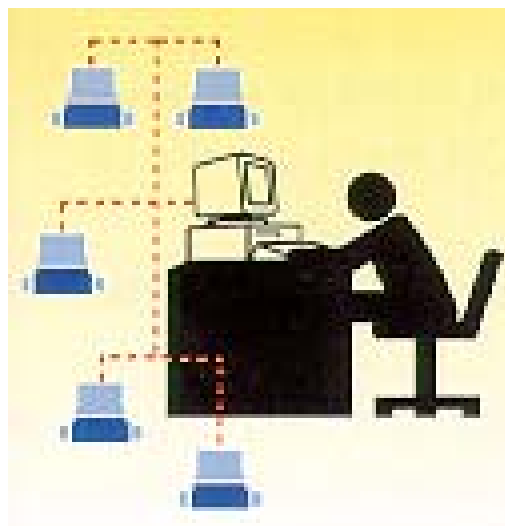


SCYLAR-HEAT

- *Communication description*



| Contents | Page |
|--|-------------|
| 1. INTRODUCTION | 2 |
| 2. GENERAL INFORMATION | 2 |
| 2.1 Protocol | 2 |
| 2.2 Addressing | 3 |
| 2.2.1 Primary Addressing | 3 |
| 2.2.2 Secondary Addressing | 3 |
| 2.3 Baudrate | 4 |
| 2.4 Readinglist | 4 |
| 3. SND_NKE | 5 |
| 4. SND_UD | 5 |
| 4.1 Switching Baudrate (Transmissionrate) | 5 |
| 4.2 Application Reset | 6 |
| 4.3 Change Primary Address | 6 |
| 4.4 Select Combimeter Specific Data | 6 |
| 5. REQ_UD2 | 7 |
| 5.1 Data Header | 7 |
| 6. EXAMPLE DATA RECORD | 7 |
| Appendix | 8 |

1. INTRODUCTION

The M-Bus („Meter-Bus“) is a new European standard for remote reading of heatmeters and it is also usable for all other types of consumption meters as well as for various sensors and actuators.

The *Combimeter II* has a M-Bus-Communicationport (default) and also the

possibility to use the M-Bus-protocol with help of an optical port (ZVEI, default) or a communicationmodule (RS-232, accessoires).

More details are not described here. Further information are available on the Internet-Web-Side <http://www.m-bus.com>.

2. General Information

2.1 Protocol

The protocol complies in all respects with the M-Bus Documentation Version 4.8 dated 11.11.1997 and with that IEC870-5 Teil 1, 2, 4 and EN 1434-3 Teil 3.

The dataprotocol consists of:
8 databits, even parity and 1 stopbit. If one byte with a wrong parity-bit is received, the total telegram will be canceled. The data are transferred on the physical level with 300, 600, 1200 oder 2400 baud halfduplex with 8 databits, 1 stopbit and 1 paritybit (even).

The least significant bit (LSB) is transmitted first (Mode 1). Therefore the „Modebit“ in the CI-field is not set. The FCV-bit in the C-field is set; the FCB-bit is toggled both SND_UD and REQ_UD2.

The procedures SND_NKE, SND_UD and REQ_UD2 are supported. All other functions are not executed and answered. The heatcounter answers with single character acknowledge („E5_H“)¹ or with the „RSP_UD“ telegram.

¹ A hexadecimal description is marked with a down-shifted H.

2.2 Addressing

2.2.1 Primary Addressing

The primary address is set to 0 (default) and can be changed with a M-Bus-Command permanently

| Primary Address | Purpose | Answer |
|-----------------|----------------------------------|--------|
| 255 | Broadcastaddress | no |
| 254 | Broadcastaddress, Point to Point | yes |
| 253 | Secondary addressing | yes |
| 1-250 | Primary addressing | yes |
| 0 | Not programmed meter | yes |

2.2.2 Secondary Addressing

The secondary address consists of the serial number (identification number of the manufacturer), the manufacturer code (24_H, 23_H=„Hyd“), the generation number (02_H) and the medium code (0C_H=heatcounter).

