Elster Multiprotocol

AE03:05.01:01.01

Specification

Contents

1. Introduction

The Elster Multiprotocol unites two communication protocols (M-Bus according to OMS and SCR/SCR+ in accordance with IEC 62056-21, formerly IEC 1107) to one protocol. Which modus is activated, is decided automatically in the field by assembly of the suitable communication module. With the help of the Elster Multiprotocol the Gas Meter becomes flexible, because all Elster Communication Modules can be directly connected to the meter or changed in field without adjusting the settings of the meter (Smart Ready).

2. Switching between M-Bus and SCR/SCR+ Mode

The external communication module, which is mounted to the Gas Meter, can switch between M-Bus and SCR/SCR+ Mode every time. The switching process is managed by the interface between Gas meter and communication module (ACM Interface). As the communication module chooses the right mode automatically, it is not necessary to change the modus over the communication protocol.

3. Modus M-Bus according to OMS

If this modus is activated by the external communication module, the Gas Meter communicates Wired M-Bus according to OMS Vol.2 Primary 2.0.0. In case of a Wired M-Bus communication module (e.g. **ACM M-Bus Wire**) is used, the physical layer is designed according to DIN EN13757-2

- Communication: asynchrony
- Baud rate: **2400**/ 300
- Parity: Even
- Data Bits: 8
- Stop Bit: 1

3.1 Data Link Layer

The usage of the frame count bit (FCB) of the C-Field is specified in EN 60870-5-2:1993. The assumption is that ignoring the FCB in the particular case of DSMR communication has no harming side-effect, since communication is carried out with single, independent, packets. However, it will be a proprietary implementation; and any compliancy or compatibility issue will be the responsibility of the vendor.

Supported C-Fields

Name	Hex
SND_NKE	40
REQ_UD1	5A
REQ_UD2	5B
SND_UD	53
RSP_UD	08

Table 1: C-Fields Overview

3.1.1 SND_NKE

	Field	Hex	Remark
0	Start Character	10	Short frame
1	C-Field	40	SND_NKE
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	

Table 2:SND_NKE

3.1.2 REQ_UD1

	Field	Hex	Remark
0	Start Character	10	Start byte short telegram
1	C	5A	Request User Data (counter sending) FCB=0
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	Always 16

Table 3:REQ_UD1

3.1.3 REQ_UD2

	Field	Hex	Remark
0	Start Character	10	Start byte short telegram
1	C	5B	Request User Data (counter sending) FCB=0
2	A	A-0	Primary Address
3	*Checksum*		
4	Stop Character	16	Always 16

Table 4:REQ_UD2

3.1.4 SND_UD

	Field	Hex	Remark
0	Start Character	68	Start byte long telegram
1	L	L-0	Length
2	L	L-0	Length
3	Start Character	68	Start byte long telegram
4	C	53	SND_UD (FCB=0)
5	A	A-0	Primary Address
6	*CI-Field Data Block*		
7	*Checksum*		
8	Stop Character	16	Always 16

Table 5: SND_UD

3.1.5 RSP_UD

	Field	Hex	Remark
0	Start Character	68	Start byte long telegram
1	L	L-0	Length
2	L	L-0	Length
3	Start Character	68	Start byte long telegram
4	C	08	(FCB=0)
5	A	A-0	Primary Address
6	*CI-Field Data Block*		
7	*Checksum*		
8	Stop Character	16	Always 16

Table 6: RSP_UD

3.2 Application Layer

3.2.1 Supported CI Fields

Control Information	Hex	Header
Application Reset	50	None
Command to device	51	None
Selection of device	52	None
Command to device	5A	Short Data Header
Command to device	5B	Long Data Header
Response error from device	70	None
Response from device	72	Fixed Data Header
Set Baud Rate	B8/BB	None

3.2.2 Short Data Header

	Field		Hex	Remark
0	*SND_UD Frame*			
1		CI	5A	Data send (master to slave)
2	4 byte data header	Access No	AC-0	Access Number
3		Status	S-0	Status
4		Signature	X0	Number of bytes encrypted, must be multiple of 16
5			EC-0	Encryption Method Code; for Absolute Encoder AE3 always zero
6	*Variable Data Blocks*			

