M-BUS communication protocol

for 32A energy counter with integrated M-BUS

User manual

1MSUPRMB3003

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M-Bus communication protocol

for 32A energy counter with integrated M-BUS

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1. M-BUS INTERFACE

The M-BUS Interface is developed to connect the Energy Counter to M-BUS network.
The interface gets the power supply from the bus.

English

1.1 Overview

- M-BUS Interface complying with EN13757-2 and EN13757-3
- Circuiting by means of drilled two-wires cables
- 2 screw clamps for the M-BUS Interface
- Current consumption of M-BUS Interface: ≤ 1.5 mA. This corresponds to 1 standard load.
- The data transmission speed is selectable between 300, 2400 and 9600 baud
- The default speed is 9600 baud.
- The default Primary Address is 000

2. TELEGRAM FORMATS

The telegram formats are three, identified by the first character.

Byte	Single Character (HEX)	Short Telegram (HEX)	Long Telegram (HEX)
1	E5	10	68
2		C Field	L Field
3		A Field	L Field (Ripetition)
4		CS (Checksum)	68
5		16	C Field
6			A Field
7			CI Field
8 - YY			Data (0 – 246 Bytes)
YY + 1			CS (Checksum)
YY + 2			16

Table 2.1 – The M-BUS Telegram Formats

- **Single Character:** This telegram format consists of the single character E5h and is used to acknowledge the telegram received.
- **Short Telegram:** This telegram is identified by the start character 10h and consists of five character. It's used by the M-BUS Master to command the transmission of data from the M-BUS Slave.
- **Long Telegram:** This telegram is identified by the start character 68h and consists of a variable number of   characters, in which are present also the actived data. It's used by the M-BUS Master to transmits commands to the M-BUS Slave, and by the M-BUS Slave to send the read-out Data to the M-BUS Master.

English

2.1 TELEGRAM FIELDS

The telegram fields (C, A, CI Fields, L and CS) have a fixed length of one byte (8 bit) and serve predetermined effects in the M-BUS communication. The L Field defines the number of bytes of the active data.

2.1.1 C FIELD

The Control Field (C Field) contains information on the direction of the exchange of communication, the success of the actual operation of communication and the proper function of the telegram.

Bit Number	7	6	5	4	3	2	1	0
Master → Slave	0	1	FCB	FCV	F3	F2	F1	F0
Slave → Master	0	0	ACD	DFC	F3	F2	F1	F0

Table 2.2 – C Field Bit Division

The Bit Nr 6 is set to 1 if the communication has the direction Master → Slave; viceversa it is set to 0.
In the Master → Slave direction, if the frame count bit valid (FCV - Bit Nr 4) is set to 1, then the frame count bit (FCB – Bit Nr 5) has not to be ignored.

The FCB is used to indicate successful transmission procedure. A Master shall toggle the bit after a successful reception of a reply from the Slave. After this, if the Slave answer is multi-telegram, the Slave has to send the next telegram of the multi-telegram answer.
If the expected reply is missing, or the reception faults, the master resends the same telegram with the same FCB.
The Bits Nr 3 – 0 are the function code of the message.
The C Field used here, are:

Telegram Name	C Field (BIN)	C Field (HEX)	Telegram	Description
SND_NKE	01000000	40	Short Frame	Initialization of the Slave
SND_UD	01x10011	53 / 73	Long Frame	Master send data to Slave
REQ_UD2	01x11011	5B / 7B	Short Frame	Master requests Class 2 Data to Slave
RSP_UD	000x1000	08 / 18	Long Frame	Data transfer from Slave to Master

Table 2.3 – C Field of the commands used in this protocol

2.1.2 A FIELD

The Address Field (A Field) is used to address the recipient in the calling direction, and to identify the sender of information in the receiving direction.
The size of this field is one byte, and it can assume the value between 0 – 255, divided in this way:

A Field (HEX)	Primary Address	Remarks
00	0	Default Address Given by Manufacturer
01 – FA	1 – 250	Primary Address Settable
FB, FC	251, 252	Reserved for Future Use
FD	253	Used for Secondary Address Procedures
FE	254	Use to Transmit Information to All Partecipants in the M-BUS System
FF	255	Use to Transmit Information to All Partecipants in the M-BUS System

Table 2.4 – Value of Address Field

Using the address 254 (FEh) every Slave answer with the acknowledging (E5h) or with their primary address.
Using the address 255 (FFh) no one Slave replies.

