QALCOSONIC E3
Mbus user protocol

1. General structure of protocol

1.1.General features of protocol

Meter uses a M-bus protocol .
Default baud rate: 2400 bps, Even, 1 Stop.
Baud rate can be changed.
Protocol is the same for Mbus interface and for optical interface.
Primmary adress of Mbus is individual for Mbus interface and for optical interface.

1.2. Data strings

Data string to meter SND_NKE:

1	2	3	4	5
10h	40h	A	CS	16h

A - M-bus primary address of meter
CS – control sum (the youngest byte of amount of 2-nd and 3-rd bytes)

Data string to meter SND_UD2:

1	2	3	4	5	6	7	8...n-2	n-1	n
68h	L	L	68h	53h 73h	A	51h	Data bytes	CS	16h

L - lenght of string (the number of bytes from 5-th to n-2 byte)
A - M-bus primary address of meter
CS – control sum (the youngest byte of amount of 5-th to n-2 bytes)

Data string to meter REQ_UD2:

1	2	3	4	5
10h	5Bh 7Bh	A	CS	16h

A - M-bus primary address of meter
CS – control sum (the youngest byte of amount of 2-nd and 3-rd bytes)

Answer of the meter CON:

E5h

Answer of the meter RSP_UD2:

1	2	3	4	5	6	7	8...11	12, 13	14	15	16	17	18,19
68h	L	L	68h	C	A	CI	ID	Man	Vrs	Md	TC	St	Sign

20	...	...	...	...	...	... n-2	n-1	n
DIF	VIF	Data		DIF	VIF	Data	CS	16h

L - lenght of string (the number of bytes from 5-th to n-2 byte)
C – „C field“ (08)
A - M-bus primary address of meter
CI - „CI field“
ID – identification number of meter (BSD8, used for secondary addressing, can be changed - see paragraph 4.1),
Man – Manufacturer code (AXIOMA Metering UAB manufacturer code „AXI“: 09h 07h)
Vrs – number of protocol version (0Bh)
Md – code of medium (for „heat / cold energy“: 0Dh)
TC – counter of telegrams
St - meter status code
Sign - 00 00
The bytes 20...n-2 is data from meter:
DIF – code of data format
VIF – code of data units
Data– values of data
CS – control sum (the youngest byte of amount of 5-th to n-2 bytes).

2. Selection of the data type

2.1. Selection of the data type “All data”

Master sends to the meter telegram SND_UD2:

68h	03h	03h	68h	53h 73h	A	50h	CS	16h

or

68h	04h	04h	68h	53h 73h	A	50h	00h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.2. Selection of the data type “User data”

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	10h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.3. Selection of the data type “Simple billing**”** (Years logger)

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	20h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.4. Selection of the data type “Enhanced billing” (Days logger)

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	30h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.5. Selection of the data type “Multi tariff billing” (Months logger)

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	40h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.6. Selection of the data type “Instantaneous values”

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	50h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.7. Selection of the data type “Load management values for management” (Hours logger)

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	60h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.8. Selection of the data type “Installation and startup”

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	80h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.9. Selection of the data type “Testing”

Master sends to the meter telegram SND_UD2:

68h	04h	04h	68h	53h 73h	A	50h	90h	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

2.10. Parameter list for preselecting

If not satisfied with Default parameter lists (presented in the tables 1 ... 9). Obtain a desired parameter list presented in Table 11th.

(Paragraph 2.1 ... 2.9) Additionaly it is need to send parameter selecting telegram SND_UD2:

68h	L	L	68h	53h 73h	A	51h	SEL_1	SEL_2	…	SEL_N	CS	16h

SEL selecting parameter code from the table of 11 (made out of sequence as many codes as you want to select of the parameters).

Note . It may be selectes as many parameters but Response telegram length can not exceed 250 bytes.

Answer of the meter CON (if A not equal FFh):

E5h

3. Data request

3.1. Data request

Master sends to the meter telegram SND_UD2:

10h	5Bh 7Bh	A	CS	16h

In all cases, except A = FFh, meter response RSP_UD2 telegrame with selected data (tables 1 ...9)

If no data record, answer of meter is CON:

E5h

3.2. Meter data coding

Table 1

Application reset sub-codes and storages: All data (CI = 50 or CI = 50 00)
Default list

