CONNECTING COMPETENCE. SCHRACK TECHNIK

DIZ M-Bus Description

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M-BUS Description for
DIZ generation G meters
with firmware version 1.100000

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1 M-Bus Interface

1.1 Standards and Documents

The M-Bus interface (‚Metering-Bus') is an interface in accordance with the European standard EN13757-2 and -3 which describes, in particular, remote meter reading. This standard is an extension of DIN 1434-3. Furthermore the document „MBDOC48.doc" of the M-Bus user group served as an implementation document for this meter.

<u>Note 1:</u>
In the case that the DIZ receives a call for application reset without additional parameters on the M-Bus interface, the "Last Received FCB" memory bit will be reset and the data record pointer for the data output falls back to the first default data record.

<u>Note 2:</u>
In the case that the DIZ receives a telegram for slave selection by secondary address on the M-Bus interface and the secondary address is equal to the secondary address of the DIZ, the "Last Received FCB" memory bit will be reset and the data record pointer for the data output falls back to the default data record. If the secondary addresses are not equal an active selection for the communication via the pseudo primary address 253 (FD_{16}) will be reset.

<u>Note 3:</u>
The standard EN 13757-2:2004 includes: "Short telegram master to slave: SND_NKE. Answer: $E5. Note that this command shall only present the internal "last received FCB-bit" and clear the optional selection bit. It shall not be used for any other kind of reset function."

The M-BUS interface characteristics of the DIZ are deviating from this standard at this point.
In the case that the DIZ receives a command (SND_NKE) for link layer reset for the primary addresses 253, 254 or 255, the last received FCB memory bit will be reset. An active selection for the communication via the pseudo primary address 253 (FD_{16}) will be reset and the data record pointer for the data output falls back to the first default data record. If the primary addresses are equal, the "Last Received FCB" memory will be reset and the data record pointer for the data output falls back to the first default data record.

<u>Note 4:</u>
The standard EN 13757-3:2013 includes: "A slave with implemented secondary addressing and with implemented FCB-administration has a "Last received FCB"-memory bit for the communication via the pseudo primary address 253 (FDh). If it can communicate also alternatively over some other primary address (except the special addresses 254 and 255) an additional "Last received FCB"-memory bit for each of these primary addresses is required."

The M-BUS interface characteristics of the DIZ are deviating from this standard at this point.
The DIZ M-BUS interface uses one "last received FCB" memory bit for the communication via the pseudo primary address 253 (FD_{16}) and all further available primary addresses of the device.

1.2 Introduction to the M-Bus protocol

Process of communication:

The M-Bus master sends a telegram SND_UD to the meter and receives the telegram E5h back as a positive confirmation from the meter. In the case of an error, the meter does not respond and the master runs into a Timeout. Such an error case can be a wrong parameter or an incorrect access right.

Reading out a register from the meter takes place in 2 steps:

1. First the master sends the telegram SND_UD with which it selects a register from the meter. The telegram looks just as the telegram for a write access, however, the field DIF must be set to 0x08 (select to readout). In confirmation the meter answers with the telegram E5h thereby selecting the data register.
2. Next the master sends the transmission request REQ_UD2. As a result, the meter responds with the telegram RSP_UD containing the contents of the selected data register.

Whereas writing in a register takes place in just one step:

1. The master sends the telegram SND_UD with the new values for a selected register. The meter writes the new values in its register and confirms the request with the telegram E5h.

This manual uses the term "command" for a collection of telegram properties resulting in a clear data structure. Commands used in standards like DIN EN 62056-21 don't exist for M-Bus.

1.2.1 Telegram setup: SND_NKE

This telegram initialises communication in the meter and must always be sent to the meter before start of communication. A meter who is selected via secondary address will be deselected if the telegram is directed to the primary address 253, 254 or 255. The FCB will be reset and the data record pointer for the data output falls back to the first default data record.

The fields marked red are automatically generated by the meter and the fields marked blue mark a command with a parameter.

SND_NKE	
Value / Code	**Description**
10	Start
40	C Field: Meter communication, start-up
AA	A Field: Address
PP	checksum
16	Stop

Example of an initialisation of the meter via the test address 254: 10 40 FE 3E 16

1.2.2 Telegram setup: E5h

This telegram consists of a character and is sent in a positive confirmation from the meter.

1.2.3 Telegram setup: SND_UD

RSP_UD	
Value / Code	**Description**
68	Start
LL	L Field: Length
LL	L Field: Repeat of the length
68	Repeat Start
CC	C Field: 53h/73h (with FCB)
AA	A Field: Address
CI	CI Field: „variable data respond”
Variable Data Structure. Start.	
Fixed Data Header	
SS SS SS SS	Identification number (secondary address of the meter)
A8 15	Manufacturer identification, LSB first
00	Version
02	Medium Electricity
ZZ	Access meter
PS	Status
00 00	Signature
Data Information Block	
DIF	DIF Code
DIFE	Possible extension of the DIF Code
VIF	VIF Code
VIFE	Possible extension of the VIF Code
DT	Possible data
Variable Data Structure. Stop.	
PP	Checksum
16	Stop

1.2.4 Telegram setup: REQ_UD2

This telegram type is used for data requests. The response contains either standard data or previously selected data.

REQ_UD2	
Value / Code	**Description**
10	Start
5B/7B	C Field: Data inquiry
AA	A Field: Address
PP	Checksum
16	Stop

Example of a data request via the test address 254: 10 7B FE 79 16

1.2.5 Telegram setup: RSP_UD

This telegram type is used for responses to data requests. The format of the data is always compliant to „Variable Data Structure“.

RSP_UD	
Value / Code	**Description**
68	Start
LL	L Field: the length
LL	L Field: repeat of the length
68	Repeat start
08	C Field: Answer
AA	A Field: Meters primary address
CI	CI Field: „variable data respond”
Variable Data Structure. Start.	
Fixed Data Header	
SS SS SS SS	Identification number Meters secondary address
A8 15	Manufacturer identification, LSB first
00	Version
02	Medium Electricity
ZZ	Access meter
PS	Status
00 00	Signature
Data Information Block	
DIF	DIF Code
DIFE	DIFE: possible extension of the DIF Code
VIF	VIF: VIF Code
VIFE	VIFE: possible extension of the VIF Code
DT	Data
Variable Data Structure. Stop.	
PP	Checksum
16	Stop

1.3 M-Bus telegrams

1.3.1 Read commands

1.3.1.1 Energy register value

Description: Reading the energy register value

Syntax of request the energy register value (SND_UD – Parameter):

CI	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	***SS***	***TT***	***UU***	***VV***	***WW***	***XX***	***YY***	(none)
T0:	08_{16}	(none)	(none)					
T1:	88_{16}	10_{16}	(none)					
T2:	88_{16}	20_{16}	(none)					
T3:	88_{16}	30_{16}	(none)					
T4:	88_{16}	80_{16}	10_{16}					
A+:				$0s_{16}$	(none)	(none)	(none)	0 <= ***s*** <= 7
A-:				$8s_{16}$	$3C_{16}$	(none)	(none)	0 <= ***s*** <= 7
R+:				FB_{16}	82_{16}	$7s_{16}$	(none)	0 <= ***s*** <= 7
R-:				FB_{16}	82_{16}	Fs_{16}	$3C_{16}$	0 <= ***s*** <= 7