Table 7: Short Data Header

3.2.3 Long Data Header

	Field			Hex	Remark
0	*SND_UD Frame*				
1			CI	5B	Data send (master to slave)
2	Long Header	Short ID	Identification Number	ID-0	Identification Number
3				ID-1	
4				ID-2	
5				ID-3	
6			Manufacturer Identification	MI-0	Manufacturer ID
7				MI-1	
8			Version	V-0	Generation
9			Medium	M-0	Medium
10		Short Header	Access No	AC-0	Access Number
11			Status	ST-0	Error Status Code
12			Signature	X0	Number of bytes encrypted, must be multiple of 16
13				EC-0	Encryption Method Code; for Absolute AE3 always zero
14	*Variable Data Blocks*				

Table 8: Long Data Header

3.2.4 Fixed Data Header

	Field			Hex	Remark
0	*RSP_UD Frame*				
1			CI	72	Data send (slave to master)
2	Long Header	Short ID	Identification Number	ID-0	Identification Number
3				ID-1	
4				ID-2	
5				ID-3	
6			Manufacturer Identification	MI-0	Manufacturer ID
7				MI-1	
8			Version	V-0	Generation
9			Medium	M-0	Medium
10		Short Header	Access No	AC-0	Access Number
11			Status	ST-0	Error Status Code
12			Signature	00	Number of bytes encrypted, must be multiple of 16
13				EC-0	No encryption method use
14	*Variable Data Blocks*				

Table 9: Fixed Data Header

Note 1: The combination of Identification Number (4 octets), Manufacturer identification (2 octets), Version identification (1 octet) and Device Type identification (Medium field, 1 octet) is defined as the Short ID.

Note 2: The Short ID shall be unique within the network of the grid operator. The manufacturer guarantees uniqueness with a Version field that is fixed over the lifetime of the individual M-Bus device. Hence firmware upgrades are not possible without changing the Version number.

3.3 Error Status Codes

The following table shows the M-Bus status byte according to EN 13757-3:2004

$b_7\, b_6\, b_5\, b_4\, b_3\, b_2\, b_1\, b_0$

	Bit	Meaning	Set Conditions	Reset Conditions
0	b_0	Application Busy	Absolute Encoder was not able to read the Index	After the next successful readout.
1	b_1			
2	b_2	Low power	Battery is low. This bit is only considered by the communication module ACM Wave System. As the AE3 is a battery free index, the bit will be ignored by the cable solution	Change the ACM WAVESYSTEM
3	b_3			
4	b_4	Temporary Error	The actuality duration time is unknown in the ACM WAVE RECEIVER. This bit is only considered by the communication module ACM Wave System.	When the ACM WAVE RECEIVER receives a new RSP_UD frame.
5	b_5	-	-	-
6	b_6	-	-	-
7	b_7	-	-	-

Table 10: OMS M-Bus Status Byte

3.4 Version field

The Version field is implemented as a bit mask:

b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
Protocol Type		Protocol Version					

Table 11: Version Field

Protocol Type

Code	Meaning
00	Elster wired M-Bus
01	Elster P2 V2.2
10	Multiprotocol, Mode M-Bus according to OMS Vol.2 Primary 2.0.0
11	Reserved for future use

Table 12: Protocol Type Definitions

The Protocol Version represents the version of the Protocol, e.g. OMS Vol. 2 Primary 2.0.0/ Multiprotocol

Protocol Version for Protocol Type = 'Elster OMS'

Code	Meaning
000000	M-Bus according to OMS Vol.2 Primary 2.0.0
000001	Multiprotocol, Mode M-Bus according to OMS Vol.2 Primary 2.0.0 (this document)
any other value	Reserved for future OMS Implementations

Table 13: Protocol Version Definition

3.5 Variable Data Blocks

Data Points Overview

ID	Name	Data Record Header				
		DIF	DIFE	VIF	VIFE	LVAR
T01	Ownership number	0D	-	FD	11	00…BF
T02	Volume, converted	0C	-	13…14	-	-
T03	Volume, unconverted	0C	-	93…94	3A	-
T04	Actuality Duration	02	-	74	-	-

Data Points

3.5.1 Ownership Number

	Field	Hex	Remark
0	DIF	0D	Variable length
1	VIF	FD	Ownership number
2	VIFE	11	Ownership number
3	LVAR	00…BF	Ownership number length
4	Ownership number	ON-0	4 characters, ASCII coded LSB (i.e. last character) first.
5		ON-1	
6		ON-2	
7		ON-3	

Data Point D001: Ownership Number

3.5.2 Volume, converted

	Field	Hex	Remark
0	DIF	0C	Data format 8 Digit BCD, Storage Number Bit = 0 / 1
1	VIF	13…14	Multiplier 0,001 m³ ...0,01 m³
2	Volume	V-0	Temperature Converted Value, where V-0 is the LSB of the value
3		V-1	
4		V-2	
5		V-3	