The slaves are chosen to their respective secondary address with help of the following command
:

| | | | | | | | | | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|------|------|-------|-------|-----|-----|----|-----------------|
| 68 _H | 0B _H | 52 _H | 68 _H | 53 _H | FD _H | 52 _H | ID 1 | ID 2 | ID 3 | ID 4 | Man 1 | Man 2 | Gen | Med | CS | 16 _H |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|------|------|-------|-------|-----|-----|----|-----------------|

The master sends a SND_UD with the control information 52_H to the address 253 (FD_H) and fills the specific meter (identification number, manufacturer, version, medium) with values of the slave which is to be addressed. The address FD_H and control information 52_H are information for the slave to compare the following secondary address with its own, and to change into the selected mode if they are identical.

In this case the slave answers with a E5_H, otherwise the slave does not send an answer. „Selected“ means, that this slave is addressed to the bus address FD_H. A joker FF_H can be sent for ID (identification-number), Gen (version), Man (manufacturer) and Med (medium), if they are unknown.

The selected slaves will be deselected by a SND_NKE, reset (CI-50_H) or by secondary address selection of a new slave. In case of extended secondary addressing the costumeraddress and -number (each 12 digits BCD) are used instead of the values mentioned above.

The costumeraddress and -number can be modified with a M-Bus-Command permanently (storing in not-transient memory, see command 016 resp. 017). Both values are set on „000000000000“ (default). A secondary adress selection can be made exclusive with the costu-meraddress or -number or else with costu-meraddress and -number (see command 030). If both values are used, the costumeraddress must be at the first position

2.3 Baudrate

The default baudrate is 300 baud, when the M-Bus is connected. When the optical port or the communicationmodule is in use, the baudrate is

2400 baud. The baudrate can be changed between 300, 600, 1200 or 2400 baud by using a M-Bus-Command (see command 009).

2.4 Readinglist

It does not make sense to send every value after every reading request („REQ_UD2“) due to the quantity of values, which can be read out. Instead of this a readinglist is used which contains not more than 10 elements. Every reading request is stored in this list. In case of „REQ_UD2“ all in the list stored requests will be worked out and sent in a „RSP_UD“-telegram. Only requests are stored in the reading list, not possible values. That means, until a „REQ_UD2“ was received, all

corresponding values are read. The reading list is organized as a ring buffer. If 10 elements exist and a further should be added, then the oldest element is put out automatically. The complete reading list can be deleted (see command 051), but also each several element can be deleted (addressing 0D_H). If several similar elements in the ring buffer exist, becomes in case of deletion of one single element always only the first founded element put out.

After an Application Reset (see 4.2) the Readinglist is filled with the following data:

| Storage | Value | VIB |
|---------|-------------------|--------------------------------------|
| 0 | 20.08.99 13:25 | Time Point [Date+Time] |
| 0 | 8195 | Flow Temperature 10 [m°C] |
| 0 | 3834 | Return Temperature 10 [m°C] |
| 0 | 416125 | Energy [KWh] |
| 0 | 493 | Volume [m3] |
| 1 | 395522 | Energy [KWh] |
| 1 | 01.05.99 00:00 | Time Point [Date+Time] |
| 1 | 01.05.00 00:00 | Time Point [Date+Time]->Future Value |

3. SND_NKE

C-Field = FD_H. This procedure serves to boot up after a break or at start of the communication. If a slave is selected by secondary communication, it will be deselected immediately. A reply for a REQ_UD2 will not be changed by the function SND_NKE; if for example before an input of a

SND_NKE by SND_UD the volume for query has been chosen, then the answer to the REQ_UD2 will continue with indicating the volume.