2.1.3 CI FIELD

The Control Information (CI Field) contains information for the receiver of the telegram.
The CI Field values used here, are:

CI Field (HEX)	Primary Address
51	The telegram contains data for the Slave
52	Selection of the Slave
72	The telegram contains data for the Master
B8	Set Baud Rate to 300 bps
BB	Set Baud Rate to 2400 bps
BD	Set Baud Rate to 9600 bps

Table 2.5 – Value of CI Field

2.1.4 L FIELD

The Length Field (L Field) defines the number of bytes (expressed in hex value) of the Active Data making up the telegram, plus 3 byte for the C, A and Cl Fields.
This field is always transmitted twice in Long Telegrams.

2.1.5 CS FIELD (CHECKSUM)

The Checksum (CS Field) serves to recognize transmission and synchronization faults, and is configured from specific parts of telegram. The checksum is calculated from the arithmetical sum of the data mentioned above plus the Active Data, i.e. from C Field to CS Field (excluded).

2.2 ACTIVE DATA

The Active Data (0 – 246 bytes) in Long Telegrams include the data to be read from the M-BUS Master (Read-Out Data), or Command Information transmitted by the Master to the Slave.

2.2.1 CODING OF ACTIVE DATA TRANSMITTED FROM SLAVE TO MASTER: FIXED DATA RECORD HEADER

Each block of Active Data transmitted by the Slave to the Master starts with the following Fixed Data Record Header (FDH):

Byte Nr.	Size (Byte)	Value (Hex)	Description
1 – 4	4	xx xx xx xx	M-BUS Interface Identification Number
5 – 6	2	xx xx	Manufacturer’s ID
7	1	xx	Version Number of M-BUS Interface Firmware (00 – FF)
8	1	02	Medium: Electricity
9	1	xx	Access Number (00 – FF → 00)
10	1	xx	M-BUS Interface Status (00 = Energy Counter in Error, 01 = Energy Counter OK)
11 – 12	2	0000	Signature (always 0000, i.e. not used)

Table 2.6 – Fixed Data Record Header

The Identification Number is a changeable number by the customer and runs from 00000000 to 99999999.
The Access Number has unsigned binary coding, and is incremented (module 256) by one after each RSP_UD from the Slave.

English

English

2.2.2 CODING OF ACTIVE DATA TRANSMITTED FROM SLAVE TO MASTER: DATA RECORDS

Every Data Record sent by Slave to the Master consist of the following Data Record Header (DRH) :

Data Information Block (DIB)		Value Information Block (VIB)		
DIF	DIFE	VIF	VIFE	Data
1 Byte	0 – 10 Byte(s)	1 Byte	0 – 10 Byte(s)	0 – n Bytes

Table 2.7 – Data Records Structure

2.2.2.1 Data Information Block (DIB)

The Data Information Block (DIB) contains as a minimum one Data Information Field (DIF). This byte can be extended by a further 10 Data Information Field Extension Bytes (DIFE).
The coding of DIF for this protocol is:

Bit	Name	Description
7	Extension Bit	Specifies if a DIFE Byte follows: 0 = No 1 = Yes
6	LSB of Storage Number	Always at 0, i.e. not used
5 - 4	Functions Field	Specifies the kind of the value, always at: 00 = Instantaneous Value
3 - 0	Data Field	Length and Coding of Data: 0001: 8 Bit Integer 0010: 16 Bit Integer 0011: 24 Bit Integer 0100: 32 Bit Integer 0110: 48 Bit Integer 1100: 8 digit BCD 1101: Variable Length

Table 2.8 – Data Information Field Structure

The DIFE in this implementation of the protocol is never used.

