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# СЧЕТЧИКИ ЭЛЕКТРОЭНЕРГИИ

## Технические характеристики на

### ЕЕМ230



# EEM230-D-M

## Electrical Energy Meter with integrated M-Bus interface

Electrical energy meter with an integrated M-Bus interface allow direct reading of all relevant data, such as energy (total and partial), current, voltage, active and reactive power.

### MAIN FEATURES:

- Single-phase energy meter, 230 VAC 50 Hz
- Direct measurement up to 32 A
- Display of active power, voltage and current
- M-Bus interface to query the data
- Reactive power available through interface
- Up to 250 meter can be connected to the M-Bus interface
- 7-digit display
- Lead seal possible with cap as accessory
- Accuracy class B according to EN50470-3, accuracy class 1 according to IEC62053-21



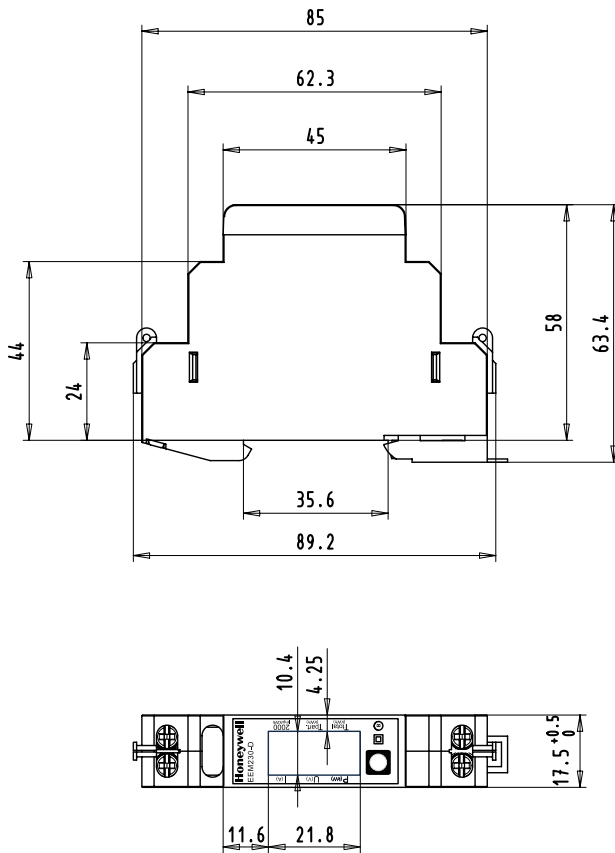
### Order Number

Standard Version: **EEM230-D-M**  
MID Version: **EEM230-D-M-MID**  
Sealing caps: **EEM230-SEALCAP**  
**(Bulk with 20 units)**

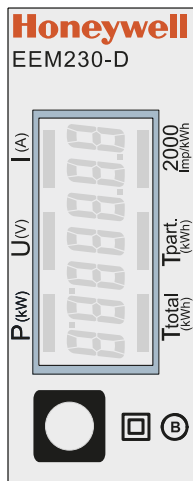
TECHNICAL DATA	
PRECISION CLASS	B according to EN50470-3, 1 according to IEC62053-21
OPERATING VOLTAGE	230 VAC, 50 Hz Tolerance -20 % / +15 %
REFERENCE/ MEASUREMENT CURRENT	$I_{ref} = 5 \text{ A} / I_{max} = 32 \text{ A}$
STARTING/ MINIMUM CURRENT	$I_{st} = 20 \text{ mA} / I_{min} = 0.25 \text{ A}$
POWER CONSUMPTION	Active 0.4 W per phase
COUNTING RANGE	00000.00... 99999.99 100000.0...999999.9
DISPLAY	LCD backlit, digits 5 mm high
PULSES PER KWH	LC-Display 2000 Imp./kWh