#	Parameter	DIF VIF	Type	Units
1	Date and time	04 6D	32 bit integer	Type F
2	Date and time of error starting	34 6D	32 bit integer	Type F
3	Error code	34 FD 17	32 bit integer	
4	Battery operation time	04 20	32 bit integer	sec
5	Working time without error	04 24	32 bit integer	sec
6	Energy for heating	(04 86 3B) (04 8E 3B) (04 FB 8D 3B)	32 bit integer	(kWh), (MJ), (Mcal).
7	Energy for cooling *	(04 86 3C) (04 8E 3C) (04 FB 8D 3C)	32 bit integer	(kWh), (MJ), (Mcal).
8	Energy of tariff 1 *	(84 10 86 3x) (84 10 8E 3x) (84 10 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
9	Energy of tariff 2 *	(84 20 86 3x) (84 20 8E 3x) (84 20 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
10	Volume	04 13	32 bit integer	0,001 m3
11	Volume of pulse input 1 *	84 40 13	32 bit integer	0,001 m3
12	Volume of pulse input 2 *	84 80 40 13	32 bit integer	0,001 m3
13	Power	04 2B	32 bit integer	W
14	Flow rate	04 3B	32 bit integer	0,001m3/h
15	Temperature 1	02 59	16 bit integer	0,01ºC
16	Temperature 2	02 5D	16 bit integer	0,01ºC
17	Temperature difference	02 61	16 bit integer	0,01K
18	Serial number	0C 78	32bit BCD8	
19	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Table 2

Application reset sub-codes and storages: User data (CI = 50 10)
Default list

#	Parameter	DIF VIF	Type	Units
1	Date and time	04 6D	32 bit integer	Type F
2	Date and time of error starting	34 6D	32 bit integer	Type F
3	Error code	34 FD 17	32 bit integer	
4	Battery operation time	04 20	32 bit integer	sec
5	Volume of pulse input 1 *	84 40 13	32 bit integer	0,001 m3
6	Volume of pulse input 2 *	84 80 40 13	32 bit integer	0,001 m3
7	Pulse value of input 1 *	02 93 28	16 bit integer	0,001 m3
8	Pulse value of input 2 *	02 93 29	16 bit integer	0,001 m3
9	Pulse value of output 1 *	02 93 2A	16 bit integer	0,001 m3
10	Pulse value of output 2 *	02 93 2B	16 bit integer	0,001 m3
11	Software version	01 FD 0E	8 bit integer	
12	Yearly set day	42 EC 7E	Type G	
13	Monthly set day	82 08 EC 7E	Type G	
14	Meter type	0D FD 0B	88 bit string	“AXI QS E3”
15	Serial number	0C 78	32bit BCD8	
16	CRC	02 7F	16 bit integer	CRC16

Table 3

Application reset sub-codes and storages: Simple billing (Years logger) (CI = 50 20)
Default list

#	Parameter	DIF VIF	Type	Units
1	Logger date and time	44 6D	32 bit integer	Type F
2	Logger working time without error	44 24	32 bit integer	sec
3	Logger energy for heating	(44 86 3B) (44 8E 3B) (44 FB 8D 3B)	32 bit integer	(kWh), (MJ), (Mcal).
4	Logger energy for cooling *	(44 86 3C) (44 8E 3C) (44 FB 8D 3C)	32 bit integer	(kWh), (MJ), (Mcal).
5	Logger energy of tariff 1 *	(C4 10 86 3x) (C4 10 8E 3x) (C4 10 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
6	Logger energy of tariff 2 *	(C4 20 86 3x) (C4 20 8E 3x) (C4 20 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
7	Logger volume	44 13	32 bit integer	0,001 m3
8	Logger volume of pulse input 1 *	C4 40 13	32 bit integer	0,001 m3
9	Logger volume of pulse input 2 *	C4 80 40 13	32 bit integer	0,001 m3
10	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Table 4

Application reset sub-codes and storages: Enhanced billing (Days logger) (CI = 50 30)
Default list

#	Parameter	DIF VIF	Type	Units
1	Logger date and time	84 08 6D	32 bit integer	Type F
2	Average temperature 1	82 08 59	16 bit integer	0,01ºC
3	Average temperature 2	82 08 5D	16 bit integer	0,01ºC
4	Logger working time without error	84 08 24	32 bit integer	sec
5	Logger energy for heating	(84 08 86 3B) (84 08 8E 3B) (84 08 FB 8D 3B)	32 bit integer	(kWh), (MJ), (Mcal).
6	Logger energy for cooling *	(84 08 86 3C) (84 08 8E 3C) (84 08 FB 8D 3C)	32 bit integer	(kWh), (MJ), (Mcal).
7	Logger energy of tariff 1 *	(84 18 86 3x) (84 18 8E 3x) (84 18 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
8	Logger energy of tariff 2 *	(84 28 86 3x) (84 28 8E 3x) (84 28 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
9	Logger volume	84 08 13	32 bit integer	0,001 m3
10	Logger volume of pulse input 1 *	84 48 13	32 bit integer	0,001 m3
11	Logger volume of pulse input 2 *	84 88 40 13	32 bit integer	0,001 m3
12	Logger duration when q > qmax	84 08 BB 58	32 bit integer	sec
13	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Table 5