The slave reacts to a correct received SND_NKE with E5_H

Normal reaction time for the answer:

| Baudrate | Reactiontime |
|--------------------|--------------|
| 300 Baud | 40 - 50 ms |
| 600 Baud | 20 - 30 ms |
| 1200 and 2400 Baud | 10 - 20 ms |

4. SND_UD

C-Field = 53_H/73_H. With this procedure the master transfers data to a slave. The slave can confirm the correct data receipt with E5_H or indicate with not-

confirmation, that the telegram was not received correctly. Normal reaction time for the answer: all baudrates 100 - 800 ms

4.1 Switching Baudrate (Transmissionspeed) (FWW-Command 009)

The baudrate can be switched between 300 (CI=B8_H), 600 (CI=B9_H), 1200 (CI=BA_H) and 2400 (CI=BB_H) baud. Splitted baudrates between transmit and receive are not allowed, but there can be devices with different baudrates on the bus. The slave confirms the correctly received telegram by transmitting an E5_H with the old baudrate and uses the new baudrate from now on.

Example

The master switches the slave (in point to point) from 300 baud to 2400 baud.

Master to slave: 60_H 03_H 03_H 68_H 53_H FE_H BB_H CS
16 with 300 baud

Slave to master: E5_H with 300 baud

The transmissionspeed is now 2400 baud. CS is the checksum.

Typical answer time, same as for SND_NKE-procedure

4.2 Application Reset (FWW-Command 000)

With the CI-Code 50_H the master can release a reset of the application layer in the slave. The baudrate is not changed after an application reset. It is not possible to communicate with the slave up to 3 seconds after a reset is transmitted.

The slave will be deselected, if it was selected by secondary addressing.
The answer to a REQ_UD2 after a reset will be a default data record (see 2.4 Readoutlist).

4.3 Changing the Primary Address (FWW-Command 004)

It is possible to change the primary address, when DIF=01_H and VIF=7A_H.

Master to slave: 68_H 06_H 06_H 68_H 53_H 4C_H 51_H 01_H
7A_H 08_H 27_H 16_H

Example

Slave to master: E5_H

Change the primary address from 4C_H to 08_H.

The typical answertime is the same as for SND_NKE

4.4 Combimeter Specific Data

See appendix, where the important commands (M-Bus-Telegram), corresponding to the Fernwärme-Wien-Protocol, are described. The abbreviations which are used there, are described here as follows:

| | |
|------------------------------------|---|
| SND_UD: | Send User Data to Slave M-Bus-Telegram |
| REQ_UD2: | Request for Class 2 Data M-Bus-Telegram |
| RSP_UD: | Data Transfer from Slave to Master after Request M-Bus-Telegram |
| CI: | Control Information Field of the M-Bus-Telegram |
| DIB: | Data Information Block of the M-Bus-Telegram |
| VIB: | Value Information Block of the M-Bus Telegram |
| Type F: | 4 Byte Integervalue, contains information about date and time |
| 0C _H /0D _H : | Value Information Field Extension for adding to the reading list (0C _H) resp. erasing out of the reading list (0D _H). |
| FWW | Datarecord according to Fernwärme-Wien-Protocol |

5. REQ_UD2

The master asks with C-Field=5B_H/7B_H for data from the slaves. The data are chosen by the function SND_UD.

Typical reaction time for answer:
all baudrates 100-800ms.

5.1 Data Header

The first twelve bytes of the userdata in a respond consist of a block with a fixed length and structure.

| Ident. No. | Manufacturer | Version | Medium | Access No. | Status | Signature |
|------------|--------------|---------|--------|------------|--------|-----------|
| 4 Byte | 2 Byte | 1 Byte | 1 Byte | 1 Byte | 1 Byte | 2 Byte |

Identification-Number: 4 byte, as JJPPPPPP, in which JJ the year and P the current number in the production are (see 5.2). Data are BCD-coded.

Manufacturer: 2 byte 4965_H for Raab Karcher Energy Service (RKE)
2 byte 2324_H for Hydrometer (HYD)

Version: 1 byte
Combimeter II (Energy) 89_H

Medium: 1 byte 04_H for heat outlet; 0C_H- heat inlet; 07_H-volume counter

Accessnumber: The access number has binary code without sign and raises up by the value 1 after every REQ_UD2.