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	***SS***	***TT***	***UU***	***VV***	***WW***	***XX***	***YY***	***ZZZZZZZZZZZZ***
T0:	$0E_{16}$	(none)	(none)					
T1:	$8E_{16}$	10_{16}	(none)					
T2:	$8E_{16}$	20_{16}	(none)					
T3:	$8E_{16}$	30_{16}	(none)					
T4:	$8E_{16}$	80_{16}	10_{16}					
A+:				$0s_{16}$	(none)	(none)	(none)	* 10^{s-3} Wh
A-:				$8s_{16}$	$3C_{16}$	(none)	(none)	* 10^{s-3} Wh
R+:				FB_{16}	82_{16}	$7s_{16}$	(none)	* 10^{s-3} varh
R-:				FB_{16}	82_{16}	Fs_{16}	$3C_{16}$	* 10^{s-3} varh

Values of ***ZZZZZZZZZZZZ***: Energy register in the format 12 digits BCD in the specified arity

Remark 1: The arity of ***s*** is freely selectable in the read command.
In the answer following values are valid:

s	Resolution of the value	Condition
0	*10^{-3} Wh (varh)	with test mode = act. and/or total transformer ratio < 1000
2	*10^{-1} Wh (varh)	with test mode = inact. and/or total transformer ratio < 1000
3	*10^{0} Wh (varh)	with test mode = act. and/or total transformer ratio ≥ 1000
5	*10^{2} Wh (varh)	with test mode = inact. and/or total transformer ratio ≥ 1000

Example for reading the register value of pos. act. energy of tariff T1reading A- T1 = 4820.50kWh

→	68 07 07 68 73 FE 51 88 10 82 3C 18 16
←	E5
→	10 5B FE 59 16
←	68 19 19 68 08 01 72 12 36 61 03 A8 15 03 02 24 00 00 00 8E 10 82 3C 00 50 20 48 00 00 21 16

1.3.1.2 Active power

Description: Reading the instantaneous values of active power

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	***UU***	***VV***	***WW***	(none)
P_{sum}:			28_{16}	(none)	(none)	
P_{L1}:			$A8_{16}$	FC_{16}	01_{16}	
P_{L2}:			$A8_{16}$	FC_{16}	02_{16}	
P_{L3}:			$A8_{16}$	FC_{16}	03_{16}	

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	***UU***	***VV***	***WW***	***ZZZZZZZZZZZZZZZZ***
P_{sum}:			28_{16}	(none)	(none)	
P_{L1}:			$A8_{16}$	FC_{16}	01_{16}	
P_{L2}:			$A8_{16}$	FC_{16}	02_{16}	
P_{L3}:			$A8_{16}$	FC_{16}	03_{16}	

Values of ***ZZZZZZZZZZZZZZZZ*** : active power as 64-bit integer in mW

Example for reading the total active power PSum = 24.169W

→	68 05 05 68 73 FE 51 08 28 F2 16
←	E5
→	10 5B FE 59 16
←	68 19 19 68 08 01 72 12 36 61 03 A8 15 03 02 25 00 00 00 07 28 69 5E 00 00 00 00 00 00 04 16

1.3.1.3 Reactive power

Description: Reading the instantaneous values of reactive power

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	***UU***	***VV***	***WW***	***XX***	(none)
Q_{sum}:			FB_{16}	14_{16}	(none)	(none)	
Q_{L1}:			FB_{16}	94_{16}	FC_{16}	01_{16}	
Q_{L2}:			FB_{16}	94_{16}	FC_{16}	02_{16}	
Q_{L3}:			FB_{16}	94_{16}	FC_{16}	03_{16}	

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	***UU***	***VV***	***WW***	***XX***	***ZZZZZZZ…ZZZZ***
Q_{sum}:			FB_{16}	14_{16}	(none)	(none)	
Q_{L1}:			FB_{16}	94_{16}	FC_{16}	01_{16}	
Q_{L2}:			FB_{16}	94_{16}	FC_{16}	02_{16}	
Q_{L3}:			FB_{16}	94_{16}	FC_{16}	03_{16}	

Values of ***ZZZZZZZZZZZZZZZZ*** : reactive power as 64-bit integer in mvar

Example for reading the total reactive power QSum = 24.169var

→	68 06 06 68 73 FE 51 08 FB 14 D9 16
←	E5
→	10 5B FE 59 16
←	68 1A 1A 68 08 01 72 12 36 61 03 A8 15 03 02 25 00 00 00 07 FB 14 69 5E 00 00 00 00 00 00 EB 16

1.3.1.4 Apparent power

Description: Reading the instantaneous values of apparent power

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	***UU***	***VV***	***WW***	***XX***	(none)
S_{sum}:			FB_{16}	34_{16}	(none)	(none)	
S_{L1}:			FB_{16}	$B4_{16}$	FC_{16}	01_{16}	
S_{L2}:			FB_{16}	$B4_{16}$	FC_{16}	02_{16}	
S_{L3}:			FB_{16}	$B4_{16}$	FC_{16}	03_{16}	

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	***UU***	***VV***	***WW***	***XX***	***ZZZZZZZ…ZZZZ***
S_{sum}:			FB_{16}	34_{16}	(none)	(none)	
S_{L1}:			FB_{16}	$B4_{16}$	FC_{16}	01_{16}	
S_{L2}:			FB_{16}	$B4_{16}$	FC_{16}	02_{16}	
S_{L3}:			FB_{16}	$B4_{16}$	FC_{16}	03_{16}	

Values of ***ZZZZZZZZZZZZZZZZ*** : apparent power as 64-bit integer in mVA

Example for reading total apparent power SSum = 24.169VA

→	`68 06 06 68 73 FE 51 08 FB 34 F9 16`
←	`E5`
→	`10 5B FE 59 16`
←	`68 1A 1A 68 08 01 72 12 36 61 03 A8 15 03 02 25 00 00 00` `07 FB 34 69 5E 00 00 00 00 00 00 0B 16`

1.3.1.5 Phase voltage

Description: Reading the instantaneous values of phase voltage

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	***UU***	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	***UU***	*ZZZZZZZZZZZZZZZZ*

Values of ***UU***: 01_{16} → U1N
02_{16} → U2N
03_{16} → U3N

Values of ***ZZZZZZZZZZZZZZZZ*** : phase voltage as 64-bit integer in mV

Example for reading the phase voltage U1N = 230V

→	68 08 08 68 73 01 51 08 FD C6 FC 01 8D 16
←	E5
→	10 5B 01 5C 16
←	68 1C 1C 68 08 01 72 00 00 00 00 A8 15 00 02 13 00 00 00 07 FD C9 FC 01 70 82 03 00 00 00 00 00 0C 16

1.3.1.6 Line voltage

Description: Reading the instantaneous values of line voltage

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	*08*	(none)	FD	C6	FC	***UU***	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	*07*	(none)	FD	C6	FC	***UU***	***ZZZZZZZZZZZZZZZZ***

Values of ***UU***: 05_{16} → U12
06_{16} → U23
07_{16} → U31

Values of ***ZZZZZZZZZZZZZZZZ*** : line voltage as 64-bit integer in mV

Example for reading the line voltage U12 = 400V

→	68 08 08 68 73 01 51 08 FD C6 FC 05 91 16
←	E5
→	10 5B 01 5C 16
←	68 1C 1C 68 08 01 72 00 00 00 00 A8 15 00 02 13 00 00 00 07 FD C6 FC 05 80 1A 06 00 00 00 00 00 B8 16