MOUNTING	
MOUNTING	On 35 mm rail, according to EN60715TH35
TERMINAL CONNECTIONS MAIN CIRCUIT	Conductor cross-section max. 6 mm <sup>2</sup> , screwdriver pozidrive no. 1, slot no.1 torque: 1.2 Nm
TERMINAL CONNECTIONS CONTROL CIRCUIT	Conductor cross-section max. 2.5 mm <sup>2</sup> , screwdriver pozidrive no. 0, slot no.1 torque: 0.5 Nm
INSULATION CHARACTERISTICS	4 kV/50 Hz test according to VDE 0435 for energy meter part 6 kV 1.2/50 µs surge voltage according to IEC255-4 2 kV/50 Hz test according to VDE 0435 for Interface Device protection class II
AMBIENT TEMPERATURE	-25 °C...+55 °C
STORAGE TEMPERATURE	30 °C...+85 °C
RELATIVE HUMIDITY	75 % without condensation
ENVIRONMENT	ModensabM2 Electromagnetic E2
EMC/ INTERFERENCE IMMUNITY	Surge voltage according to IEC61000-4-5 at main circuit, 4 kV at M-Bus interface, 1 kV Burst voltage according to IEC61000-4-4, at main circuit 4 kV at M-Bus interface 1 kV ESD according to IEC61000-4-2, contact 8 kV, air 15 kV

