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SWITCH TO THE FUTURE

MBUS COMMUNICATION PROTOCOL 7M24 - 7M38

M-BUS

The M-BUS interface fully complies with M-BUS European standard EN13757-2. The entire communication is ensured with 8 Data Bits, Even Parity, 1 Stop Bit and a Baud Rate from 300 to 9600 Bauds.

Communication settings

Default communication settings are: 2400, 8, E, 1 primary address 0 and secondary address is set to serial number of device.

Initialize M-Bus (SNK_NKE)

This Short Telegram initializes the M-BUS 7M.38.8.400.XXXX. The M-BUS 7M.38.8.400.XXXX confirms correct receipt by Single Character Acknowledgement (ACK = E5). If the telegram was not correctly received the 7M.38.8.400.XXXX will not send an acknowledgement.

Select M-BUS 7M.38.8.400.XXXX Using Secondary Address (SND_UD)

This Telegram enables to select M-BUS 7M.38.8.400.XXXX. The M-BUS 7M.38.8.400.XXXX confirms the correct receipt by ACK. If the telegram has not been correctly received the M-BUS 7M.38.8.400.XXXX will not send an Acknowledgement. After issue of the Single Character Acknowledgement the M-BUS 7M.38.8.400.XXXX is ready to transmit the entire Read-out Data within 3 seconds from receiving the Telegram „Transmit Read-out Data". At the end of 3 seconds the M-BUS 7M.38.8.400.XXXX will switch back to normal mode.

Transmit Read-out Data via Primary/Secondary Address (REQ_UD2)

This Short Telegram enables to select the M-BUS 7M.38.8.400.XXXX and to command it to transmit the Read-out Data parameterized. The M-BUS 7M.38.8.400.XXXX confirms correct receipt by transmitting of the Read-out Data. If the Short Telegram has not been received correctly; no Data will be transmitted by the M-BUS 7M.38.8.400.XXXX. The Read-out Data are sent within 35 ms – 75 ms from receipt of the Short Telegram by the M-BUS Meter (fom more infomations see section M-Bus telegrams).

Set Baud Rate via Primary/Secondary Address (SND_UD)

This telegram enables to set the desired Baud Rate. The M-BUS 7M.38.8.400.XXXX confirms the correct receipt by ACK. If the telegram was not received correctly the M-BUS 7M.38.8.400.XXXX does not send an Acknowledgement. The (ACK) is sent by the M-BUS 7M.38.8.400.XXXX in the Old Baud Rate. As soon as ACK is transmitted the M-BUS Meter switches to the baud rate newly parameterized. If the 7M.38.8.400.XXXX now does not receive a new Telegram under the new baud rate within a period of 30 seconds – 40 seconds, it automatically switches back to the old baud rate. This is apt to prevent that a faulty setting of the baud rate may interrupt communication.

Set Primary Address via Primary/Secondary Address (SND_UD)

This Telegram enables to set a new Primary Address. The M-BUS 7M.38.8.400.XXXX confirms the correct receipt by ACK. If the telegram has not been correctly received the M-BUS 7M.38.8.400.XXXX will not send an Acknowledgement

Set Secondary Address via Primary/Secondary Address (SND_UD)

This Telegram enables to set a new Secondary Address. The M-BUS 7M.38.8.400.XXXX confirms the correct receipt by ACK. If the telegram has not been correctly received the M-BUS 7M.38.8.400.XXXX will not send an Acknowledgement.

Secondary Address (UD) consists of:

Identification Number:	00000000 – 99999999	8-digit Secondary Address number
Manufacturer's Code:	73 26	2 Byte Company Constant (ISS = "73 26")
Version Number:	01 – FF	1 Byte
Medium:	02	1 Byte Constant Electricit

Reset, Restart M-BUS MC350 via Primary/Secondary Address (SND_UD)

This Telegram reset/restarts M-BUS MC350. The M-BUS 7M.38.8.400.XXXX confirms correct receipt by ACK. If the telegram was not correctly received the M-BUS 7M.38.8.400.XXXX will not send an acknowledgement.