Application reset sub-codes and storages: Multi tariff billing (Months logger) (CI = 50 40)
Default list

#	Parameter	DIF VIF	Type	Units
1	Logger date and time	84 08 6D	32 bit integer	Type F
2	Average temperature 1	82 08 59	16 bit integer	0,01ºC
3	Average temperature 2	82 08 5D	16 bit integer	0,01ºC
4	Logger working time without error	84 08 24	32 bit integer	sec
5	Logger energy for heating	(84 08 86 3B) (84 08 8E 3B) (84 08 FB 8D 3B)	32 bit integer	kWh (MJ) (Mcal)
6	Logger energy for cooling *	(84 08 86 3C) (84 08 8E 3C) (84 08 FB 8D 3C)	32 bit integer	kWh (MJ) (Mcal)
7	Logger energy of tariff 1 *	(84 18 86 3x) (84 18 8E 3x) (84 18 FB 8D 3x)	32 bit integer	kWh (MJ) (Mcal)
8	Logger energy of tariff 2 *	(84 28 86 3x) (84 28 8E 3x) (84 28 FB 8D 3x)	32 bit integer	kWh (MJ) (Mcal)
9	Logger volume	84 08 13	32 bit integer	0,001 m3
10	Logger volume of pulse input 1 *	84 48 13	32 bit integer	0,001 m3
11	Logger volume of pulse input 2 *	84 88 40 13	32 bit integer	0,001 m3
12	Logger duration when q > qmax	84 08 BE 58	32 bit integer	sec
13	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Remark.

If meter is specialy configured, in table 5 listed monthly parameters data is transmitted and in accordance after inquiry (“All data” table 1) data transmission.

Table 6

Application reset sub-codes and storages: Instantaneous values (CI = 50 50)
Default list

#	Parameter	DIF VIF	Type	Units
1	Date and time	04 6D	32 bit integer	Type F
2	Date and time of error starting	34 6D	32 bit integer	Type F
3	Error code	34 FD 17	32 bit integer	
4	Battery operation time	04 20	32 bit integer	sec
5	Working time without error	04 24	32 bit integer	sec
6	Energy for heating	(04 86 3B) (04 8E 3B) (04 FB 8D 3B)	32 bit integer	(kWh), (MJ), (Mcal).
7	Energy for cooling *	(04 86 3C) (04 8E 3C) (04 FB 8D 3C)	32 bit integer	(kWh), (MJ), (Mcal).
8	Energy of tariff 1 *	(84 10 86 3x) (84 10 8E 3x) (84 10 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
9	Energy of tariff 2 *	(84 20 86 3x) (84 20 8E 3x) (84 20 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).

10	Volume	04 13	32 bit integer	0,001 m3
11	Volume of pulse input 1 *	84 40 13	32 bit integer	0,001 m3
12	Volume of pulse input 2 *	84 80 40 13	32 bit integer	0,001 m3
13	Power	04 2B	32 bit integer	W
14	Flow rate	04 3B	32 bit integer	0,001m3/h
15	Temperature 1	02 59	16 bit integer	0,01ºC
16	Temperature 2	02 5D	16 bit integer	0,01ºC
17	Temperature difference	02 61	16 bit integer	0,01K
18	Meter type	0D FD 0B	88 bit string	"AXI QS E3"
19	Serial number	0C 78	32bit BCD8	
20	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Table 7

Application reset sub-codes and storages: Load management values for management (Hours logger) (CI = 50 60) Default list

#	Parameter	DIF VIF	Type	Units
1	Logger date and time	C4 86 03 6D	32 bit integer	Type F
2	Average power	C4 86 03 2B	32 bit integer	W
3	Average flow	C4 86 03 3B	32 bit integer	0,001m3/h
4	Average temperature 1	C2 86 03 59	16 bit integer	0,01ºC
5	Average temperature 2	C2 86 03 5D	16 bit integer	0,01ºC
6	Logger min flow	E4 86 03 3B	32 bit integer	0,001m3/h
7	Logger max flow	D4 86 03 3B	32 bit integer	0,001m3/h
8	Logger min temperature difference	E2 86 03 61	16 bit integer	0,01K
9	Logger max temperature difference	D2 86 03 61	16 bit integer	0,01K
10	Logger error code	F4 86 03 FD 17	32 bit integer	
11	Logger working time without error	C4 86 03 24	32 bit integer	sec
12	Logger energy for heating	(C4 86 03 86 3B) (C4 86 03 8E 3B) (C4 86 03 FB 8D 3B)	32 bit integer	(kWh), (MJ), (Mcal).
13	Logger energy for cooling *	(C4 86 03 86 3C) (C4 86 03 8E 3C) (C4 86 03 FB 8D 3C)	32 bit integer	(kWh), (MJ), (Mcal).
14	Logger energy of tariff 1 *	(C4 96 03 86 3x) (C4 96 03 8E 3x) (C4 96 03 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
15	Logger energy of tariff 2 *	(C4 A6 03 86 3x) (C4 A6 03 8E 3x) (C4 A6 03 FB 8D 3x)	32 bit integer	(kWh), (MJ), (Mcal).
16	Logger volume	C4 86 03 13	32 bit integer	0,001 m3
17	Logger volume of pulse input 1 *	C4 C6 03 13	32 bit integer	0,001 m3
18	Logger volume of pulse input 2 *	C4 86 43 13	32 bit integer	0,001 m3
19	Logger duration when q > qmax	C4 86 03 BE 58	32 bit integer	sec
20	CRC	02 7F	16 bit integer	CRC16