## DIMENSION DIAGRAM

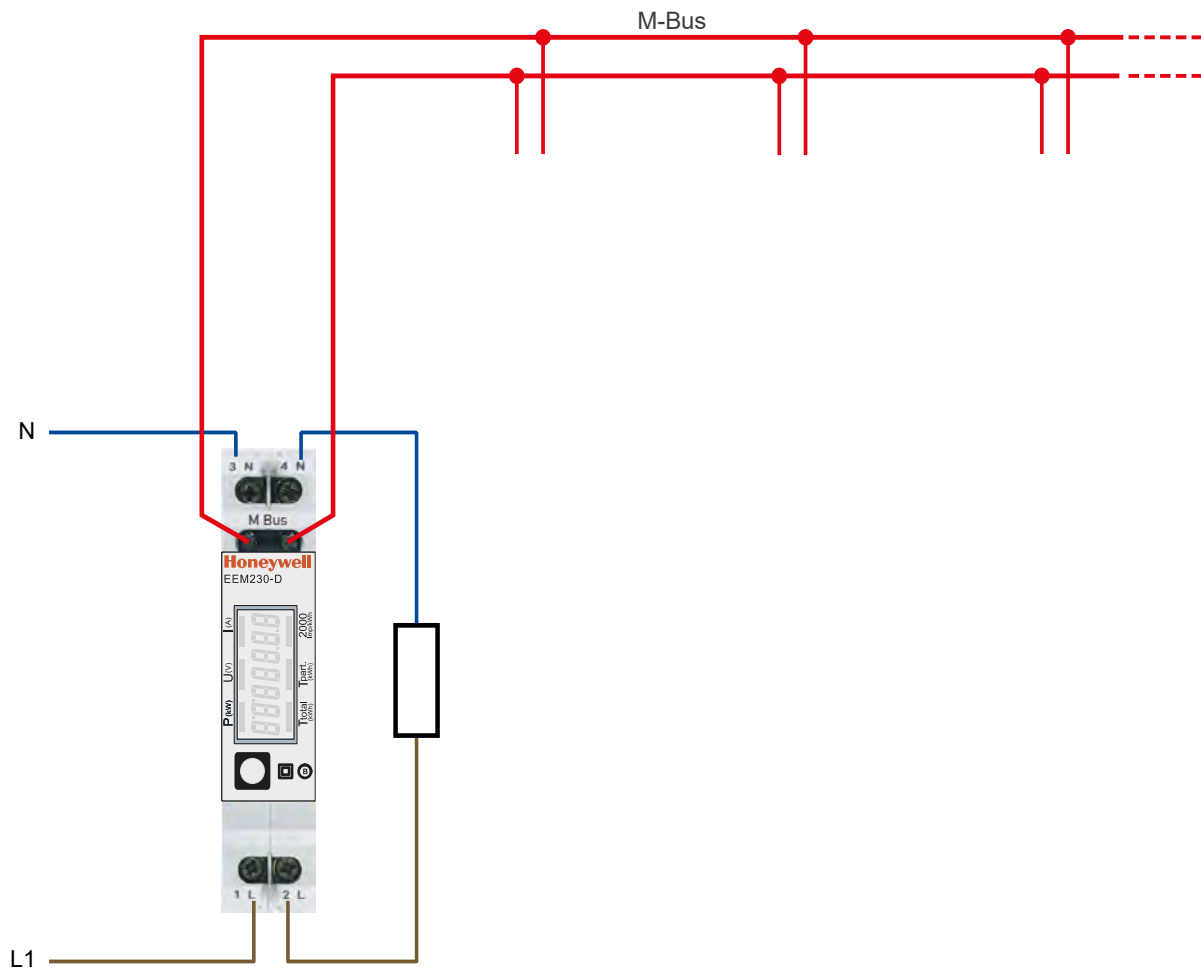


## DISPLAY ELEMENTS, DIRECT MEASUREMENT



- **T total (kWh)** Indicates the total consumption
  - **T part (kWh)** Indicates the partial consumption. This value can be reset
  - **P (kW)** Indicates the instantaneous power
  - **U (V)** Indicates the voltage
  - **I (A)** Indicates the current
  - **2000 pulses/kWh** Pulsates according to the amount of used power.
- Error indication (Line 1L/2L inverted) pulsating with 600/600 ms

## WIRINGS DIAGRAM



## FW VERSIONS

In autumn 2016, a new FW version was launched. As of firmware version 1.3.3.6, the setting of the baud rate changes.

- The baud rate is no longer automatically detected, it has to be changed using the two keys and the LC display (see pages 5).
- The baud rate can be changed using a M-Bus telegram (see pages 7).

