours counter (ERRHOUR)	0x0A	0xA6 0x18



PRIOS alarms (PRIOSAL)	0x03	0x67
Customer number (CUSTADR)	0x07	0x7A
Fabrication number	0x0C	0x78 4 Byte WNUM
Manufacturer's ID (basis for master password)	0x07	0x78 4 Byte WNUM 4 Byte WNUM
Ambient temperature °C	0x02	0x66
Ambient temperature if error	0x32	0x66
Overflow seconds counter	0x04	0xA4 0x6D (Operating time [s] -> Overflow Values)
Overflow event counter	0x02	0xFD 0xE1 0x6D (Cumulation Counter -> Overflow Values)
Ownership (ASCII) (OWSNMPID)	0x0D	0xFD 0x11 LENGTH
Ownership (8 digits BCD) (NNUM)	0x0C	0xFD 0x11
Meter Point ID (ASCII) (OWSNMPID)	0x0D	0xFD 0x10 LENGTH
Meter Point ID (8 digits BCD) (NNUM)	0x0C	0xFD 0x10
Radio Interval (of the current RF-Channel)	0x02	0xFD 0x3C
Radio telegram counter (is increased when sending a radio telegram, but not when sending the synchron-telegram)	0x01	0xFD 0x08

## 7 Description of LC display

### Operation:

Meter information can be called up on the LCD. The display information is arranged in a number of display loops. These display loops contain the display windows, which are provided by automatically changing displays (shown as display window in one line).

The display window can be changed by pressing the button. Each press of the button changes to the next display window.

To save the battery, the meter switches to sleep mode (display off) if the button is not pressed for approx. 4 minutes; it can be woken up by pressing the button.

After wake-up, the current status appears in the display for approx. 2 seconds if an error exists; e.g. error message E -- 7 -- A (air in the pipe).

Display sequence (ex works setting for HY Germany):

1. Current total volume
2. Display test (alternates between all on and all off)

3. Error messages (if error exists, e.g. "E -- 7 -- A")
4. Flow rate (m<sup>3</sup>/h), display → "Err" if not installed
5. Alternates between total volume on reading date and reading date
6. Current return volume
7. Alternates between software version and software checksum (e.g. "F01-001" → "C 46530")
8. Battery lifetime (display → "batt" alternating with date)

The parameters of the LC display can be configured with the IZAR@SET software and Bluetooth opto head.

Table of possible values of changing displays (LCD)

0 Total volume	1 Total volume high resolution @ PLEV = 0
2 Return volume	
3 Forward volume	
4 Flow rate	
5 Water temperature °C	
6 Water temperature °F	
7 Operating hours	
8 Error status	
9 Error status @ Error	
10 Error status @ PLEVNDEF = 1	
11 Display test all on	
13 Date	
14 SEC_Adr	15 Customer number (NNUM)
16 Pri Adr	17 Primary address
18 Software version, e.g. 'F01-000'	19 Checksum software
20	21

Parameter 'P-001'	Checksum parameter Checksum over InfoA	
22 UHF On or UHF Off or RADIOINST		
23 Batt	24 Battery renewal date	
5 Reading date	26 Total volume on reading date	
27 Reading date	28 Return volume on reading date	
29 'Out4'	30 Total volume high resolution	31 Flow rate
32 Total volume high resolution		
33 Error hours counter 'Eh xxxx'		
34 Measurement optical button button + LOGKD (HighByte)		
35 NNUM @ PLEV=0 (DISP = 14/15)		
36 'Out1'	37 Pulse value 1	
38 'Out2'	39 Pulse value 2	