x = B – for energy for heating, x = C – for energy for cooling

Table 8

Application reset sub-codes and storages: Installation and startup (CI = 50 80)
Default list

#	Parameter	DIF VIF	Type	Units
1	Date and time	04 6D	32 bit integer	Type F
2	Date and time of error starting	34 6D	32 bit integer	Type F
3	Error code	34 FD 17	32 bit integer	
4	Battery operation time	04 20	32 bit integer	sec
5	Working time without error	04 24	32 bit integer	sec
6	Test mode status	01 FF 03	8 bit integer	
7	Device mode status	01 FF 04	8 bit integer	
8	Software version	01 FD 0E	8 bit integer	
9	Yearly set day	42 EC 7E	Type G	
10	Monthly set day	82 08 EC 7E	Type G	
11	Meter type	0D FD 0B	88 bit string	“AXI QS E3”
12	Serial number	0C 78	32bit BCD8	
13	CRC	02 7F	16 bit integer	CRC16

Table 9

Application reset sub-codes and storages: Testing (CI = 50 90)
Default list

#	Parameter	DIF VIF	Type	Units
1	Date and time	04 6D	32 bit integer	Type F
2	Date and time of error starting	34 6D	32 bit integer	Type F
3	Error code	34 FD 17	32 bit integer	
4	Battery operation time	04 20	32 bit integer	sec
5	Flow rate	04 3B	32 bit integer	0,001m3/h
6	Temperature 1	02 59	16 bit integer	0,01ºC
7	Temperature 2	02 5D	16 bit integer	0,01ºC
8	Temperature difference	02 61	16 bit integer	0,01K
9	Pulse value of energy test output	02 FF 01	16 bit integer	
10	Pulse value of volume test output	02 FF 02	16 bit integer	
11	Test mode status	01 FF 03	8 bit integer	
12	Device mode status	01 FF 04	8 bit integer	
13	Volume high resolution	04 01	32 bit integer	mWh
14	Energy high resolution	04 10	32 bit integer	ml
15	Device configuration	01 FF 09	8 bit integer	
16	Software version	01 FD 0E	8 bit integer	
17	Device type	0D FD 0B	88 bit string	“AXI QS E3”
18	Seial number	0C 78	32bit BCD8	
19	CRC	02 7F	16 bit integer	CRC16

Table 10

Error code encryption

Byte N	Bite N	if bite = 1	LCD indication code "ERROR xxxx"
0	0	-	
	1	-	
	2	Hardware status flag Er02	8000
	3	Hardware status flag Er03	8000
	4	End of battery live time	1000
	5	Hardware status flag Er05	0008
	6	-	
	7	-	
1	0	-	
	1	-	
	2	Flow sensor is empty	0001
	3	Flow flows in a reverse direction	0002
	4	Flow rate less qi	
	5	-	
	6	-	
	7	-	
2	0	Temperture sensor 1 error or short circuit	0080
	1	Temperture sensor 1 disconected	0080
	2	Temperture 1 < 0ºC	00C0
	3	Temperture 1 > 180ºC	0080
	4	Temperture sensor2 error or short circuit	0800
	5	Temperture sensor 2 disconected	0800
	6	Temperture 2 < 0ºC	0C00
	7	Temperture 2 > 180ºC	0800
3	0	Hardware status flag Er30	0880
	1	-	
	2	Temperature difference < 3ºC	4000
	3	Temperature difference > 150ºC	2000
	4	Flow rate greater 1,2qs	0004
	5	Hardware status flag Er35	8000
	6	-	
	7	Hardware status flag Er37	8000