1.3.1.7 Current

Description: Reading the instantaneous values of current

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	FD	D9	FC	***UU***	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	FD	D9	FC	***UU***	*ZZZZZZZZZZZZZZZZ*

Values of ***UU*** : 01_{16} → I1
02_{16} → I2
03_{16} → I3
04_{16} → IN

Values of ***ZZZZZZZZZZZZZZZZ*** : current as 64-bit integer in mA

Example for reading the current I1 = 40A

→	68 08 08 68 73 01 51 08 FD D9 FC 01 A0 16
←	E5
→	10 5B 01 5C 16
←	68 1C 1C 68 08 01 72 00 00 00 00 A8 15 00 02 13 00 00 00 07 FD D9 FC 01 40 9C 00 00 00 00 00 00 03 16

1.3.1.8 Frequency

Description: Reading the line frequency

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FB_{16}	$2C_{16}$	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	07_{16}	(none)	FB_{16}	$2C_{16}$	***ZZZZZZZZZZZZZZZZ***

Values of ***ZZZZZZZZZZZZZZZZ***: Contains the line frequency (8-byte integer) in mHz.

Example for reading the frequency (50Hz)

→	68 06 06 68 73 01 51 08 FB 2C F4 16
←	E5
→	10 5B 01 5C 16
←	68 1A 1A 68 08 01 72 12 34 56 78 A8 15 00 02 08 00 00 00 07 FB 2C 50 C3 00 00 00 00 00 00 F7 16

1.3.1.9 Power factor

Description: Reading the instantaneous values of power factor

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	VIFE	DATA
51_{16}	08_{16}	(none)	***UU***	***VV***	***WW***	***XX***	***YY***	(none)
PF_{sum}:			$A8_{16}$	$B4_{16}$	35_{16}	(none)	(none)	
PF_{L1}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	01_{16}	
PF_{L2}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	02_{16}	
PF_{L3}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	03_{16}	

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	VIFE	VIFE	VIFE	DATA
72_{16}	07_{16}	(none)	***UU***	***VV***	***WW***	***XX***	***YY***	*ZZ…ZZ*
PF_{sum}:			$A8_{16}$	$B4_{16}$	35_{16}	(none)	(none)	
PF_{L1}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	01_{16}	
PF_{L2}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	02_{16}	
PF_{L3}:			$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	03_{16}	

Values of ***ZZZZZZZZ***: Instantaneous power factor as 32-bit integer * 10-3

Example for reading the total power factor (PF = 0.82)

→	68 07 07 68 73 01 51 08 A8 B4 35 5E 16
←	E5
→	10 5B 01 5C 16
←	68 1B 1B 68 08 01 72 00 00 00 00 A8 15 00 02 13 00 00 00 04 A8 B4 35 34 03 00 00 19 16

1.3.1.10 Power quadrant

Description: Reading the power quadrant

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	17_{16}	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	FF_{16}	17_{16}	***ZZ***

Values of ***ZZ***: Contains the active quadrant in which the system is currently measuring power (1 byte integer).

Example for reading the power quadrant (Measurement of P+ and Q+)

→	68 06 06 68 73 01 51 08 FF 17 E3 16
←	E5
→	10 5B 01 5C 16
←	68 13 13 68 08 01 72 12 34 56 78 A8 15 00 02 08 00 00 00 01 FF 17 01 6E 16

1.3.1.11 Error status

Description: Reading the error status

Syntax of request (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FD_{16}	17	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	FD_{16}	17_{16}	***UU***

The data contains the error status of the meter as 8 bit unsigned integer. The error status includes individual flags that indicate the operating status of the meter.

Values of ***UU***:

01_{16} – checksum of program memory
02_{16} – checksum of parameter data
04_{16} – checksum of edited data
08_{16} – checksum of backup data
10_{16} – checksum of calibration data

Example for reading the error status (00)

→	68 06 06 68 73 01 51 08 FD 17 E1 16
←	E5
→	10 5B 01 5C 16
←	68 13 13 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 01 FD 17 00 65 16

1.3.1.12 Operating hours

Description: Reading the operating hours

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	22_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	04_{16}	(none)	22_{16}	(none)	***UUUUUUUU***$_{16}$

Values of ***UUUUUUUU***: Contains the number of operating hours of meter as 32-bit integer

Example for reading the operating hours (24h)

→	68 05 05 68 73 01 51 08 22 EF 16
←	E5
→	10 5B 01 5C 16
←	68 15 15 68 08 01 72 12 34 56 78 A8 15 00 02 08 00 00 00 04 22 18 00 00 00 94 16

1.3.1.13 Total transformer ratio

Description: Reading the total transformer ratio

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	15_{16}	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	04_{16}	(none)	FF_{16}	15_{16}	***UUUUUUUU***

Values of ***UUUUUUUU***: Contains the total transformer ratio as 32-bit integer

Example for reading the total transformer ratio (CTxVT = 1)

→	`68 06 06 68 73 01 51 08 FF 15 E1 16`
←	`E5`
→	`10 5B 01 5C 16`
←	`68 16 16 68 08 01 72 00 00 00 00 A8 15 00 02 13 00 00 00 04 FF 15 01 00 00 00 66 16`

1.3.1.14 Firmware version

Description: Reading the firmware version

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FD_{16}	0E	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0D_{16}$	(none)	FD_{16}	$0E_{16}$	08_{16} ***UUUUUUUUUUUUUUUU***

Values of ***UUUUUUUUUUUUUUUU***: Contains the firmware version (8-digits ASCII string, LO-HI order)

Example for reading the program version (10000000)

→	`68 06 06 68 73 01 51 08 FD 0E D8 16`
←	`E5`
→	`10 5B 01 5C 16`
←	`68 1B 1B 68 08 01 72 12 34 56 78 A8 15 00 02 08 00 00 00 0D FD 0E 08 30 30 30 30 30 30 30 31 F7 16`

1.3.1.15 Operating status

Description: Reading the operating status register I or II

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	***UU***	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	04_{16}	(none)	FF_{16}	***UU***	***ZZZZZZZZ***

Values of ***UU***: 24_{16} → operating condition register I
25_{16} → operating condition register II

Values of ***ZZZZZZZZ***: Contents of the operation condition register as 32-bit integer

Example for reading the status register I

→	`68 06 06 68 73 01 51 08 FF 24 F0 16`
←	`E5`
→	`10 5B 01 5C 16`
←	`68 16 16 68 08 01 72 00 00 00 00 A8 15 00 02 13` `00 00 00 04 FF 24 00 00 00 00 74 16`

1.3.1.16 Checksums

Description: Reading the checksums

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	***YY***$_{16}$	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	FF_{16}	***YY***$_{16}$	***ZZ***$_{16}$

Values of ***YY***: 21_{16} – checksum of parameter data
22_{16} – checksum of program memory
23_{16} – checksum of edited data

Values of ***ZZ***: Contains the checksum as 2-byte Integer

Example for reading the checksum of the parameter data (1234_{16}).