M-Bus Telegram

Total Energy counters 0, 1, 2, 3

Energy counters could represent: +/- active energy, +/-reactive energy or apparent energy and one of 4-th tariff.

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
								xx.xx.xx.xx
TO	04	none	none					
T1	84	10	none					
T2	84	20	none					
A+				05	None	none	none	*10 5-3 Wh
A-				85	3C	none	none	*10 5-3 Wh
R+				FB	82	75	none	*10 5-3 varh
R-				FB	82	F5	3C	*10 5-3 varh
App				FB	84	75	none	*10 5-3 VAh

Active Tariff number

Tariff number in progress (1 to 4)

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	01			FF	01			xx

DATA: value represent as 8-bit integer

Active Power Total Pt (W)

Active power total in 32 bit x 10(2-3) W

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04			2A	01			xx.xx.xx.xx

Active Power Total (kvar)

Reactive power total in 32bit x10(2-3) var

	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04		FB	97	72		xx.xx.xx.xx

Instant Apparent Power Total (VA)

Apparent power total in 32 bit x 10(5-6) VA

	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04		FB	B4	75		xx.xx.xx.xx

n - 0…7

Power Factor: -: leading et +: lagging: PF

Power factor as 32-bit integer * 10-3

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04			A8	B4	35		xx.xx.xx.xx

Unit : W/V/A

System frequency (Hz/1000)

Contains the line frequency 32-bit integer in mHz.

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04			FB	2C			xx.xx.xx.xx

Active Power in Phase 1, 2, 3 (W)

Active power in 32bit x 10(2-3) W

	DIF	DIFE	DIFE	VIF	VIFE	VIFE	DATA
	04						xx.xx.xx.xx
P1:				AA	FC	01	
P2:				AA	FC	02	
P3:				AA	FC	03	

Current in Phase 1, 2, 3, Neutral (A)

Phase current as 32 bit x 10(9-12) A

	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04						xx.xx.xx.xx
P1:			FD	D9	FC	01	
P2:			FD	D9	FC	02	
P3:			FD	D9	FC	03	

Voltages (V)

Voltage as 32 bit x 10(7-9) V

	DIF	DIFE	VIF	VIFE	VIFE	VIFE	DATA
	04						xx.xx.xx.xx
U1:			FD	C7	FC	01	
U2:			FD	C7	FC	02	
U3:			FD	C7	FC	03	
U12:			FD	C7	FC	05	
U23:			FD	C7	FC	06	
U31:			FD	C7	FC	07	

Data point	Description	Unit	Format	Modbus		7M.24	7M.38
1	Energy Counter n1	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32752		1	1
2	Energy Counter n2	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32754		2	2
3	Energy Counter n3	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32756		3	3
4	Energy Counter n3	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32758		4	4
5	Energy Counter 1	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32760		5	5
6	Energy Counter 2	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32762		6	6
7	Energy Counter 3	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32764		7	7
8	Energy Counter 4	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32766		8	8
9	Energy Counter 5	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32768		9	9
10	Energy Counter 6	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32770		10	10
11	Energy Counter 7	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32772		11	11
12	Energy Counter 8	kWh/100 | kvarh/100 | kVAh/100	32 bit signed integer	32774		12	12
13	Active tariff number		32 bit signed integer	32656		13	13
14	Active Power Total Pt	W	16 bit signed integer	32490		14	14
15	Reactive Power Total Qt	var	32 bit signed integer	32492		15	15
16	Apparent Power Total St	VA	32 bit signed integer	32494		16	16
17	Power Factor Total PFt	0,001	32 bit signed integer	32496		17	17
18	Current Total (I)	mA	32 bit signed integer	32522		18	
19	System Frequency f	Hz/1000	32 bit signed integer	32498		19	18
20	Active Power P1	W	32 bit signed integer	32530			19
21	Active Power P2	W	32 bit signed integer	32532			20
22	Active Power P3	W	32 bit signed integer	32534			21
23	Current I1	mA	32 bit signed integer	32516			22
24	Current I2	mA	32 bit signed integer	32518			23
25	Current I3	mA	32 bit signed integer	32520			24
26	Neutral Current In	mA	32 bit signed integer	32524			
27	Phase Voltage U1	V/100	32 bit signed integer	32500		20	25
28	Phase Voltage U2	V/100	32 bit signed integer	32502			26
29	Phase Voltage U3	V/100	32 bit signed integer	32504			27
30	Phase to Phase Voltage U12	V/100	32 bit signed integer	32508			
31	Phase to Phase Voltage U23	V/100	32 bit signed integer	32510			
32	Phase to Phase Voltage U31	V/100	32 bit signed integer	32512			
33	Run Time	s	32 bit signed integer	32480		21	29