Table 11

Parameters list for preselecting

#	Parameter	SEL	DIF VIF					Type	Units
			CI = 50 Instantaneous	CI = 50 60 Hours logger	CI = 50 30 Days logger	CI = 50 40 Months logger	CI = 50 20 Years logger		
1	Date and time stamp	C8 FF 7F 6D	04 6D	C4 86 03 6D	84 08 6D	84 08 6D	44 6D	32 bit integer	Type F
2	Working time without error	C8 FF 7F 24	04 24	C4 86 03 24	84 08 24	84 08 24	44 24	32 bit integer	sec
3	Error code	F8 FF 7F FD 17	34 FD 17	F4 86 03 FD 17	B4 08 FD 17	B4 08 FD 17	74 FD 17	32 bit integer	
4	Date and time of error starting	F8 FF 7F 6D	34 6D	-	-	-	-	32 bit integer	Type F
5	Energy for heating	C8 0F FE 3B (C8 0F FE FE 3B for „Mcal“)	(04 86 3B) (04 8E 3B) (04 FB 8D 3B)	(C4 86 03 86 3B) (C4 86 03 8E 3B) (C4 86 03 FB 8D 3B)	(84 08 86 3B) (84 08 8E 3B) (84 08 FB 8D 3B)	(84 08 86 3B) (84 08 8E 3B) (84 08 FB 8D 3B)	(44 86 3B) (44 8E 3B) (44 FB 8D 3B)	32 bit integer	kWh (MJ) (Mcal)
6	Energy for cooling *	C7 0F FE 3C (C8 0F FE FE 3C for „Mcal“)	(04 86 3C) (04 8E 3C) (04 FB 8D 3C)	(C4 86 03 86 3C) (C4 86 03 8E 3C) (C4 86 03 FB 8D 3C)	(84 08 86 3C) (84 08 8E 3C) (84 08 FB 8D 3C)	(84 08 86 3C) (84 08 8E 3C) (84 08 FB 8D 3C)	(44 86 3C) (44 8E 3C) (44 FB 8D 3C)	32 bit integer	kWh (MJ) (Mcal)
7	Volume	C8 FF 7F 13	04 13	C4 86 03 13	84 08 13	84 08 13	44 13	32 bit integer	0,001m3
8	Energy of tariff 1 *	C8 1F 7E	(84 10 86 3x) (84 10 8E 3x) (84 10 FB 8D 3x)	(C4 96 03 86 3x) (C4 96 03 8E 3x) (C4 96 03 FB 8D 3x)	(84 18 86 3x) (84 18 8E 3x) (84 18 FB 8D 3x)	(84 18 86 3x) (84 18 8E 3x) (84 18 FB 8D 3x)	(C4 10 86 3x) (C4 10 8E 3x) (C4 10 FB 8D 3x)	32 bit integer	kWh (MJ) (Mcal)
9	Energy of tariff 2 *	C8 BF 7F 7E	(84 20 86 3x) (84 20 8E 3x) (84 20 FB 8D 3x)	(C4 A6 03 86 3x) (C4 A6 03 8E 3x) (C4 A6 03 FB 8D 3x)	(84 28 86 3x) (84 28 8E 3x) (84 28 FB 8D 3x)	(84 28 86 3x) (84 28 8E 3x) (84 28 FB 8D 3x)	(C4 20 86 3x) (C4 20 8E 3x) (C4 20 FB 8D 3x)	32 bit integer	kWh (MJ) (Mcal)
10	Volume of pulse input 1 *	C8 FF 3F 7B	84 40 13	C4 C6 03 13	84 48 13	84 48 13	C4 40 13	32 bit integer	0,001 m3
11	Volume of pulse input 2 *	C8 BF 7F 7B	84 80 40 13	C4 86 43 13	84 88 40 13	84 88 40 13	C4 80 40 13	32 bit integer	0,001 m3
12	Average power	C8 FF 7F 2B	04 2B	C4 86 03 2B	84 08 2B	84 08 2B	44 2B	32 bit integer	W
13	Averago Flow rate	C8 FF 7F 3B	04 3B	C4 86 03 3B	84 08 3B	84 08 3B	44 3B	32 bit integer	0,001m3/h
14	Average Temperature 1	C8 FF 7F 59	02 59	C2 86 03 59	82 08 59	82 08 59	42 59	16 bit integer	0,01ºC
15	Average Temperature 2	C8 FF 7F 5D	02 5D	C2 86 03 5D	82 08 5D	82 08 5D	42 5D	16 bit integer	0,01ºC
16	Average Temperature difference	C8 FF 7F 61	02 61	C2 86 03 61	82 08 61	82 08 61	42 61	16 bit integer	0,01K
17	Min Power	E8 FF 7F 2B	-	E4 86 03 2B	A4 08 2B	A4 08 2B	64 2B	32 bit integer	W
18	Min Power date	E8 FF 7F AB 6D	-	E4 86 03 AB 6D	A4 08 AB 6D	A4 08 AB 6D	64 AB 6D	32 bit integer	Type F
19	Max Power	D8 FF 7F 2B	-	D4 86 03 2B	94 08 2B	94 08 2B	54 2B	32 bit integer	W
20	Max Power date	D8 FF 7F AB 6D	-	D4 86 03 AB 6D	94 08 AB 6D	94 08 AB 6D	54 AB 6D	32 bit integer	Type F
21	Min Flow rate	E8 FF 7F 3B	-	E4 86 03 3B	A4 08 3B	A4 08 3B	64 3B	32 bit integer	0,001m3/h
22	Min Flow rate Date	E8 FF 7F BB 6D	-	E4 86 03 BB 6D	A4 08 BB 6D	A4 08 BB 6D	64 BB 6D	32 bit integer	Type F
23	Max Flow rate	D8 FF 7F 3B	-	D4 86 03 3B	94 08 3B	94 08 3B	54 3B	32 bit integer	0,001m3/h
24	Max Flow rate Date	D8 FF 7F BB 6D	-	D4 86 03 BB 6D	94 08 BB 6D	94 08 BB 6D	54 BB 6D	32 bit integer	Type F
25	Min Temerature 1	E8 FF 7F DB 59	-	E2 86 03 59	A2 08 59	A4 08 59	62 59	16 bit integer	0,01ºC