→	`68 06 06 68 73 01 51 08 FF 21 ED 16`
←	`E5`
→	`10 5B 01 5C 16`
←	`68 13 13 68 08 01 72 12 34 56 78 A8 15 00 02 08 00 00 00 FF 21` `34 12 BC 16`

1.3.1.17 Load profile

Description: Reading the load profile

Syntax of request to read the load profile (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	49_{16}	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	04_{16}	(none)	FF_{16}	49_{16}	***UUUU VVVV***

Syntax of setting of selection of records to be read out of the load profile (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	04_{16}	(none)	FF_{16}	49_{16}	***UUUU VVVV***

Values of ***UUUU*** : Index of the first record to be read out of the load profile (0_{10} .. 3000_{10}), 0 = recent value

Values of ***VVVV*** : Number of records to be read out of the load profile (0_{10} .. 3000_{10})

Example for selecting the most recent 10 entries:

→	`68 0A 0A 68 73 01 51 04 FF 49 00 00 0A 00 1B 16`
←	`E5`

Syntax of request for the selected records (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	45_{16}	(none)

For every record to be transmitted the meter expects a new REQ_UD2 command with toggled FCB. The transmission starts with the oldest record.
The data set has following structure (the presence of each channel depends on the configuration):

1. Timestamp[1]

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	$6D_{16}$	(none)	(none)	(none)	timestamp type F

2. Positive active energy

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	02_{16}	(none)	(none)	(none)	12 digits BCD

3. Negative active energy

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	82_{16}	$3C_{16}$	(none)	(none)	12 digits BCD

[1] for the format see 1.3.2.5 Time / Date

4. Positive reactive energy

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	FB_{16}	82_{16}	72_{16}	(none)	12 digits BCD

5. Negative reactive energy

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	FB_{16}	82_{16}	$F2_{16}$	$3C_{16}$	12 digits BCD

6. Information „ more records follow“

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$1F_{16}$	(none)	(none)	(none)	(none)	(none)	(none)

Example for reading out the load profile after selection of a range:

→	68 06 06 68 73 01 51 08 FF 45 11 16
←	E5
→	10 5B 01 5C 16
←	68 41 41 68 08 01 72 12 36 61 03 A8 15 03 02 14 08 00 00 02 FF 45 3E 02 0E 00 82 49 74 31 01 00 0E 80 3C 80 66 52 41 00 00 0E FB 82 70 00 54 16 49 61 00 0E FB 82 F0 3C 42 57 08 21 29 00 04 6D 32 31 91 13 1F 95 16
…	
→	10 5B 01 5C 16
←	68 41 41 68 08 01 72 12 36 61 03 A8 15 03 02 1D 08 00 00 02 FF 45 46 02 0E 00 82 49 74 31 01 00 0E 80 3C 80 66 52 41 00 00 0E FB 82 70 00 54 16 49 61 00 0E FB 82 F0 3C 42 57 08 21 29 00 04 6D 1E 32 91 13 1F 93 16
→	10 7B 01 7C 16
←	68 40 40 68 08 01 72 12 36 61 03 A8 15 03 02 1E 08 00 00 02 FF 45 47 02 0E 00 82 49 74 31 01 00 0E 80 3C 80 66 52 41 00 00 0E FB 82 70 00 54 16 49 61 00 0E FB 82 F0 3C 42 57 08 21 29 00 04 6D 23 32 91 13 7B 16

1.3.1.18 Type code system

Description: Reading the type code system

Syntax of request (SND_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	7C 06 FF 70 79 74 AF 00_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0D_{16}$	(none)	7C 06 FF 70 79 74 AF 00_{16}	(none)	$1F_{16}$ ***TT TT .. TT***

Values of ***TT..TT*** : type code system (31-digits ASCII string, LO-HI-order)

Example for reading the type code system:

→	68 0C 0C 68 53 FE 51 08 7C 06 FF 70 79 74 AF 00 37 16
←	E5
→	10 7B FE 79 16
←	68 38 38 68 08 01 72 12 36 61 03 A8 15 03 02 02 08 00 00 0D 7C 06 FF 70 79 74 AF 00 1F 57 51 2F 30 35 46 2D 30 30 30 30 30 33 2D 4D 30 2D 30 4D 4B 2D 30 30 2D 4C 45 31 53 2D 5A 49 44 01 16

1.3.2 Set data

1.3.2.1 Baud rate

Description: Reading / setting the baud rate
Access group: Set data

Syntax of request (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	42_{16}	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	FF_{16}	42_{16}	***UU***$_{16}$

Values of ***UU*** : 00_{16} → 300 baud
01_{16} → 2400 baud
02_{16} → 9600 baud

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
VV$_{16}$	(none)	(none)	(none)	(none)	(none)

Values of ***VV*** : $B8_{16}$ → 300 baud
BB_{16} → 2400 baud
BD_{16} → 9600 baud

Example for reading the baud rate (2400 baud)

→	68 06 06 68 73 01 51 08 FF 42 0E 16
←	E5
→	10 5B 01 5C 16
←	68 13 13 68 08 01 72 78 56 34 12 A8 15 00 02 01 00 00 00 01 FF 42 01 92 16

1.3.2.2 Primary address

Description: Reading / setting the primary address
Access group: Set data

Syntax of request (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	$7A_{16}$	(none)	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	$7A_{16}$	(none)	***UU***$_{16}$

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	01_{16}	(none)	$7A_{16}$	(none)	***UU***$_{16}$

Values of ***UU*** : 00_{10} to 250_{10} (00_{16} to FA_{16})

Example for reading the Primary address (01_{10} or 01_{16})

→	68 05 05 68 73 01 51 08 7A 47 16
←	E5
→	10 7B 01 7C 16
←	68 12 12 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 01 7A 01 CC 16

1.3.2.3 Secondary address

Description: Reading / setting the secondary address
Access group: Set data

Syntax of request g (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	79_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0C_{16}$	(none)	79_{16}	(none)	***UUUUUUUU***

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	$0C_{16}$	(none)	79_{16}	(none)	***UUUUUUUU***

Values of ***UUUUUUUU***: 00000000 to 99999999 (BCD coded)

Example for reading the secondary address (12345678).

→	68 05 05 68 73 01 51 08 79 46 16
←	E5
→	10 7B 01 7C 16
←	68 15 15 68 08 01 72 78 56 34 12 A8 15 00 02 07 00 00 00 0C 79 78 56 34 12 EE 16

1.3.2.4 Test mode

Description: Set / deactivate the test mode
Access group: Set data

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
50_{16}	(none)	(none)	(none)	(none)	***UU***$_{16}$

Values of ***UU*** : 91_{16} → Test mode active energy measurement
92_{16} → Test mode reactive energy measurement
90_{16} → Deactivate test mode

Example for setting the test mode (active energy measurement)

→	`68 04 04 68 73 01 50 91 55 16`
←	`E5`

1.3.2.5 Time / Date

Description: Reading / setting the time and date
Access group: Set data

Syntax of request (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	$6D_{16}$	(none)	***UUUUUUUU***$_{16}$

Values of ***UUUUUUUU***: 32-bit unsigned integer as a binary number. Time format Type F

$b_{23}b_{22}b_{21}$, $b_{31}b_{30}b_{29}b_{28}$ – year (from 0 to 99)
$b_{27}b_{26}b_{25}b_{24}$ – month (from 1 to 12)
$b_{20}b_{19}b_{18}b_{17}b_{16}$ – day (from 1 to 31)
b_{15} – summertime-wintertime-flag
(0 → standard time, 1 → summertime)
$b_{14}b_{13}$ – century ((from 0 to 3) * 100 + 1900))
$b_{12}b_{11}b_{10}b_{9}b_{8}$ – hours (from 0 to 23)
b_{7} – status RTC (1 → running reserve depleted)
b_{6} – reserved, always 0
$b_{5}b_{4}b_{3}b_{2}b_{1}b_{0}$ – minutes (from 0 to 59)

Remark 1: For the transmission of the system time the format Type F is used, which contains the day, month, year (4 digits), hour and minute. The seconds are not included.