2.2.2.2 Value Information Block (VIB)

the Value Information Block (VIB) contains as a minimum one Value Information Field (VIF). This byte can be extended by a further 10 Value Information Field Extension Bytes (DIFE).
The coding of VIF is:

Bit	Name	Description
7	Extension Bit	Specifies if a VIFE Byte follows: 0 = No 1 = Yes
6 - 0	Value Information	Contains Information on the single Value, such as Unit, Multiplicator, etc...

Table 2.9 – Value Information Field Structure

The coding of VIFE is:

Bit	Name	Description
7	Extension Bit	Specifies if a VIFE Byte follows: 0 = No 1 = Yes
6 - 0	Value Information	Contains Information on the single Value, such as Unit, Multiplicator, etc...

Table 2.10 – Value Information Field Extension Structure

2.2.2.3 Standard Value Information Field (VIF) Used

VIFE (BIN)	VIFE (HEX)	Description	Unit
10000010	82	Energy	0.1Wh
01111001	79	Set Secondary Address	Dimensionless
01111010	7A	Set Primary Address	Dimensionless
10101000	A8	Power	mW
11111101	FD	A standard VIFE from extension table follows	Dimensionless
11111111	FF	A further manufacturer specific VIFE follows	Dimensionless

Table 2.11 – Standard Value Information Field Used

2.2.2.4 Standard Value Information Field Extension (VIFE) Used

VIF (BIN)	VIF (HEX)	Description	Unit
00001011	0B	Parameter Set Identification	Dimensionless
00001100	0C	Firmware Version	Dimensionless
00001101	0D	Hardware Version	Dimensionless
11001100	C6	Voltage	mV
11011001	D9	Current	mA

Table 2.12 – Standard Value Information Field Extension Used

2.2.2.5 Manufacturer Specific Value Information Field Extension (VIFE) Used

VIFE (BIN)	VIFE (HEX)	Description	Unit
00000000	00	Monophase	0.1Wh, mV, mA, mW, mVA or mvar
01010000	50	Frequency	0.1Hz
01010101	55	Serial Number	Dimensionless
01010110	56	Model	Dimensionless
01010111	57	Type	Dimensionless
01011000	58	Firmware Release	Dimensionless
01011001	59	Hardware Release	Dimensionless
01100010	62	Error Code	Dimensionless
01100101	65	OEM	Dimensionless
01100110	66	S0 State	Dimensionless
01110000	70	Reset Counter	Dimensionless
01110001	71	Start Counter	Dimensionless
01110010	72	Stop Counter	Dimensionless
01110011	73	Partial Counter Status	Dimensionless
10000000	80	Energy	0.1Wh
10000010	82	Partial	Dimensionless
10000100	84	Power Factor	Dimensionless
10010100	94	Unit Hertz (cycle per second) * 10-1	0,1 Hz

Table 2.13 – Manufacturer Specific Value Information Field Extension Used

If Bit No. 7 in the Specific Value Information Field Extension (VIFE) is set to 1, another VIFE Byte follows.
If Bit 7 is set to 0, the first Data Byte follows next.

3. COMMUNICATION PROCESS

The M-BUS module accepts two kinds of transmission:

Send / Confirm	**SND / CON**
Request / Respond	**REQ / RSP**

A standard straight communication between M-BUS Master and M-BUS Slave is:

MASTER		**SLAVE**
SND_NKE	→	E5h
SND_UD	→	E5h
REQ_UD2	→	RSP_UD

3.1 SEND / CONFIRM PROCEDURE

3.1.1 SND_NKE

This procedure serve to start up after an interruption or beginning of communication. If the Slave was selected for secondary addressing, it will be deselected.
The value of the frame count bit FCB is cleared in the Slave, i.e. it expects that the first telegram from a Master with FCV = 1, has the FCB = 1.
The Slave confirms a correct reception of the telegram with the single character acknowledge (E5h) or omits the answer if it didn't receive the telegram correctly.
Here follows the structure of SND_NKE command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	10	Start character - short telegram
2	1	40	C Field
3	1	xx	A Field – Primary Address 00 – FA: Valid Primary Address FB, FC: Reserved for Future Use FD: Transmission is to the selected slave using Secondary Address (selected slave sends E5h) FE: Transmission to All M-BUS Slave in the System (everyone sends E5h) FF: Transmission to All M-BUS Slave in the System (no one sends E5h)
4	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 2 → byte 4)
5	1	16	Stop character