#	Parameter	SEL	DIF VIF					Type	Units
			CI = 50 Instantaneous	CI = 50 60 Hours logger	CI = 50 30 Days logger	CI = 50 40 Months logger	CI = 50 20 Years logger		
26	Min Temerature 1 Date	E8 FF 7F D9 6D	-	E4 86 03 D9 6D	A4 08 D9 6D	A4 08 D9 6D	64 D9 6D	32 bit integer	Type F
27	Max Temperature 1	D8 FF 7F 59	-	D2 86 03 59	92 08 59	92 08 59	52 59	16 bit integer	0,01ºC
28	Max Temperature 1 Date	D8 FF 7F D9 6D	-	D4 86 03 D9 6D	94 08 D9 6D	94 08 D9 6D	54 D9 6D	32 bit integer	Type F
29	Min temperature 2	E8 FF 7F 5D	-	E2 86 03 5D	A2 08 5D	A2 08 5D	62 5D	16 bit integer	0,01ºC
30	Min Temperature 2 Date	E8 FF 7F DD 6D	-	E4 86 03 DD 6D	A4 08 DD 6D	A4 08 DD 6D	64 DD 6D	32 bit integer	Type F
31	Max Temperature 2	D8 FF 7F 5D	-	D2 86 03 5D	92 08 5D	92 08 5D	52 5D	16 bit integer	0,01ºC
32	Max Temperature 2 Date	D8 FF 7F DD 6D	-	D4 86 03 DD 6D	94 08 DD 6D	94 08 DD 6D	54 DD 6D	32 bit integer	Type F
33	Min Temperature difference	E8 FF 7F 61	-	E2 86 03 61	A2 08 61	A2 08 61	62 61	16 bit integer	0,01K
34	Min Temperature difference Date	E8 FF 7F E1 6D	-	E4 86 03 E1 6D	A4 08 E1 6D	A4 08 E1 6D	64 E1 6D	32 bit integer	Type F
35	Max Temperature difference	D8 FF 7F 61	-	D2 86 03 61	92 08 61	92 08 61	52 61	16 bit integer	0,01K
36	Max Temperature difference Date	D8 FF 7F E1 6D	-	D4 86 03 E1 6D	94 08 E1 6D	94 08 E1 6D	54 E1 6D	32 bit integer	Type F
37	Duration when q < qmin	C8 FF 7F BE 50	04 BE 50	C4 86 03 BE 50	84 08 BE 50	84 08 BE 50	44 BE 50	32 bit integer	sec
38	Flow min level qmin	C8 FF 7F BE 40	05 BE 40	-	-	-	-	float	1 m3/h
39	Duration when q > qmax	C8 FF 7F BE 58	04 BE 58	C4 86 03 BE 58	84 08 BE 58	84 08 BE 58	44 BE 58	32 bit integer	sec
40	Flow max level qmax	C8 FF 7F BE 48	05 BE 48	-	-	-	-	float	1 m3/h
41	Battery operation time	C8 FF 7F 20	04 20	-	-	-	-	32 bit integer	sec
42	Energy high resolution	C8 FF 7F 01	04 01	-	-	-	-	32 bit integer	
43	Volume high resolution	C8 FF 7F 10	04 10	-	-	-	-	32 bit integer	

x = B – for energy for heating, x = C – for energy for cooling

Remarks.