Data Point D002: Volume, converted

3.5.3 Volume, unconverted

	Field	Hex	Remark
0	DIF	0C	Data format 8 Digit BCD, Storage Bit = 0 / 1
1	VIF	93…94	Multiplier 0,001 m³ ... 0,01 m³
2	VIFE	3A	VIF contains unconverted units.
3	Volume	V-0	Unconverted volume where V-0 is the LSB of the value
4		V-1	
5		V-2	
6		V-3	

Data Point D003: Volume, unconverted

3.5.4 Actuality Duration

This data Block is only available by using the communication module **ACM WaveSystem RF**. It represents the time between digitalisation of the actual meter index and RF transmission.

	Field	Hex	Remark
0	DIF	02	16 Bit Integer/Binary
1	VIF	74	Actuality duration
2	Time	T-0	Actuality duration in seconds, where T-0 is the LSB of the value.
3		T-1	

Data Point D004: Actuality Duration

3.6 Procedures

Overview

ID	Telegram Name	CI-Field
T001	SND_UD Set Baud Rate	B8/BB
T002	SND_UD Application Reset	50
T003	SND_UD Slave Select	52
T004	RSP_UD Standard Data Record	72

3.6.1 SND_UD Set Baud Rate

	Field
0	*SND_UD Frame*
1	*Control Information:* *B8 set baud rate to 300 baud* *BB set baud rate to 2400 baud*

Procedure T001: SND_UD Set Baud Rate

3.6.2 SND_UD Application Reset

	Field
2	*SND_UD Frame*
3	*Control Information: 50 Application Reset*

Procedure T002: SND_UD Application Reset

3.6.3 SND_UD Slave Select

	Field
0	*SND_UD Frame*
1	*Control Information: 52 Slave Select*
2	*Short ID*

Procedure T003: SND_UD Slave Select

3.6.4 RSP_UD Standard Data Record

	Field
0	*RSP_UD Frame*
1	*Control Information: 72 slave to master*
2	*Fixed Data Header*
3	*Data Point T02 Volume, converted* *or* *Data Point T03Volume, unconverted*
4	*[Data Point T04 Actuality Duration]*

Procedure T004: RSP_UD Standard Data Record

4. Modus SCR/ SCR+ with OBIS numbers according to OMS

SCR means **S**ystem for meter **C**ommunication and **R**eadout. It is specified for powerless meters in which the meter is powered by an interruptible or permanent connection for communication and remote readout.
The meter power supply and the meter communication interface can be either a DC or AC electrical connection, by two wires, with arbitrary polarity.
The modus of the multiprotocol is used by the communication module e.g. **ACM SCR+ Wire**.

- Communication: asynchrony/ synchrony (SCR+, see section 4.3)
- Baud rate: 300
- Parity: Even
- Data Bits: 7
- Stop Bit: 1

4.1 Reading the meter

To read the meter, the transmission unit starts communication with a sign on either (all characters are ASCII coded)

a) /?!<CR><LF>
b) /? MeterNumber!<CR><LF>
c) continuous Power up
d) clocked Power up

To a sign on a), b), or c), the meter replies with a Data Readout according to section 4.2
A Sign on d) starts the Synchronous Link mode (see section 4.3)

Notes:

1. The Sign on “/?!<CR><LF>” or “/?Meternumber!<CR><LF>” must observe the timing requirements of IEC 62056-21.
2. Continuous Power up is treated as a Sign On without meter address (/?!<CR><LF>)
3. A minimum power down time of 2 sec must be observed before Power up Sign on
4. When reading the protocol with power on, depending on the hardware used, some extra characters may be present before the leading /. These should simply be skipped.

4.2 Answer of the meter

The OBIS designators of this protocol are according to OMS, Issue 2.0.0 / 2009-07-20

A Data Readout (unconverted volume) is as follows:

/Manuf_Id Medium Version<CR><LF>
<STX>7-0:3.0.0(Reading*m3)<CR><LF>
0-0:96.1.0(MeterNumber)<CR>LF>
0.0.0(NominaSize)<CR><LF>
!<CR><LF>
<ETX><BCC>

A Data Readout (temperature converted volume) is as follows:

/Manuf_Id Medium Version<CR><LF>
<STX>7-0:3.1.0(Reading*m3)<CR><LF>
0-0:96.1.0(MeterNumber)<CR>LF>
0.0.0(NominaSize)<CR><LF>
!<CR><LF>
<ETX><BCC>