Example for reading time and date (23.02.2006 14:56).

→	`10 40 01 41 16`
←	`E5`
→	`68 05 05 68 73 01 51 08 6D 3A 16`
←	`E5`
→	`10 7B 01 7C 16`
←	`68 15 15 68 08 01 72 78 56 34 12 A8 15 00 02 07 00 00 00 04 6D 38 2E D7 02 05 16`

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	06_{16}	(none)	$6D_{16}$	(none)	*UUUUUUUUUUUU*$_{16}$

Values of ***UUUUUUUUUUUU***:

$b_{47}b_{46}$	– amount of difference of summertime, always 0
$b_{45}b_{44}b_{43}b_{42}b_{41}b_{40}$	– week (from 1 to 53), no support, ignored
$b_{39}b_{38}b_{37}b_{36}$+ $b_{31}b_{30}b_{29}$	– year (from 0 to 99)
$b_{35}b_{34}b_{33}b_{32}$	– month (from 1 to 12)
$b_{28}b_{27}b_{26}b_{25}b_{24}$	– day (from 1 to 31)
$b_{23}b_{22}b_{21}$	– weekday, no support, ignored
$b_{20}b_{19}b_{18}b_{17}b_{16}$	– hours (from 0 to 23)
b_{15}	– time invalid, is ignored when writing
b_{14}	– signs for summertime deviation
$b_{13}b_{12}b_{11}b_{10}b_9b_8$	– minutes (from 0 to 59)
b_7	– leap-year, no support, ignored
b_6	– summertime / wintertime, no support, ignored
$b_5b_4b_3b_2b_1b_0$	– seconds (from 0 to 59)

Example for setting the date and time (01.12.2012 01:33:00).

→	`68 0B 0B 68 73 01 51 06 6D 80 21 01 81 1C 00 77 16`
←	`E5`

1.3.2.6 Summertime definition

Description: Reading / setting the time for switching between summer and wintertime
Access group: Set data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	08_{16}	(none)	7C 06 00 6D 6F 73 AF 00_{16}	(none)	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	$0D_{16}$	(none)	7C 06 00 6D 6F 73 AF 00_{16}	(none)	08_{16} ***ff hh dd mm FF HH DD MM***

Values of: ***MM*** Start month (standard time)

00_{16} no switching to summertime

01_{16} .. $0C_{16}$ a specific month

(01_{16}=January, ...,$0C_{16}$=December).

DD Start day (standard time)

00_{16} no switching to summertime

01_{16} .. $1F_{16}$ a specific day of the month

40_{16} first Monday in month

....

46_{16}	first Sunday in month
50_{16}	second Monday in month
....	.....
56_{16}	second Sunday in month
60_{16}	third Monday in month
....	.....
66_{16}	third Sunday in month
80_{16}	last Monday in month
....	.....
86_{16}	last Sunday in month

HH Start hour (standard time)

00_{16} .. 17_{16} a specific hour

FF Earliest start date for DD = 40_{16} .. 66_{16}

00_{16} .. $1A_{16}$ 1. to 26. of the month

mm End of month (standard time)

00_{16}	no switching to summertime
01_{16} .. $0C_{16}$	a specific month
dd	end of day (standard time)
00_{16}	no switching to summertime
01_{16} .. $1F_{16}$	a specific day of the month
40_{16}	first Monday in month
....	.....
86_{16}	last Sunday in month

hh End of hour (standard time)

00_{16} .. 17_{16} a specific hour

ff Earliest end day at dd = 40_{16} .. 66_{16}

00_{16} .. $1A_{16}$ 1. to 26. of month

Example for setting the summertime definition. Switching to summertime last Sunday in March and switching back to standard time last Sunday in October.

→	68 15 15 68 73 01 51 0D 7C 06 00 6D 6F 73 AF 00 08 00 02 86 0A 00 02 86 03 75 16
←	E5

1.3.2.7 Tariff switching times

Description: Reading / setting the tariff switching times
Access group: Set data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	7C 06 **##** 00 7A 74 AF 00_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0D_{16}$	(none)	7C 06 **##** 00 7A 74 AF 00_{16}	(none)	10 00_{16} ***QR OP MN LL KK JJ II HH GG FF EE DD CC BB AA***

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	$0D_{16}$	(none)	7C 06 **##** 00 7A 74 AF 00_{16}	(none)	10 00_{16} ***QR OP MN LL KK JJ II HH GG FF EE DD CC BB AA***

Values of **##** : 00_{16} Season 1: Monday to Friday
04_{16} Season 1: Saturday
08_{16} Season 1: Sunday

Parameter:

AA 1. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
BB 2. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
CC 3. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
DD 4. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
EE 5. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
FF 6. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
GG 7. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
HH 8. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
II 9. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
JJ 10. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
KK 11. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)
LL 12. switching time (00_{16}... $5F_{16}$ = 00 .. 95 = ¼ hour-index)

M$_{16}$ $hhll_2$ with: hh = with a switching time of AA activating tariff (00_2 … 11_2 = 0..3)
ll = with a switching time of BB activating tariff (00_2 … 11_2 = 0..3)

N$_{16}$ $hhll_2$ with: hh = with a switching time of CC activating tariff (00_2 … 11_2 = 0..3)
ll = with a switching time of DD activating tariff (00_2 … 11_2 = 0..3)

O$_{16}$ hhll$_2$ with:	hh = with a switching time of EE activating tariff ($00_2 ... 11_2$ = 0..3) ll = with a switching time of FF activating tariff ($00_2 ... 11_2$ = 0..3)
P$_{16}$ hhll$_2$ with:	hh = with a switching time of GG activating tariff ($00_2 ... 11_2$ = 0..3) ll = with a switching time of HH activating tariff ($00_2 ... 11_2$ = 0..3)
Q$_{16}$ hhll$_2$ with:	hh = with a switching time of II activating tariff ($00_2 ... 11_2$ = 0..3) ll = with a switching time of JJ activating tariff ($00_2 ... 11_2$ = 0..3)
R$_{16}$ hhll$_2$ with:	hh = with a switching time of KK activating tariff ($00_2 ... 11_2$ = 0..3) ll = with a switching time of LL activating tariff ($00_2 ... 11_2$ = 0..3)
00 :	always 00_{16}

Remark 1 : The values ***AA ... LL*** must be specified in ascending order.

Remark 2 : Unused switching times have to be specified as 00_{16} (starting from ***AA***).

Remark 3 : From 00:00 a.m. to the first switching time tariff 1 is active.

Remark 4 : If a tariff is set, which the meter does not support (e. g. tariff 3 for a two-tariff meter), the standard tariff (T1) is automatically activated during this time period.