Status: 1 byte
bit 0: 0
bit 1: 0=no error, 1=every user error
Bit 2-7: 0;

Signature: 2 byte, 00 00_H

6. Example data record:

SND_UD „Readout Temp. at Inlet (°C)“:

Send:

| | | | | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 68 _H | 06 _H | 06 _H | 68 _H | 73 _H | FE _H | 51 _H | 04 _H | DB _H | 0C _H | AD _H | 16 _H |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|

REQ_UD2:

Send:

| | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| 10 _H | 7B _H | FE _H | 79 _H | 16 _H |
|-----------------|-----------------|-----------------|-----------------|-----------------|

Receive:

| | | | | | | | | | | | | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 68 _H | 15 _H | 15 _H | 68 _H | 08 _H | 00 _H | 72 _H | 50 _H | 34 _H | 12 _H | 98 _H | 65 _H | 49 _H | 89 _H | 0C _H | 00 _H |
| 00 _H | 00 _H | 00 _H | 04 _H | 5B _H | 34 _H | 00 _H | 00 _H | 00 _H | 7E _H | 16 _H | | | | | |

Appendix

| Command | FWW | CI | DIB | VIB | Value | Notes |
|--|-----|---|---|--|-----------------------|---|
| Communicationreset | 000 | 50 _H | - | - | - | Delete readinglist |
| Set date/time | 001 | 51 _H | 04 _H | 6D _H | I4 Type F | Set counter clock |
| Take over date/time | 002 | 54 _H | - | - | - | Start counter clock |
| Select date/time | 003 | 51 _H | 04 _H | ED _H 0C _H /0D _H | - | Read counter clock |
| Set M-BUS address | 004 | 51 _H | 01 _H | 7A _H | I1 | Set primary address |
| Calibration mode ON | 006 | - | - | - | - | Switch on calibration mode |
| Baudrate | 009 | B8 _H B9 _H BA _H BB _H 51 _H | - - - - 01 _H | - - - - FD _H 9C _H 0C _H /0D _H | - - - - - | Set to 300 Baud Set to 600 Baud Set to 1200 Baud Set to 2400 Baud Call for possible baudrates |
| Call Series-No., Manufacturer, Medium, Version | 010 | - | - | - | - | Appliance identification |
| Reset error ring buffer | 011 | 51 _H | B0 _H 80 _H 01 _H | FD _H 97 _H 07 _H | - | Reset buffer |
| Costumeraddress | 016 | 51 _H | 0E _H | FD _H 10 _H | B12 | Set costumer address |
| | 016 | 51 _H | 0E _H | FD _H 90 _H 0C _H /0D _H | - | Read costumer address |
| Costumernumber | 017 | 51 _H | 0E _H | FD _H 11 _H | B12 | Set costumer number |
| | 017 | 51 _H | 0E _H | FD _H 91 _H 0C _H /0D _H | - | Read costumer number |