Table 3.1 – SND_NKE command Structure

Answer of the Slave: E5h

3.1.2 SND_UD

This procedure is used to send user data to the M-BUS Slave. The Slave confirms a correct reception of the telegram with the single character acknowledge (E5h) or omits the answer if it didn't receive the telegram correctly.
Here follows the structure of the SND_UD commands used in this protocol.

3.1.2.1 Set Primary Address

This action enables to set a new Primary Address in the Slave interface.
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	06	L-Field
3	1	06	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	01	DIF: 8 Bit Integer, 1 Byte
9	1	7A	VIF: Set Primary Address
10	1	xx	Value: New Primary Address Valid Range: 00 – FA (0 - 250) Invalid Range: FB – FF
11	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 10)
12	1	16	Stop character

Table 3.2 – SND_UD command: Set Primary Address Using Primary Address

Answer of the Slave: E5h

3.1.2.2 Set Secondary Address

This action enables to set a new Secondary Address in the Slave interface.
The Secondary Address has this structure:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1 – 4	4	xx xx xx xx	Identification Number Range : 00000000 - 99999999
5 – 6	2	xx xx	Manufacturer ID Range: 01 – FF, 01 - FF
7	1	xx	Version Number Range: 01 - FF
8	1	02	Device Type Identification 02: Electricity

Table 3.3 – Secondary Address Structure

English

Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	09	L-Field
3	1	09	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	0C	DIF: 8 digits BCD, 4 Byte
9	1	79	VIF: Set Secondary Address
10	1	xx	Value: New Secondary Address digit 7 and 8 Range: 00 - 99
11	1	xx	Value: New Secondary Address digit 5 and 6 Range: 00 – 99
12	1	xx	Value: New Secondary Address digit 3 and 4 Range: 00 – 99
13	1	xx	Value: New Secondary Address digit 1 and 2 Range: 00 - 99
14	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 13)
15	1	16	Stop character

Table 3.4 – SND_UD command: Set Secondary Address Using Primary Address

Answer of the Slave: E5h

3.1.2.3 Set Baud Rate

This action allows to change the Baud Rate of the M-BUS Slave.
The Slave answers with single character acknowledgement (E5h) in the old baud rate. As soon as the ACK is transmitted, the Slave switches to the new baud rate.
To make sure that the Slave has properly changed its baud rate, the Master, within 2 minutes has to send a command to the Slave in the new baud rate. If the Slave doesn't send the ACK after x retry, the Master has to return to the old baud rate.
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	03	L-Field
3	1	03	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00 - FF = 0 - 255)
7	1	xx	CI-Field: Set New Baud Rate B8: Set Baud Rate to 300 baud BB: Set Baud Rate to 2400 baud BD: Set Baud Rate to 9600 baud
8	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 7)
9	1	16	Stop character

Table 3.5 – SND_UD command: Set Baud Rate Using Primary Address

Answer of the Slave: E5h

3.1.2.4 Reset Total Counter
This action is permitted only if the Energy Counters is “NO MID” or “yes reset” type.
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	06	L-Field
3	1	06	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	00	DIF: no data
9	1	FF	VIF followed by manufacturer specific VIFE
10	1	70	manufacturer specific VIFE: Reset Counter
11	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 11)
12	1	16	Stop character

Table 3.6 – SND_UD command: Reset Active Energy Counters Using Primary Address

Answer of the Slave: E5h

3.1.2.5 Reset Partial Energy Counter
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	08	L-Field
3	1	08	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	00	DIF: no data
9	1	FF	VIF followed by manufacturer specific VIFE
10	1	82	VIFE: Partial Counter
11	1	FF	VIFE followed by manufacturer specific VIFE
12	1	70	Manufacturer specific VIFE: Reset Counter
13	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 13)
14	1	16	Stop character