Example for setting tariff switch times from Monday to Friday.

→ 00:00 – 02:00 = Tariff 1 (**1**#$_{16}$ = **00**##$_2$ = 00_2)
→ 02:00 – 08:00 = Tariff 2 (**1**#$_{16}$ = ##**01**$_2$ = 01_2)
→ 08:00 – 18:00 = Tariff 3 (#**B**$_{16}$ = **10**##$_2$ = 10_2)
→ 18:00 – 24:00 = Tariff 4 (#**B**$_{16}$ = ##**11**$_2$ = 11_2)

→	68 1D 1D 68 73 01 51 0D 7C 06 00 00 7A 74 AF 00 10 00 1B 00 00 48 20 08 00 00 00 00 00 00 00 00 00 8C 16
←	E5

1.3.2.8 Time switch program number

Description: Reading / setting the time switch program number
Access group: Set data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	7C 06 FF 02 02 00 00 01_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0D_{16}$	(none)	7C 06 FF 02 02 00 00 01_{16}	(none)	08_{16} ***AAAAAAAAAAAAAAAA***

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	$0D_{16}$	(none)	7C 06 FF 02 02 00 00 01_{16}	(none)	08_{16} ***AAAAAAAAAAAAAAAA***

DATA : ***AAAAAAAAAAAAAAAA*** → 8 digits ASCII string (LO-HI-Order)

Example for reading the time switch program number (12345678)

→	68 0C 0C 68 73 01 51 08 7C 06 FF 02 02 00 00 01 53 16
←	E5
→	10 5B 01 5C 16
←	68 21 21 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 0D 7C 06 FF 02 02 00 00 01 08 38 37 36 35 34 33 32 31 8F 16

1.3.2.9 Parameter set number (Set data)

Description: Reading / setting the parameter set number
Access group: Set data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	7C 06 32 01 02 00 00 01_{16}	(none)	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	$0D_{16}$	(none)	7C 06 32 01 02 00 00 01_{16}	(none)	08_{16} ***AAAAAAAAAAAAAAAA***

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	$0D_{16}$	(none)	7C 06 32 01 02 00 00 01_{16}	(none)	08_{16} ***AAAAAAAAAAAAAAAA***

DATA : ***AAAAAAAAAAAAAAAA*** – 8 digits ASCII string (LO-HI-Order)

Example for reading the parameter set number (12345678)

→	68 0C 0C 68 73 01 51 08 7C 06 32 01 02 00 00 01 85 16
←	E5
→	10 5B 01 5C 16
←	68 21 21 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 0D 7C 06 32 01 02 00 00 01 08 38 37 36 35 34 33 32 31 C1 16

1.3.3 Edit dates

1.3.3.1 Activate edit mode with a password

Description: Activate the edit mode with a password (if parameterized)
Access group: Edit data

Syntax of request (information if the edit mode is active):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	44_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	02_{16}	(none)	FF_{16}	44_{16}	***ZZZZ***

Values of ***ZZZZ*** : The password for edit mode ($0..999_{10}$), encrypted

Example for reading the activation status of the edit mode (01_{16} = edit mode is active)

→	68 06 06 68 73 01 51 08 FF 44 10 16
←	E5
→	10 5B 01 5C 16
←	68 13 13 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 01 FF 44 01 95 16

1.3.3.2 Exit edit mode

Description: Exit the edit mode, if active
Access group: Edit data

Syntax of setting:

CI	DIF	DIFE	VIF	VIFE	DATA
50_{16}	(none)	(none)	(none)	(none)	$C0_{16}$

Example for leaving the edit mode.

→	68 04 04 68 73 01 50 C0 84 16
←	E5

1.3.3.3 Pulse length of the output

Description: Reading / setting the pulse length of the pulse output
Access group: Edit data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	14_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	01_{16}	(none)	FF_{16}	14_{16}	***ZZ***

Values of ***ZZ*** : 00_{16} 30 ms
01_{16} 50 ms
02_{16} 100 ms
04_{16} 500 ms

Example for setting a pulse length of 50 ms.

→	`68 07 07 68 73 01 51 02 FF 14 01 DB 16`
←	`E5`

1.3.3.4 Pulse constant of the output

Description: Reading / setting the constant of the pulse output
Access group: Edit data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	13_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	02_{16}	(none)	FF_{16}	13_{16}	***ZZZZ***

Values of ***ZZZZ*** : 0000_{16} 1 Imp./kWh
0001_{16} 10 Imp./kWh
0002_{16} 50 Imp./kWh
0004_{16} 100 Imp./kWh
0008_{16} 500 Imp./kWh
0010_{16} 1.000 Imp./kWh
0020_{16} 5.000 Imp./kWh
0040_{6} 10.000 Imp./kWh
0080_{16} 50.000 Imp./kWh
0100_{16} 100.000 Imp./kWh

Example for setting the pulse constant to 500 Imp./kWh.

→	`68 08 08 68 73 01 51 02 FF 13 08 00 E1 16`
←	`E5`

1.3.3.5 Password

Description: Reading / setting the password for the edit menu
Access group: Edit data

Syntax of request (only in par-status):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	43_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	04_{16}	(none)	FF_{16}	43_{16}	***UUUU VVVV***

DATA: **UUUU** old password in the range of 0000_{16} to $03E7_{16}$ (0_{10} to 999_{10}), encrypted

VVVV new password in the range of 0000_{16} to $03E7_{16}$ (0_{10} to 999_{10}), encrypted

Example for setting the password.

→	`68 0A 0A 68 73 01 51 02 FF 43 uu uu vv vv cs 16`
←	`E5`

1.3.3.6 Transformer ratio for current

Description: Reading / setting the transformer ratio for current
Access group: Edit data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	11_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	02_{16}	(none)	FF_{16}	11_{16}	**ZZZZ**

DATA: ***ZZZZ*** Transformer ratio in the range of 0001_{16} to $270F_{16}$ (0_{10} to 9999_{10})

Remark 1: The product of the transformer ratios for current and voltage must not exceed 999.999.

Remark 2: The energy register values are reset to 0 after changing the transformer ratios.

Example for setting the transformer ratio $7B_{16}$ (123_{10}).

→	`68 08 08 68 73 01 51 02 FF 11 7B 00 52 16`
←	`E5`

1.3.3.7 Transformer ratio for voltage

Description: Reading / setting the transformer ratio for voltage
Access group: Edit data

Syntax of request:

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	12_{16}	(none)

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	02_{16}	(none)	FF_{16}	12_{16}	***ZZZZ***

DATA: ***ZZZZ*** Transformer ratio in the range of 0001_{16} to $03E7_{16}$ (0_{10} to 999_{10})

Remark 1: The product of the transformer ratios for current and voltage must not exceed 999.999.

Remark 2: The energy register values are reset to 0 after changing the transformer ratios.

Example for setting the transformer ratio $7B_{16}$ (123_{10}).