# Menu to display the values on the LCD

Up to versions FW1.3.3.5

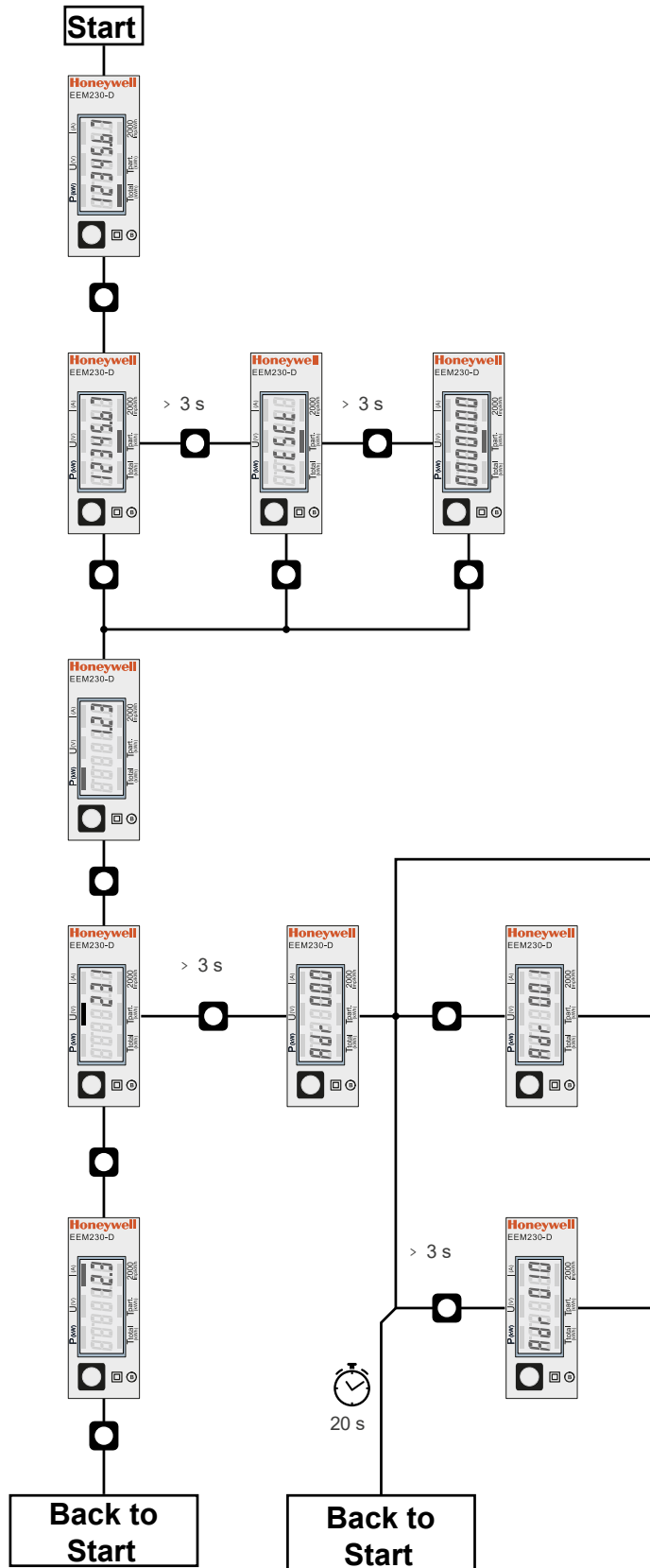
T total  
Total consumption

Tpart.  
Partial consumption

P  
Instantaneous power

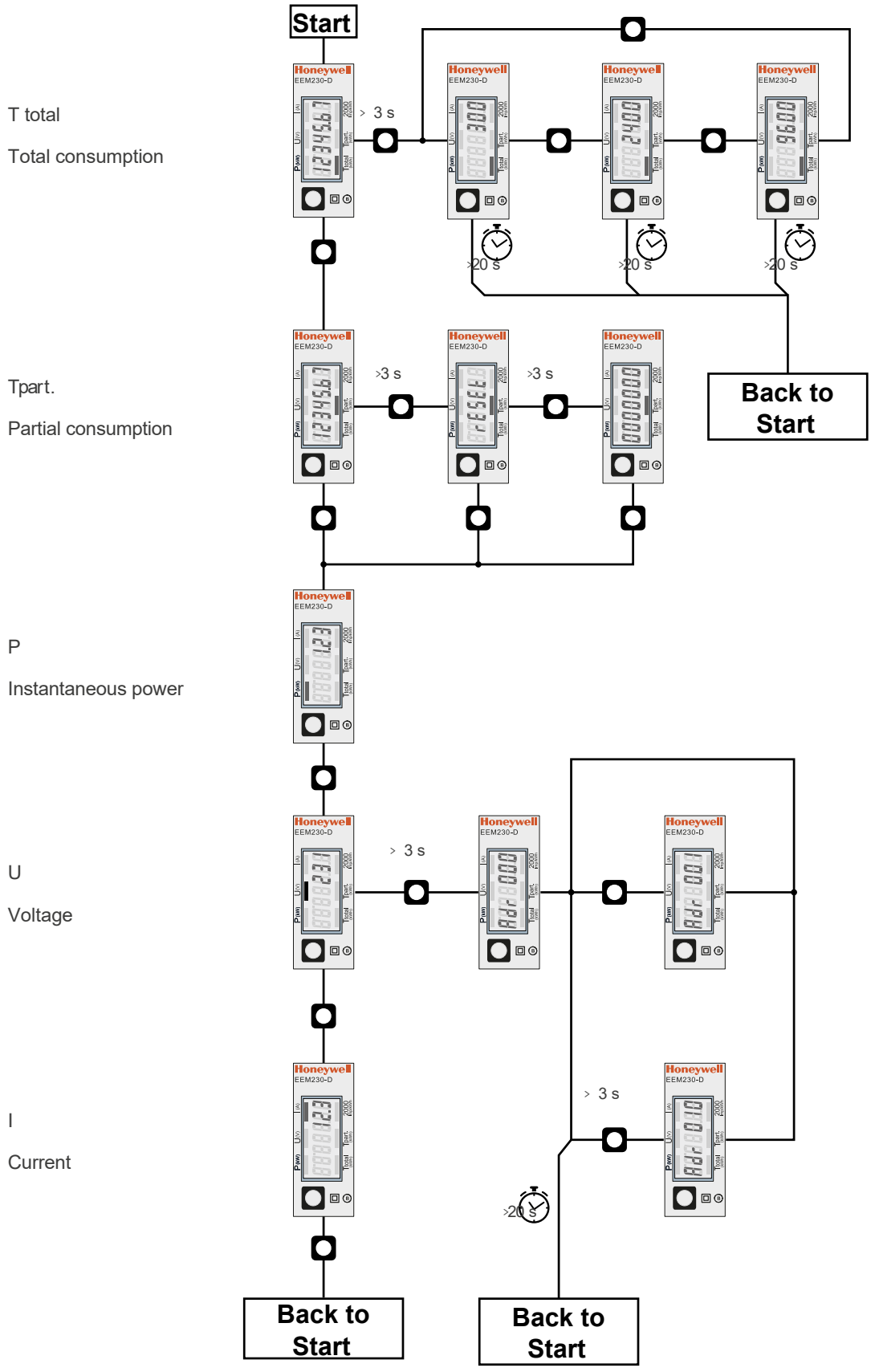
U  
Voltage

I  
Current



# Menu to display the values on the LCD

Starting with version FW1.3.3.6



# Data M-Bus

## Up to versions FW1.3.3.5

TECHNICAL DATA M-BUS	
BUS SYSTEM	M-Bus
BUS LENGTH	According to M-Bus
TRANSMISSION RATES	specification 300, 2400, 9600 Bd. The transmission rate is automatically detected
RESPONSE TIME: (SYSTEM RESPONSE)	Write up to 60 ms Read up to 60 ms

### Data transfer

f When reading out the values, all values are transferred in a telegram

f It supports the following telegrams (see p.6 for more detailed information):

- Initialisation SND\_NKE Response: 0xE5
- Reading meter Response: RSP\_READ\_UD2
- Changing primary address SND\_UD Response: 0xE5
- Reset  $T_{part}$  SND\_UD Response: 0xE5

f The device does not respond to unknown queries

f The transmission rate is automatically detected

f The device has a voltage monitor. In the case of a power failure, all the registers are saved in the EEPROM.

### Change the M-Bus address direct on device

f In the menu, go for «U»

f Push long ( $\geq 3$  sec)  "MBUS-ADR"

f Push short  M-Bus address +1, push long  M-Bus address +10

f Once the desired address is selected wait, to validate, till the root menu to come back

### Secondary addressing

f It is possible to communicate with the energy meter using the secondary address, according to EN13757 f The use of Wild Cards is possible