Table 3.7 – SND_UD command: Reset Partial Energy Counter Using Primary Address

Answer of the Slave: E5h

English

3.1.2.6 Start Partial Energy Counters
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	08	L-Field
3	1	08	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	00	DIF: no data
9	1	FF	VIF followed by manufacturer specific VIFE
10	1	82	VIFE: Partial Counters
11	1	FF	VIFE followed by manufacturer specific VIFE
12	1	71	Manufacturer specific VIFE: Start Counter
13	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 13)
14	1	16	Stop character

Table 3.8 – SND_UD command: Start Partial Energy Counter Using Primary Address

Answer of the Slave: E5h

3.1.2.7 Stop Partial Energy Counters
Here follows the command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	08	L-Field
3	1	08	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	xx	A-Field, Primary Address (00-FF = 0-255)
7	1	51	CI-Field
8	1	00	DIF: no data
9	1	FF	VIF followed by manufacturer specific VIFE
10	1	82	VIFE: Partial Counters
11	1	FF	VIFE followed by manufacturer specific VIFE
12	1	72	Manufacturer specific VIFE: Stop Counter
13	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 12)
14	1	16	Stop character

Table 3.9 – SND_UD command: Stop Partial Energy Counter Using Primary Address

Answer of the Slave: E5h

3.1.2.8 Select a Slave Using Secondary Address

Here follows the command to select a Slave by Secondary Address:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long query
2	1	0B	L-Field
3	1	0B	L-Field Ripetition
4	1	68	Start character long query ripetition
5	1	73	C-Field SND_UD
6	1	FD	A-Field, Primary Address = 253, i.e. take the secondary address
7	1	52	CI-Field
8 – 15	8	xx xx xx xx xx xx xx xx	Secondary Address UD (See the relative paragraph)
16	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte 15)
17	1	16	Stop character

Table 3.10 – SND_UD command: Select a slave Using Secondary Address

Answer of the Slave: E5h

After that, the selected slave can be interrogated using FD as Primary Address.

3.1.3 REQ_UD2

This procedure is used by the M-BUS Master to receive data to the M-BUS Slave. The Slave confirms a correct reception of the telegram with the RSP_UD answer or omits the answer if it didn't receive the telegram correctly.
The Slave sends the data requested by SND_UD command.
Here follows the structure of the REQ_UD2 command:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	10	Start character short telegram
2	1	7B / 5B	C-Field , Transmit Read-Out Data
3	1	xx	A Field – Primary Address 00 – FA: Valid Primary Address FB, FC: Reserved for Future Use FE: Transmission to All M-BUS Slave in the System (everyone sends E5h) FF: Transmission to All M-BUS Slave in the System (no one sends E5h) Out of Range: FD: Transmission is by Secondary Address
4	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 2 → byte 3)
5	1	16	Stop character

Table 3.12 – REQ_UD2 command

Answer of the Slave: RSP_UD

English

English

3.1.4 RSP_UD

This procedure is used by the M-BUS Slave to send the requested data to the M-BUS Master.
The behavior of the multi-frame answer is explained in Annex A.
Here follows the structure of the RSP_UD telegram:

Byte Nr.	Size (Byte)	Value (Hex)	Description
1	1	68	Start character long telegram
2	1	xx	L-Field
3	1	xx	L-Field Ripetition
4	1	68	Start character long telegram ripetition
5	1	08 /18	C-Field RSP_UD
6	1	xx	A-Field, Primary Address (00 - FA = 0 - 250)
7	1	72	CI-Field
8 – 11	4	xx xx xx xx	M-BUS Interface Identification Number
12 – 13	2	xx xx	Manufacturer's Mark
14	1	xx	Version Number of M-BUS Interface Firmware (00 – FF)
15	1	02	Medium: Electricity
16	1	xx	Access Number (00 – FF → 00)
17	1	xx	M-BUS Interface Status (see error flags par.)
18 – 19	2	0000	Signature (always 0000, i.e. not used)
20 – YY	0 – EA	xx...xx	Read-out Data Parametrised (see the following paragraphs)
YY + 1	1	0F / 1F	DIF: 0F = no more data; 1F = other data to send
YY + 2	1	xx	CS Checksum, summed from C-Field to Selected Parameter of Parameter Set 19 (byte 5 → byte YY + 1)
YY + 3	1	16	Stop character

Table 3.13 – RSP_UD command

Here follows Read-Out data, included in 20 – YY bytes of the RSP_UD table.