→	`68 08 08 68 73 01 51 02 FF 12 7B 00 53 16`
←	`E5`

1.3.3.8 Arity of energy registers

Description: Reading / setting the arity of energy registers
Access group: Edit data

Syntax of request (SND_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	08_{16}	(none)	FF_{16}	10_{16}	(none)

Syntax of response (RSP_UD – Parameter)

CI	DIF	DIFE	VIF	VIFE	DATA
72_{16}	01_{16}	(none)	FF_{16}	10_{16}	***UU***

Syntax of setting (SND_UD - Parameter):

CI	DIF	DIFE	VIF	VIFE	DATA
51_{16}	01_{16}	(none)	FF_{16}	10_{16}	***UU***

Values of ***UU***:
00_{16} = 4444.4444 kWh/ kvarh
01_{16} = 55555.333 kWh/ kvarh
02_{16} = 666666.22 kWh/ kvarh
04_{16} = 7777777.1 kWh/ kvarh
08_{16} = 88888888 kWh/ kvarh

Example for reading the arity of the energy registers for a direct connected meter (7777777.1 kWh)

→	68 06 06 68 73 01 51 08 FF 04 D0 16
←	E5
→	10 5B 01 5C 16
←	68 13 13 68 08 01 72 78 56 34 12 A8 15 00 02 02 00 00 00 01 FF 10 04 64 16

2 Analysis sheets

2.1.1 Standard data set 1

The standard data set 1 corresponds to the standard data set of DIZ Generation G with following contents / structure:

1. Active energy, positive, without tariff

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	02_{16}	(none)	(none)	(none)	12 digits BCD

2. Active energy, positive, tariff T1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	10_{16}	02_{16}	(none)	(none)	(none)	12 digits BCD

3. Active energy, positive, tariff T2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	20_{16}	02_{16}	(none)	(none)	(none)	12 digits BCD

4. Active energy, positive, tariff T3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	30_{16}	02_{16}	(none)	(none)	(none)	12 digits BCD

5. Active energy, positive, tariff T4

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	80_{16}	10_{16}	02_{16}	(none)	(none)	12 digits BCD

6. Active energy, negative, without tariff

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	82_{16}	$3C_{16}$	(none)	(none)	12 digits BCD

7. Active energy, negative, tariff T1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	10_{16}	82_{16}	$3C_{16}$	(none)	(none)	12 digits BCD

8. Active energy, negative, tariff T2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	20_{16}	82_{16}	$3C_{16}$	(none)	(none)	12 digits BCD

9. Active energy, negative, tariff T3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	30_{16}	82_{16}	$3C_{16}$	(none)	(none)	12 digits BCD

10. Active energy, negative, tariff T4

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	80_{16}	10_{16}	82_{16}	$3C_{16}$	(none)	12 digits BCD

11. Reactive energy, positive, without tariff

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	FB_{16}	82_{16}	72_{16}	(none)	12 digits BCD

12. Reactive energy, positive, tariff T1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	10_{16}	FB_{6}	82_{16}	72_{16}	(none)	12 digits BCD

13. Reactive energy, positive, tariff T2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	20_{16}	FB_{6}	82_{16}	72_{16}	(none)	12 digits BCD

14. Reactive energy, negative, without tariff

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0E_{16}$	(none)	FB_{16}	82_{16}	$F2_{16}$	$3C_{16}$	12 digits BCD

15. Reactive energy, negative, tariff T1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	10_{16}	FB_{6}	82_{16}	$F2_{16}$	$3C_{16}$	12 digits BCD

16. Reactive energy, negative, tariff T2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$8E_{16}$	20_{16}	FB_{16}	82_{16}	$F2_{16}$	$3C_{16}$	12 digits BCD

17. Total active power

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	28_{16}	(none)	(none)	(none)	8 byte integer

18. Error status

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
01_{16}	(none)	FD_{16}	17_{16}	(none)	(none)	1 byte integer

2.1.2 Standard data set 2

The standard data set 2 is an extended standard data set. It can be accessed after transmission of the standard data set 1. The data set has following content / structure:

1. Total active power

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	28_{16}	(none)	(none)	(none)	8 byte integer

2. Active power P1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	$A8_{16}$	FC_{16}	01_{16}	(none)	8 byte integer

3. Active power P2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	$A8_{16}$	FC_{16}	02_{16}	(none)	8 byte integer

4. Active power P3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	$A8_{16}$	FC_{16}	03_{16}	(none)	8 byte integer

5. Phase voltage U1N

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	01_{16}	8 byte integer

6. Phase voltage U2N

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	02_{16}	8 byte integer

7. Phase voltage U3N

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	03_{16}	8 byte integer

8. Outer conductor voltage U12

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	05_{16}	8 byte integer

9. Outer conductor voltage U23

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	06_{16}	8 byte integer

10. Outer conductor voltage U31

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$C6_{16}$	FC_{16}	07_{16}	8 byte integer

11. Current I1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$D9_{16}$	FC_{16}	01_{16}	8 byte integer

12. Current I2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$D9_{16}$	FC_{16}	02_{16}	8 byte integer

13. Current I3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$D9_{16}$	FC_{16}	03_{16}	8 byte integer

14. Current IN

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FD_{16}	$D9_{16}$	FC_{16}	04_{16}	8 byte integer

15. Primary address

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
01_{16}	(none)	$7A_{16}$	(none)	(none)	(none)	1 byte integer

16. Secondary address

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0C_{16}$	(none)	79_{16}	(none)	(none)	(none)	8 digits BCD

17. Baud rate

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
01_{16}	(none)	FF_{16}	42_{16}	(none)	(none)	1 byte integer

18. Error status

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
01_{16}	(none)	FD_{16}	17_{16}	(none)	(none)	1 byte integer

2.1.3 Standard data set 3

The standard data set 3 is an extended standard data set. It can be accessed after transmission of the standard data set 2. The data set has following content / structure:

1. Total reactive power

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	14_{16}	(none)	(none)	8 byte integer

2. Reactive power Q1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	94_{16}	FC_{16}	01_{16}	8 byte integer

3. Reactive power Q2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	94_{16}	FC_{16}	02_{16}	8 byte integer

4. Reactive power Q3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	94_{16}	FC_{16}	03_{16}	8 byte integer

5. Total apparent power

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	34_{16}	(none)	(none)	8 byte integer

6. Apparent power S1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	$B4_{16}$	FC_{16}	01_{16}	8 byte integer

7. Apparent power S2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	$B4_{16}$	FC_{16}	02_{16}	8 byte integer

8. Apparent power S3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{16}	(none)	FB_{16}	$B4_{16}$	FC_{16}	03_{16}	8 byte integer

9. Total power factor

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	$A8_{16}$	$B4_{16}$	35_{16}	(none)	4 byte integer

10. Power factor PF1

DIF	DIFE	VIF	VIFE	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	01_{16}	4 byte integer

11. Power factor PF2

DIF	DIFE	VIF	VIFE	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	02_{16}	4 byte integer

12. Power factor PF3

DIF	DIFE	VIF	VIFE	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	$A8_{16}$	$B4_{16}$	$B5_{16}$	FC_{16}	03_{16}	4 byte integer

13. Frequency

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
07_{6}	(none)	FB_{16}	$2C_{16}$	(none)	(none)	8 byte integer

14. Transformer ratio CT

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
02_{16}	(none)	FF_{16}	11_{16}	(none)	(none)	2 byte integer

15. Transformer ratio VT

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
02_{16}	(none)	FF_{16}	12_{16}	(none)	(none)	2 byte integer

16. Total transformer ratio

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
04_{16}	(none)	FF_{16}	15_{16}	(none)	(none)	4 byte integer