# Data M-Bus

## Starting with version FW1.3.3.6

TECHNICAL DATA M-BUS	
BUS SYSTEM	M-Bus
STANDARD	EN13757
BUS LENGTH	According to M-Bus
TRANSMISSION RATES	300, 2400, 9600 Bd. (factory setting: 2400 Bd). The transmission rate can be changed via Write/Display/M-Bus.
RESPONSE TIME: (SYSTEM RESPONSE)	Read up to 60 ms Write up to 60 ms

### Data transfer

f When reading out the values, all values are transferred in a telegram

f It supports the following telegrams (see p.6 for more detailed information):

- |  |         |                      |
|--|---------|----------------------|
| ■ Initialisation                           | SND_NKE | Response: 0xE5 (ACK) |
| ■ Reading meter                            | REQ_UD2 | Response: RSP_UD     |
| ■ Changing primary address                 | SND_UD  | Response: 0xE5 (ACK) |
| ■ Reset $T_{part}$                         | SND_UD  | Response: 0xE5 (ACK) |
| ■ Slave selection for secondary addressing | SND_UD  | Response: 0xE5 (ACK) |
| ■ The transmission rate is changeable      | SND_UD  | Response: 0xE5 (ACK) |

f The device does not respond to unknown queries

f The device has a voltage monitor. In the case of a power failure, all the registers are saved in the EEPROM.

### Change the M-Bus address direct on device

f In the menu, go for «U»

f Push long ( $\geq 3$  sec)  «Adr ...»

f In the following menu: push short  M-Bus address +1,

push long  M-Bus address +10

f When the desired address is set, wait until the main display appears again.