3.1.4.1 Voltage

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	03	DIF – 24 Bit Integer, 3 Byte
YY + 1	1	FD	VIF followed by STANDARD specific VIFE
YY + 2	1	C6	STANDARD specific VIFE: Voltage
YY + 3	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 4	1	00	MANUFACTURER specific VIFE: Monophase
YY + 5 – YY + 6 – YY + 7	3	xx xx xx	Value: Voltage

Table 3.14 – Voltage

3.1.4.2 Current

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	04	DIF – 32 Bit Integer, 4 Byte
YY + 1	1	FD	VIF followed by STANDARD specific VIFE
YY + 2	1	D9	STANDARD specific VIFE: Current
YY + 3	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 4	1	00	MANUFACTURER specific VIFE: Monophase
YY + 5 – YY + 6 – YY + 7	3	xx xx xx xx	Value: Current

Table 3.15 – Current

3.1.4.3 PF

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF – 16 Bit Integer, 2 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	84	STANDARD specific VIFE: Power factor
YY + 3	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 4	1	00	MANUFACTURER specific VIFE: Monophase
YY + 5 – YY + 6	2	xx xx	Value: Power factor

Table 3.16 – Power Factor

3.1.4.4 Power

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	06	DIF – 48 Bit Integer, 6 Byte
YY + 1	1	A8	VIF: Power
YY + 2	1	FF	VIFE follower by MANUFACTURER specific VIFE
YY + 3	1	00	MANUFACTURER specific VIFE: Monophase
YY + 4 – YY + 9	6	xx xx xx xx xx xx	Value: Power

Table 3.17 – Power

3.1.4.5 +kWhSYS

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	06	DIF – 48 Bit Integer, 6 Byte
YY + 1	1	82	VIF: Energy
YY + 2	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 3	1	80	MANUFACTURER specific VIFE: Imported Energy
YY + 4	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 5	1	00	MANUFACTURER specific VIFE: Monophase
YY + 6 – YY + 11	6	xx xx xx xx xx xx	Value: Imported energy

Table 3.18 – Total Active Energy Counter

3.1.4.6 +kWhSYS – PAR

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	06	DIF –48 Bit Integer, 6 Byte
YY + 1	1	82	VIF: Energy
YY + 2	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 3	1	80	MANUFACTURER specific VIFE: Imported Energy
YY + 4	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 5	1	82	MANUFACTURER specific VIFE: Partial
YY + 6	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 7	1	00	MANUFACTURER specific VIFE: Monophase
YY + 8 – YY + 13	6	xx xx xx xx xx xx	Value: Imported partial energy

Table 3.19 – Partial Active Energy Counter

English

English

3.1.4.7 Frequency

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF – 16 Bit Integer, 2 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	94	MANUFACTURER specific VIFE: 0.1Hz
YY + 3	1	FF	VIFE followed by MANUFACTURER specific VIFE
YY + 4	1	50	MANUFACTURER specific VIFE: Frequency (0.1Hz)
YY + 5 – YY + 6	2	xx xx	Value: Frequency

Table 3.20 – Frequency

3.1.4.8 Serial Number

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	0D	DIF – Variable Length
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	55	MANUFACTURER specific VIFE: Serial Number
YY + 3 – YY + 13	1	0A	Value: Serial Number First Byte is LVAR: i.e. 10 ASCII char follows
YY + 4 – YY + 13	10	xx xx xx xx xx xx xx xx xx xx	Value: Serial Number (ASCII char), transmitted "Least significant byte first"

Table 3.21 – Serial Number

3.1.4.9 Energy Counter Firmware Release

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF – 16 Bit Integer, 2 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	58	MANUFACTURER specific VIFE: Firmware EC Release
YY + 3 – YY + 4	2	xx xx	Value: Firmware EC Release, e.g. xx.xx