1. Table 1…11 energy and volume DIF VIF codes are provided of comma position for 0,001 MWh, 0,001 GJ, 0,001 Gcal and 0,001 m^3. Other values can be set for the energy and volume.
2. Table 1…11 parameters marked "*", will be transmitted only if the conditions are kept:

Table 12

Parameter	Condition
Energy for cooling . Logger energy for cooling	Heat meter application type – for measurement of energy consumed for heating and cooling
Energy of tariff 1. Logger energy of tariff 1	Tariff 1 function is On
Energy of tariff 2, Logger energy of tariff 2	Tariff 2 function is On
Volume of pulse input 1, Logger pulse input 1	Pulse input 1 is active
Volume of pulse input 2, Logger pulse input 2	Pulse input 2 is active
Pulse value of output 1	Pulse output 1 is active
Pulse value of output 2	Pulse output 2 is active

3.3. CRC16 checksum calculation algorithm

```
/*
 * The polynomial x^0 + x^5 + x^12.
*/
const __u16 crc_ccitt_table[256] = {
            0x0000, 0x1189, 0x2312, 0x329b, 0x4624, 0x57ad, 0x6536, 0x74bf,
            0x8c48, 0x9dc1, 0xaf5a, 0xbed3, 0xca6c, 0xdbe5, 0xe97e, 0xf8f7,
            0x1081, 0x0108, 0x3393, 0x221a, 0x56a5, 0x472c, 0x75b7, 0x643e,
            0x9cc9, 0x8d40, 0xbfdb, 0xae52, 0xdaed, 0xcb64, 0xf9ff, 0xe876,
            0x2102, 0x308b, 0x0210, 0x1399, 0x6726, 0x76af, 0x4434, 0x55bd,
            0xad4a, 0xbcc3, 0x8e58, 0x9fd1, 0xeb6e, 0xfae7, 0xc87c, 0xd9f5,
            0x3183, 0x200a, 0x1291, 0x0318, 0x77a7, 0x662e, 0x54b5, 0x453c,
            0xbdcb, 0xac42, 0x9ed9, 0x8f50, 0xfbef, 0xea66, 0xd8fd, 0xc974,
            0x4204, 0x538d, 0x6116, 0x709f, 0x0420, 0x15a9, 0x2732, 0x36bb,
            0xce4c, 0xdfc5, 0xed5e, 0xfcd7, 0x8868, 0x99e1, 0xab7a, 0xbaf3,
            0x5285, 0x430c, 0x7197, 0x601e, 0x14a1, 0x0528, 0x37b3, 0x263a,
            0xdecd, 0xcf44, 0xfddf, 0xec56, 0x98e9, 0x8960, 0xbbfb, 0xaa72,
            0x6306, 0x728f, 0x4014, 0x519d, 0x2522, 0x34ab, 0x0630, 0x17b9,
            0xef4e, 0xfec7, 0xcc5c, 0xddd5, 0xa96a, 0xb8e3, 0x8a78, 0x9bf1,
            0x7387, 0x620e, 0x5095, 0x411c, 0x35a3, 0x242a, 0x16b1, 0x0738,
            0xffcf, 0xee46, 0xdcdd, 0xcd54, 0xb9eb, 0xa862, 0x9af9, 0x8b70,
            0x8408, 0x9581, 0xa71a, 0xb693, 0xc22c, 0xd3a5, 0xe13e, 0xf0b7,
            0x0840, 0x19c9, 0x2b52, 0x3adb, 0x4e64, 0x5fed, 0x6d76, 0x7cff,
            0x9489, 0x8500, 0xb79b, 0xa612, 0xd2ad, 0xc324, 0xf1bf, 0xe036,
            0x18c1, 0x0948, 0x3bd3, 0x2a5a, 0x5ee5, 0x4f6c, 0x7df7, 0x6c7e,
            0xa50a, 0xb483, 0x8618, 0x9791, 0xe32e, 0xf2a7, 0xc03c, 0xd1b5,
            0x2942, 0x38cb, 0x0a50, 0x1bd9, 0x6f66, 0x7eef, 0x4c74, 0x5dfd,
            0xb58b, 0xa402, 0x9699, 0x8710, 0xf3af, 0xe226, 0xd0bd, 0xc134,
            0x39c3, 0x284a, 0x1ad1, 0x0b58, 0x7fe7, 0x6e6e, 0x5cf5, 0x4d7c,
            0xc60c, 0xd785, 0xe51e, 0xf497, 0x8028, 0x91a1, 0xa33a, 0xb2b3,
            0x4a44, 0x5bcd, 0x6956, 0x78df, 0x0c60, 0x1de9, 0x2f72, 0x3efb,
            0xd68d, 0xc704, 0xf59f, 0xe416, 0x90a9, 0x8120, 0xb3bb, 0xa232,
            0x5ac5, 0x4b4c, 0x79d7, 0x685e, 0x1ce1, 0x0d68, 0x3ff3, 0x2e7a,
            0xe70e, 0xf687, 0xc41c, 0xd595, 0xa12a, 0xb0a3, 0x8238, 0x93b1,
            0x6b46, 0x7acf, 0x4854, 0x59dd, 0x2d62, 0x3ceb, 0x0e70, 0x1ff9,
            0xf78f, 0xe606, 0xd49d, 0xc514, 0xb1ab, 0xa022, 0x92b9, 0x8330,
            0x7bc7, 0x6a4e, 0x58d5, 0x495c, 0x3de3, 0x2c6a, 0x1ef1, 0x0f78
};

/*
 *          crc_ccitt - recompute the CRC for the data buffer
 *          @crc - previous CRC value
 *          @buffer - data pointer
 *          @len - number of bytes in the buffer
 */

__u16 crc_ccitt(__u16 crc, __u8 const *buffer, size_t len)
{
   while (len--)
      crc = (crc >> 8) ^ crc_ccitt_table[(crc ^ (*buffer++)) & 0xff];
   return crc;
}
```