### Secondary addressing

f It is possible to communicate with the energy meter using the secondary address, according to EN13757 f The use of Wild Cards is possible

### Changing the baud rate

#### Variant 1 (local keys and LCD):

f In order to change the M-Bus baud rate, hold down  touch for 3 sec

f In the following menu,  changes the baud rate from 300 to 9600 baud and 2400

f When the desired M-Bus baud rate is set, wait until the main display appears again

#### Variant 2 (using M-Bus):

f Send:	9600	→ Telegram:	0x68 0x03 0x03 0x68 0x43 <addr> 0xBD <cs> 0x16
	2400	→ Telegram:	0x68 0x03 0x03 0x68 0x43 <addr> 0xBB <cs> 0x16
	300	→ Telegram:	0x68 0x03 0x03 0x68 0x43 <addr> 0xB8 <cs> 0x16

f Response: 0xE5 (sent with the former baud rate)

f A M-Bus master must communicate within 10 minutes to the M-Bus slave on the new baud rate to validate and save the baud rate change permanent (EN13757-3).



### Value information field (VIF)

Provides information on multiplier and the unit of the following data block

### Value information field extension (VIFE)

Detailed information on multiplier and the unit of the following data block

### Data information field (DIF)

Specifies how the data should be interpreted by the master in terms of length and encoding

### Data information field extension (DIFE)

Provides information on the tariff or subunits of the following data block

### Reading meter

Query: REQ\_UD2

Response: RSP\_UD (see Telegram structure)

TELEGRAM STRUCTURE										
0x68	0x38	0x38	0x68	0x08	PAdr	0x72	ID	0xEE	0x21	DEV
02	ACC	STAT	0	0	0x8C	0x10	0x04	Eto	0x8C	0x11
0x04	Epa	0x02	0xFD	0xC9	0xFF	0x01	V	0x02	0xFD	0xDB
0xFF	0x01	I	0x02	0xAC	0xFF	0x01	P	0x82	0x40	0xAC
0xFF	0x01	Pr	Csum	0x16						
Constantes		Variable à 1 octet			Variable à 2 octets			Variable à 4 octets		

BYTE	CONTENT	TYPE	DESCRIPTION
23 - 26	Eto=x	4 b. BCD	Energy total
30 - 33	Epa=x	4 b. BCD	Energy partial
39 - 40	V=x	2b. Integer	Voltage
46 - 47	I=x	2b. Integer	Current
52 - 53	P=x	2b. Integer	Power
59 - 60	Pr=x	2b. Integer	Reactive Power

UNIT WITH MULTIPLIER			
I	(Current)	0.1	[ A ]
U	(Voltage)	1	[ V ]
P <sub>ACTIVE</sub>	(Power)	0.01	[ kW ]
P <sub>REACTIVE</sub>	(Reactive Power)	0.01	[ kVAr ]
E	(Consumption)	0.01	[ kWh ]

## Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x68	Start
2	0x38	L_Read
3	0x38	L_Read
4	0x68	Start
5	0x08	C
6	x	Primary address
7	0x72	CI
8	x	ID1 (LSB)
9	x	ID2
10	x	ID3
11	x	ID4 (MSB)
12	0xEE	MAN1
13	0x21	MAN2
14	x	DEV (Typ - Version)
15	02	MED (Electric)
16	x	ACC
17	see footnote*	STAT
18	0	SIG1
19	0	SIG2
20	0x8C	DIF
21	0x10	DIFE
22	0x04	VIF = 0.01 kWh
23	Eto_4	T1 total
24	Eto_3	
25	Eto_2	
26	Eto_1	
27	0x8C	DIF
28	0x11	DIFE
29	0x04	VIF = 0.01 kWh