| Average time Maximum | 018 | 51 _H | 13 _H | FE _H 65 _H | I3 | Set average time |
| | 018 | 51 _H | 13 _H | FE _H E5 _H 0C _H /0D _H | - | Read average time |
| Average time Minimum | 019 | 51 _H | 23 _H | FE _H 65 _H | I3 | Set average time |
| | 019 | 51 _H | 23 _H | FE _H E5 _H 0C _H /0D _H | - | Read average time |
| Reset MIN-memory values | 022 | 51 _H | 20 _H | FE _H 07 _H | - | Reset MIN-memory values |
| Reset MAX-memory values | 023 | 51 _H | 10 _H | FE _H 07 _H | - | Reset MAX-memory values |
| Hour meter | 039 | 51 _H | 03 _H | A6 _H 0C _H /0D _H | - | Call for operating hour |
| Hardwareversion | 040 | 51 _H | 02 _H | FD _H 8D _H 0C _H /0 _H | - | Call for hardwareversion |
| Softwareversion | 041 | 51 _H | 02 _H | FD _H 8F _H 0C _H /0D _H | - | Call for softwareversion |
| Delete outputlist | 051 | 51 _H | 7F _H | FE _H 0D _H | - | Delete readinglist |
| Set point of time Fixed day 1 | 106 | 51 _H | 44 _H | ED _H 7E _H | I4 Type F | Set fixed day 1 |
| | 106 | 51 _H | 44 _H | ED _H FE _H 0C _H /0 _H | - | Read fixed day 1 |
| Set point of time Fixed day 2 | 107 | 51 _H | 84 _H | ED _H 7E _H | I4 Type F | Set fixed day 2 |
| | 107 | 51 _H | 84 _H | ED _H FE _H 0C _H /0 _H | - | Read fixed day 2 |
| Actual time point Fixed day1 | 113 | 51 _H | 44 _H | ED _H 0C _H /0D _H | - | Read last fixed day 1 |
| Actual time point Fixed day 2 | 114 | 51 _H | 84 _H 01 _H | ED _H 0C _H /0D _H | - | Read last fixed day 2 |
| Starttime tariff 1 | 120 | 51 _H | 84 _H 10 _H | FD _H 30 _H | I4 Type F | Set start time tariff 1 |
| | 120 | 51 _H | 84 _H 10 _H | FD _H B0 _H 0C _H | - | Read start time tariff 1 |
| Period tariff 1 | 121 | 51 _H | 82 _H 10 _H | FD _H 38 _H | I2 | Set period tariff 1 |
| | 121 | 51 _H | 82 _H 10 _H | FD _H B8 _H 0C _H /0D _H | - | Read period tariff 1 |
| Duration tariff 1 | 122 | 51 _H | 82 _H 10 _H | FD _H 33 _H | I2 | Set duration tariff 1 |
| | 122 | 51 _H | 82 _H 10 _H | FD _H B3 _H 0C _H /0D _H | - | Read duration tariff 1 |
| Starttime tariff 2 | 123 | 51 _H | 84 _H 20 _H | FD _H 30 _H | I4 Type F | Set start time tariff 2 |
| | 123 | 51 _H | 84 _H 20 _H | FD _H B0 _H 0C _H | - | Read start time tariff 2 |