4. Settings the parameters of meter

4.1. Changing the identification number

Master sends to the meter string SND_UD2 with new identification number „ID“ (BCD8 format):

68h	09h	09h	68h	53h 73h	A	51h	0Ch	79h	ID	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

4.2. Changing the identification number, Manufacturer ID and Medium

Master sends to the meter string SND_UD2 with new Complete ID (64 bit integer):

68h	0Dh	0Dh	68h	53h 73h	A	51h	07h	79h	Complete ID (64 bit)	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

Structure of “Complete ID” (64 bit integer):

Identification number „ID“	Manufacturer ID	Generation	Medium
4 byte (BCD8 format)	2 byte	1 byte	1 byte

Remark: Generation code is ignored (In meter Generation code is fixed 0Bh)

4.3. Changing the primary address

Master sends to the meter string SND_UD2 with new primary address „aa“:

68h	06h	06h	68h	53h 73h	A	51h	01h	7Ah	aa	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

4.4. Changing the data and time of the meter

Master sends to the meter string SND_UD2 with new data and time:

68h	09h	09h	68h	53h 73h	A	51h	04h	6Dh	Dat and time (Type F)	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

4.5. Changing the yearly set day

Master sends to the meter string SND_UD2 with new set data :

68h	08h	08h	68h	53h 73h	A	51h	42h	ECh	7Eh	Month and day (Type G)	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

4.6. Changing the monthly set day

Master sends to the meter string SND_UD2 with new set data :

68h	09h	09h	68h	53h 73h	A	51h	82h	08h	ECh	7Eh	Day (Type G)	CS	16h

Answer of the meter CON (if A not equal FFh):

E5h

<u>Remark</u>. Changig the identification number and the set date is possible only when meter is set to SERVICE mode.

4.7. Changing the baud rate

Master sends to the meter string SND_UD2 with new baud rate code „BR“:

68h	03h	03h	68h	53h 73h	A	BR	CS	16h

Answer of the meter CON (if A not equal FFh) with old baud rate:

E5h

Values of BR code:

BR=B8h – for changing boud rate to 300 bps
BR=B9h – for changing boud rate to 600 bps
BR=BAh – for changing boud rate to 1200 bps
BR=BBh – for changing boud rate to 2400 bps
BR=BCh – for changing boud rate to 4800 bps
BR=BDh – for changing boud rate to 9600 bps

5. Secondary addressing

5.1. Selecting of the meter

Master sends to the meter string SND_UD2 :

68h	0Bh	0Bh	68h	53h 73h	FD	52	NN	NN	NN	NN	HH	HH	ID	MM	CS	16h

NN – Identification number (secondary adress) BCD8 format (if „F“- this number ignored)
HH – Manufacturer code, HST format (if „FF“- this byte ignored)
ID – Identification code, HST format (if „FF“- ignored)
MM – Medium code, SMED format (if „FF“- ignored)

The meter, whose identification number is the same, is selected for further communication and send answer CON:

E5h

5.2. Communication with selected meter

Communication with selected meter carried out as usual:

- data type for reading is selected by sending to meter strig SND_UD2 (see paragraph 2), only in this case, M-bus adress must be FDh,

- answer of the selected meter CON :

E5h

- for data request master sends to the meter string (M-bus adress must be FDh):

10h	5Bh 7Bh	FDh	CS	16h

- meter response RSP_UD2 telegrame with selected data (tables 1 ...9)

5.3. Deselection of seccondary addresing mode

Master sends to the meter telegram SND_NKE with adress FDh :

10h	40h	FDh	CS	16h