Table 3.22 – Energy Counter Firmware Release

3.1.4.10 Energy Counter Hardware Release

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF – 16 Bit Integer, 2 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	59	MANUFACTURER specific VIFE: Hardware EC Release
YY + 3 – YY + 4	2	xx xx	Value: Hardware EC Release, e.g. xx.xx

Table 3.23 – Energy Counter Hardware Release

3.1.4.11 Error Code

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF – 8 Bit Integer, 1 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	62	MANUFACTURER specific VIFE: Error Code Value
YY + 3	1	xx	Value: Error Code mask on bits bit 0 - EEPROM ERROR bit 1 - RAM ERROR bit 2 - CS(FW) ERROR

Table 3.24 – Error Code

3.1.4.12 Partial Counter Status

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	02	DIF – 16 Bit Integer, 2 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	73	MANUFACTURER specific VIFE: Partial Counter Status
YY + 3 – YY + 4	2	xx xx	Value: Partial counter status 1 byte: +kWhSYS-PAR

Table 3.25 – Partial Counter Status

English

3.1.4.13 Model

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF - 8 Bit Integer, 1 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	56	MANUFACTURER specific VIFE: Model
YY + 3	1	xx	Value: Model 13 - 13U --> 1Phase,32Amp,USA 14 - 13E --> 1Phase,32Amp,EUROPE (values in expressed in decimal)

Table 3.26 – Model

3.1.4.14 Type

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF - 8 Bit Integer, 1 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	57	MANUFACTURER specific VIFE: Type
YY + 3	1	xx	Value: Type 0 - 32A single phase, BASIC 1 - 32A single phase, MID certified 2 - 32A single phase, M-BUS integrated + RESET function 3 - 32A single phase, MID certified + M-BUS integrated

Table 3.27 – Type

3.1.4.15 OEM Code

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	0D	DIF – Variable Length
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	65	MANUFACTURER specific VIFE: OEM code
YY + 3	1	4	Value: following 4 bytes
YY+4 - YY+7	4	xx xx xx xx	Value: OEM code

Table 3.28 – OEM code

3.1.4.16 S0

Byte Nr.	Size (Byte)	Value (Hex)	Description
YY	1	01	DIF – 8 Bit Integer, 1 Byte
YY + 1	1	FF	VIF followed by MANUFACTURER specific VIFE
YY + 2	1	66	MANUFACTURER specific VIFE: S0 status
YY + 3	1	xx	Value: S0 status: 0 - OFF, 1 - ON

Table 3.29 – S0

ANNEX A

In case of single-frame RSP_UD answer from the Slave, the communication process is the following:

MASTER		SLAVE
SND_NKE	→	E5h
SND_UD	→	E5h
REQ_UD2 with C Field = 7Bh i.e. FCB = 1 & FCV = 1	→	RSP_UD with C Field = 08h DIF = 0Fh as last data block

This means that, if the FCB is handled (i.e. FCV = 1), when the RSP_UD answer has a single-frame of data, the Slave has to send a RSP_UD answer with the last data block egual to 0F.

In case of multi-frame RSP_UD answer from the Slave (for example 2 frames), the communication process is the following:

MASTER		SLAVE
SND_NKE	→	E5h
SND_UD	→	E5h
REQ_UD2 with C Field = 7Bh i.e. FCB = 1 & FCV = 1	→	RSP_UD with C Field = 18h i.e. DFC = 1 DIF = 1Fh as last data block
REQ_UD2 with C Field = 5B i.e. FCB = 0 & FCV = 1	→	RSP_UD with C Field = 08 i.e. DFC = 0 DIF = 0Fh as last data block

This means that, if the FCB is handled (i.e. FCV = 1), when the RSP_UD answer has a single-frame of data, the Slave has to send a RSP_UD answer with the last data block egual to 0F.

Due to the size of the transmission memory buffer the response to a "request for class 2 data" (REQ_UD2) is always a multi-frame answer.

English

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