| | | | | | | |
|---------------------------------------|-----|-----------------|--|--|-------------|--|
| Period tariff 2 | 124 | 51 _H | 82 _H 20 _H | FD _H 38 _H | I2 | Set period tariff 2 |
| | 124 | 51 _H | 82 _H 20 _H | FD _H B8 _H 0C _H /0D _H | - | Read period tariff 2 |
| Duration tariff 2 | 125 | 51 _H | 82 _H 20 _H | FD _H 33 _H | I2 | Set duration tariff 2 |
| | 125 | 51 _H | 82 _H 20 _H | FD _H B3 _H 0C _H /0D _H | - | Read duration tariff 2 |
| Starttime tariff 3 | 126 | 51 _H | 84 _H 30 _H | FD _H 30 _H | I4 | Set start time tariff 3 |
| | 126 | 51 _H | 84 _H 30 _H | FD _H B0 _H 0C _H | Type F - | Read start time tariff 3 |
| Period tariff 3 | 127 | 51 _H | 82 _H 30 _H | FD _H 38 _H | I2 | Set period tariff 3 |
| | 127 | 51 _H | 82 _H 30 _H | FD _H B8 _H 0C _H /0D _H | - | Read period tariff 3 |
| Duration tariff 3 | 128 | 51 _H | 82 _H 30 _H | FD _H 33 _H | I2 | Set duration tariff 3 |
| | 128 | 51 _H | 82 _H 30 _H | FD _H B3 _H 0C _H /0D _H | - | Read duration tariff 3 |
| Output errorlist (Heat) | 180 | 51 _H | B1 _H 80 _H 0 _H | FD _H 97 _H 0C _H /0D _H | - | Output errorlist |
| | 180 | 51 _H | B4 _H 80 _H 0 _H | ED _H 0C _H /0D _H | - | Read time point of error |
| Forward temperature | 206 | 51 _H | 04 _H | DB _H 0C _H /0D _H | - | Read temperature in °C |
| | 206 | 51 _H | 04 _H | D9 _H 0C _H /0D _H | - | Read temperature in 1/100 °C |
| | 206 | 51 _H | 04 _H | DB _H EF _H 0C _H /0 _H | - | Read time point of call |
| Return temperature | 207 | 51 _H | 04 _H | DF _H 0C _H /0D _H | - | Read temperature in °C |
| | 207 | 51 _H | 04 _H | DD _H 0C _H /0D _H | - | Read temperature in 1/100°C |
| | 207 | 51 _H | 04 _H | DF _H EF _H 0C _H /0D _H | - | Time-point of call |
| Difference temperature | 208 | 51 _H | 04 _H | E3 _H 0C _H /0D _H | - | Read temperature in °C |
| | 208 | 51 _H | 04 _H | E1 _H 0C _H /0D _H | - | Read temperature in 1/100 °C |
| | 208 | 51 _H | 04 _H | E3 _H EF _H 0C _H /0D _H | - | Time-point of call |
| Heat quantity tariff 0 | 242 | 51 _H | 04 _H | 86 _H 0C _H /0D _H | - | Call for heat quantity |
| | 242 | 51 _H | 04 _H | 86 _H EF _H 0C _H /0D _H | - | Call-time-point heat quantity |
| Heat quantity tariff 1 | 258 | 51 _H | 84 _H 10 _H | 86 _H 0C _H /0D _H | - | Call for heat quantity |
| | 258 | 51 _H | 84 _H 10 _H | 86 _H EF _H 0C _H /0D _H | - | Call-time-point heat quantity |
| Heat quantity tariff 2 | 274 | 51 _H | 84 _H 20 _H | 86 _H 0C _H /0D _H | - | Call for heat quantity |
| | 274 | 51 _H | 84 _H 20 _H | 86 _H EF _H 0C _H /0D _H | - | Call-time-point heat quantity |
| Heat quantity tariff 3 | 290 | 51 _H | 84 _H B0 _H | 86 _H 0C _H /0D _H | - | Call for heat quantity |
| | 290 | 51 _H | 00 _H 84 _H B0 _H 00 _H | 86 _H EF _H 0C _H /0D _H | - | Call-time-point heat quantity |
| Cumulative water quantity | 322 | 51 _H | 04 _H | 96 _H 0C _H /0D _H | - | Call for cumulative water quantity |
| | 322 | 51 _H | 04 _H | 96 _H EF _H 0C _H /0D _H | - | Call-time-point cumulative water quantity |
| Current energy | 338 | 51 _H | 04 _H | AE _H 0C _H /0D _H | - | Current power |
| | | 51 _H | 04 _H | AE _H EF _H 0C _H /0 _H | - | Call-time-point current power |
| Current flow | 418 | 51 _H | 04 _H | BE _H 0C _H /0D _H | - | Current flow |
| Cumulative heat quantity fixed day 1 | 434 | 51 _H | 44 _H | 86 _H 0C _H /0D _H | - | Call for cumulative heat quantity |
| Cumulative heat quantity fixed day 2 | 435 | 51 _H | 84 _H 01 _H | 86 _H 0C _H /0D _H | - | Call for cumulative heat quantity |
| Cumulative water quantity fixed day 1 | 454 | 51 _H | 44 _H | 86 _H 0C _H /0D _H | - | Call for cumulative water quantity fixed day 1 |
| Cumulative water quantity fixed day 2 | 455 | 51 _H | 84 _H 01 _H | 86 _H 0C _H /0D _H | - | Call for cumulative water quantity fixed day 2 |