BYTE	VALUE	DESCRIPTION
30	Epa_4	T1 Partial
31	Epa_3	
32	Epa_2	
33	Epa_1	
34	0x02	DIF
35	0xFD	VIF
36	0xC9	VIFE = 1V
37	0xFF	VIFE
38	0x01	VIFE
39	V_2	Voltage
40	V_1	
41	0x02	DIF
42	0xFD	VIF
43	0xDB	VIFE = 0.1 A
44	0xFF	VIFE
45	0x01	VIFE
46	I_2	Current
47	I_1	
48	0x02	DIF
49	0xAC	VIF = 0.01kW
50	0xFF	VIFE
51	0x01	VIFE
52	P_2	Power
53	P_1	
54	0x82	DIF
55	0x40	DIFE
56	0xAC	VIF = 0.01kVAr
57	0xFF	VIFE
58	0x01	VIFE
59	Pr_2	Reactive power
60	Pr_1	
61	CS	Checksum
62	0x16	Stop

\* footnote

BYTE	BIT	VALUE	NAME	DESCRIPTION	STANDARD
17			<b>STAT</b>	<b>Status register</b>	
	0	b'xxxx xxx0'	Application_busy	Unused, is always 0	M-Bus
	1	b'xxxx xx1x'	Any_Application_Error	This bit is set when the internal communication is not working	M-Bus
	2	b'xxxx x0xx'	Power_low	Unused, is always 0	M-Bus
	3	b'xxxx 1xxx'	Permanent_Error	This bit is set when the counter type could not be found in the frame of the initialization	M-Bus
	4	b'xxx1 xxxx'	Temporary_Error	This bit is set during initialization phase and will be reset when all values have been read out once successfully. While this bit is set, the RSP_UD telegram contains no values	M-Bus
	5	b'xx1x xxxx'	Internal data refresh not ready	This bit is set as long as the internal communication is interrupted by the CS	Defined by CS
	6 and 7	b'00xx xxxx'	not defined	Unused, they are always 0	Unused

## Initialisation

Query: SND-NKE      Response: 0xE5

### Telegram structure (brief)

0x10	0x40	Padr	CSum	0x16
------	------	------	------	------

### Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x10	Start
2	0x40	Send or reply, reset
3		Primary address
4		Checksum
5	0x16	Stop

## Reset ACC (application reset)

Query: SND-UD      Response: 0xE5

### Telegram structure (brief)

0x68	0x03	0x03	0x68	0x53	Padr
0x50	CSum	0x16			

### Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x68	Start
2	0x03	Field length
3	0x03	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x50	CI
8		Checksum
9	0x16	Stop

## Changing primary address

Query: SND-UD  
(Byte 6 = actual M-Bus address; Byte 10 = new address)

Response: 0xE5

### Telegram structure (brief)

0x68	0x06	0x06	0x68	0x53	Padr
0x51	0x01	0x7A	New A	CSum	0x16

### Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x68	Start
2	0x06	Field length
3	0x06	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x51	CI
8	0x01	DIF
9	0x7A	VIF
10		New address
11		Checksum
12	0x16	Stop

## Reset T<sub>part</sub>

### (Application reset with subcode)

Query: SND-UD  
(Reset Counter: 0x01 = T<sub>1part</sub>)

Response: 0xE5

### Telegram structure (brief)

0x68	0x04	0x04	0x68	0x53	Padr
0x50	0x01	CSum	0x16		

### Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x68	Start
2	0x04	Field length
3	0x04	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x50	CI
8	0x01	Reset Counter T <sub>1part</sub>
11		Checksum
12	0x16	Stop

## Secondary address

Query: SND-UD      Response:      0xE5

### Telegram structure (brief)

0x68	0x0B	0x0B	0x68	0x53	FD
0x52	ID1	ID2	ID3	ID4	MAN1
MAN2	DEV	MED	Csum	0x616	

### Telegram structure (detailed)

BYTE	VALUE	DESCRIPTION
1	0x68	Start
2	0x0B	Field length
3	0x0B	Field length
4	0x68	Start
5	0x53	C
6	0xFD	Address selection for secondary addressing
7	0x52	CI
8	ID1	ID1
9	ID2	ID2
10	ID3	ID3
11	ID4	ID4
12	MAN1	MAN1
13	MAN2	MAN2
14	DEV	DEV
15	MED	MED
16	Csum	Csum
17	0x16	Stop

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