17. Power quadrant

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
01_{16}	(none)	FF_{16}	17_{16}	(none)	(none)	1 byte integer

2.1.4 Standard data set 4

The standard data set 4 is an extended standard data set. It can be accessed after transmission of the standard data set 3. The data set has following content / structure:

1. Manufacturers identification mark

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
02_{16}	(none)	FD_{16}	$0A_{16}$	(none)	(none)	2 byte integer

2. Program version

DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
$0D_{16}$	(none)	FD_{16}	$0E_{16}$	(none)	(none)	Version (8 digits)

3 M-Bus Layer: function/option implementation

Following functions and options are available:

3.1.1 Data Link Layer

Property	Implemented	Comment
5.1 Transmission Parameters	X	
5.2 Telegram Format	X	The support of Class 1 data and the bits DFC and ADC is not required by the standard
5.3 Description of the Fields. C Field (Control Field, Function Field).		
Bit FCB	X	Frame Count-Bit
Bit FCV	X	Frame Count Valid
Bit ACD	–	
Bit DFC	–	
SND_NKE	X	Short Frame, Initialization of Slave
SND_UD	X	Long/Control Frame, Send User Data to Slave
REQ_UD2	X	Short Frame, Request for Class 2 Data
REQ_UD1	–	Short Frame, Request for Class1 Data (see 8.1: Alarm Protocol)
RSP_UD	X	Long/Control Frame, Data Transfer from Slave to Master after Request
5.3 Description of the Fields. A Field (Address Field)		
0	X	The addresses are normally set to a value of 0 by the manufacturer of the meters, in order to designate them as unconfigured slaves.
1..250	X	
255	X	no reply, communication reset
254	X	reply own address
253	X	Network Layer: extended addressing
5.3 Description of the Fields. CI Field (control information field)	X	
5.3 Description of the Fields. Check Sum	X	
5.4 Communication Process. Reaction time EN1434-3	X	
5.4 Communication Process. Send/Confirm Procedures		
SND_NKE / E5h	X	This procedure serves to start up after the interruption or beginning of communication.
SND_UD / E5h	X	With this procedure the master transfers user data to the slave.
REQ_UD2 / RSP_UD	X	The master requests data from the slave according to Class 2.
Minimum Communication	X	REQ_UD2 / RSP_UD SND_NKE / E5h
5.4 Communication Process. Transmission Procedures in case of faults		
Start /Parity /Stop bits per character	X	
Start /Check Sum /Stop characters per telegram format	X	

Property	Implemented	Comment
The second Start character, the parity of the two field lengths, and the number of additional characters received (= L Field + 6) with a long or control frame	X	
5.5 FCB- and FCV-Bits and Addressing. 5.5.1 Applications of the FCB-mechanism		
Multi-telegram answers (RSP_UD) from slave to master	X	If a total answer sequence from a slave will not fit into a single RSP_UD (RAM buffer is too small)
Frozen answer telegrams from slave to master	–	For meter readout this frozen telegram technique is not recommended.
Multi-telegram data (SND_UD) from master to slave	–	
Incremental actions in slave initiated by master	–	
5.5 FCB- and FCV-Bits and Addressing. 5.5.2 Implementation aspects for primary addressing		
Implementation for multiple address slaves	–	only one primary address
Implementation for the primary (broadcast) address 255	X	No answer. Note that a SND_NKE to primary address 255 will clear the internal “Last received FCB”-Bits of all slaves with primary addresses 0-250 and with FCB-Bit implementation simultaneously.
Implementation for the primary (test) address 254 ($FE)	X	This test address is used by readout- or test equipment in point-to-point mode
Implementation for secondary addressing	X	network layer and selection
Error reporting in Data Link Layer	X	There can be so far only data link layer errors reported from slave to master by means of leaving out the acknowledgement or negative acknowledgement.

3.1.2 Application Layer

Property	Implemented	Comment
6.1 CI-Field.		
M Bit = 0	X	low byte first
M Bit = 1	–	high byte first
CI = 50h	X	Application reset (without additional parameters)
CI = 50h	–	Application select (with additional parameters)
CI = 51h	X	data send
CI = 52h	X	selection of slaves (only network layer)
CI = B8h, BBh, BDh	X	set baud rate 300bps, 2400bps and 9600bps
direction slave to master. CI = 70h	–	report of general application errors
direction slave to master. CI = 71h	–	report of alarm status

Property	Implemented	Comment
direction slave to master. CI = 72h	X	variable data respond
direction slave to master. CI = 73h	–	fixed data respond
6.2 Fixed Data Structure	–	
6.3 Variable Data Structure Fixed Data Header		
Ident. Nr.	X	
Manufr.	X	(15A8h / 5544 decimal)
Version	X	03h
Medium	X	Electricity (02h)
Access No.	X	Incremented with every received Telegram.
Status	X	Shows Mbus communication status 0 - No Error 2 - Any Application Error
Signature	X	The Signature remains reserved for future encryption applications, and until then is allocated the value 00 00 h.
6.3 Variable Data Structure Variable Data Blocks DIB, VIB, DATA	X	
6.4 Configuring Slaves		
Switching Baud rate	X	
Writing Data to a Slave. Primary Address Record	X	
Writing Data to a Slave. Enhanced Identification Record. Data is only the identification number	X	
Writing Data to a Slave. Enhanced Identification Record. Data is the complete identification	–	
Writing Data to a Slave. Normal Data Records	X	Without Generalized Object Layer!
Writing Data to a Slave. Write-Only Data	–	
Configuring Data Output Selection without specified data	X	No multiple values
Configuring Data Output Selection without specified data field: Any VIF	–	
Configuring Data Output Selection without specified data field: Global readout request	–	
Configuring Data Output Selection without specified data field: All Tariffs	–	
Configuring Data Output Selection without specified data field: All Storage Numbers	–	
Configuring Data Output Selection without specified data field: All Units	–	
Configuring Data Output Selection without specified data field: High Resolution Readout	–	

Property	Implemented	Comment
Configuring Data Output Selection with specified data field	–	
Configuring Data Output Deselection of data records	–	
6.5 Generalized Object Layer	–	
6.6 Application Layer Status (Error reporting in Application Layer)		
Status Field	X	0 - No Error 2 - Any Application Error
General Application Errors	–	
Record Errors	–	
6.7 Special Slave Features		
Auto Speed Detect	–	This feature is implemented in several slaves. It is no longer recommended by the M-Bus user group because it is difficult to guarantee a hamming distance of four with this method.
Slave Collision Detect	–	Collisions between transmitting slaves can occur during slave search activities by the master.
Use of the fabrication Number for extended addressing	–	The use of this number is recommended if the identification number is changeable.
Hex-Codes $A-$F in BCD-data fields	–	EN1434 allows multi-digit BCD-coded data fields. The current standard does not contain information about what happens if a non-BCD hex code ($A-$F) is detected by the master software.

3.1.3 Network Layer

Property	Implemented	Comment
7.1 Selection and Secondary Addressing	X	telegram for selecting a slave (mode 1)
7.2 FCB-Bit and Selection	X	
7.3 Searching for Installed Slaves		
Primary Addresses	X	
Secondary Addresses. Wildcards	X	
7.4 Generalized Selection Procedure		
Enhanced selection with fabrication number	–	