EQUATIONS

Number	Symbol	Definition
1	MP	Average interval
2	U_f	Phase voltage (U_1, U_2 or U_3)
3	U_{ff}	Phase-to-phase voltage (U_{12}, U_{23} or U_{31})
4	N	Total number of samples in a period
5	n	Sample number ($0 \le n \le N$)
6	x, y	Phase number (1, 2 or 3)
7	i_n	Current sample n
8	u_{fn}	Phase voltage sample n
9	u_{ffn}	Phase-to-phase voltage sample n
10	ϕ_f	Power angle between current and phase voltage f (ϕ_1, ϕ_2 or ϕ_3)

Voltage

$$U_f = \sqrt{\frac{\sum_{n=1}^{N} u_n^2}{N}}$$

Phase voltage

N – samples in averaging interval (up to 65 Hz)

$$U_{xy} = \sqrt{\frac{\sum_{n=1}^{N} (u_{xn} - u_{yn})^2}{N}}$$

Phase-to-phase voltage

u_x, u_y – phase voltages (U_f)

N – a number of samples in averaging interval

Current

$$I_{TRMS} = \sqrt{\frac{\sum_{n=1}^{N} i_n^2}{N}}$$

Phase current

N – samples in averaging interval (up to 65 Hz)

Power

$\mathrm{P}_f = \frac{1}{\mathrm{N}} \sum_{\mathrm{n}=1}^{\mathrm{N}} (u_{fn} \times \mathrm{i}_{fn})$	**Active power by phases** N – a number of periods n – index of sample in a period f – phase designation
$P_t = P_1 + P_2 + P_3$	**Total active power** t – total power 1, 2, 3 – phase designation
$\mathrm{SignQ_f}(\varphi)$ $\varphi \in [0° - 180°] \rightarrow \mathrm{SignQ}_f(\varphi) = +1$ $\varphi \in [180° - 360°] \rightarrow \mathrm{SignQ}_f(\varphi) = -1$	**Reactive power sign** Q_f – reactive power (by phases) □ – power angle
$S = U_f \cdot I_f$	**Apparent power by phases** U_f – phase voltage I_f – phase current
$S_t = S_1 + S_2 + S_3$	**Total apparent power** S_t – apparent power by phases
$Q_f = SignQ(\varphi) \times \sqrt{{S_f}^2 - {P_f}^2}$	**Reactive power by phases** S_f – apparent power by phases P_f – active power by phases
$Q_f = \frac{1}{N} \cdot \sum_{n=1}^{N} (u_{fn} \times i_{f[n+N/4]})$	**Reactive power by phases (displacement method)** N – a number of samples in a period n – sample number (0 ≤ n ≤ N) f – phase designation
$Q_t = Q_1 + Q_2 + Q_3$	**Total reactive power** Q_t – reactive power by phases
$\varphi_s = a\ tan2\ (P_f, Q_f)$ $\varphi_s = [-180°, 179{,}99°]$	**Total power angle** P_t – total active power Q_t – total reactive power
$PF = \frac{\lvert P \rvert}{S}$	**Distortion power factor** P – active power S –apparent power

THD

$I_f\ THD(\%) = \frac{\sqrt{\sum_{n=2}^{63} I_{fn}^2}}{I_{f1}} 100$	**Current THD** I_1 – value of first harmonic n – number of harmonic
$U_f\ THD(\%) = \frac{\sqrt{\sum_{n=2}^{63} U_{fn}^2}}{U_{f1}} 100$	**Phase voltage THD** U_1 – value of first harmonic n – number of harmonic