Note:

- Between “Manuf_Id” and “Medium” is a space character
- Between “Medium” and “Version” is a space character

Protocol Element	OBIS-Code	Description
Manuf_ID	Not available	The Manuf_Id is a three Uppercase letter ID according to www.dlms.com/flag/
Medium	Not available	The Medium String is a clear text with uppercase or upper and lowercase characters describing the Medium. “Gas” is used for gas meter.
Version	Not available	This element descripts the protocol version. It starts with ‘V’, followed by the fist digit (major version), a dot and a second digit (minor version).
Reading	7-0:3.0.0 (unconverted) 7-0:3.1.0 (converted)	The Reading is a String with up to 10 digits and decimal separator ‘.’ or ‘,’ if appropriate. In case of Register errors, the Reading String contains ‘?’ in place of one or more digits (Roller error) or ‘?’ in place of all digits (Register error)
MeterNumber	0-0:96.1.0	This line contains the Meter Number (always 8 digits).
NominalSize	0.0.0	This is the meter size. The element is a string which may start and end with non digit characters, but it always contains a numeric part, eventually with decimal separator ‘.’ or ‘,’ (e.g. ‘G4’)
<BCC>	Not available	The Protocol ends with the Block check character (BCC) according to DIN 66219 / IEC 1155

4.3 DC Meter Interface with synchronous transmission

Also it is possible to communicate via a synchronous communication. A transmission unit with the requirement of a frequent reading of a limited set of data from the meter with low power consumption may use the synchronous link to read the meter. The transmission unit does so by switching the supplied DC voltage with a maximum frequency of 2 kHz and listening to an echo when the DC voltage is off.

4.3.1 Power Clock

To activate the synchronous links, the transmission unit starts clocking the voltage supply at nominal 100 ms after Power on, with a nominal frequency of 830 Hz and a duty cycle > 50%.

4.3.2 Echo Specification

As soon as the required data is available, the meter starts sending bits by sending an AC Burst echo during the power off clock cycles to signal a Space state.

- Transmission is 7 bits
- even parity
- 1 stop bit.

The Power has to be switched on again when a Burst has been detected or after TCL (see section 4.3.4)

4.3.3 Burst Example

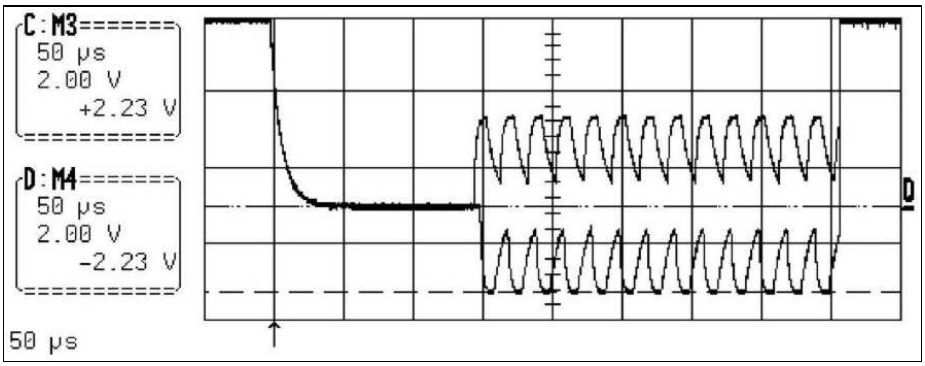

Table 14: Burst example

This example (table 14) shows both a positive voltage and a negative voltage burst example in the same Chart.

4.3.4 Synchronous Link Interface Specification

	Description	Min.	Max.	Units
	Power/Clock Voltage High	$V_{sup\ min}$	$V_{sup\ max}$	V
	Power/Clock Voltage Low	$V_{Space\ min}$	$V_{Space\ max}$	V
	Power/Clock current	$I_{idle\ min}$	$I_{idle\ max}$	A
	Burst Voltage Hight (Space)	+/- 1.5	+/- (V_{sup} –0.3)	V
	Burst Voltage Low (Mark)	0	+/- 0.3	V
	Burst Frequency	40	60	kHz
TPOR[1]	Power On to Register Ready	100	1000	ms
TCL	Power/Clock low time	250 or Burst	1000	µs
	Power Clock low time jitter		±25	%
TCH	Power/Clock high time	500	2000	µs
	Power Clock Duty Cycle $\frac{TCH}{TCH + TCL}$	50		%
TDC	Delay, Clock to Data Out		250	µs
TRC	Reset Command. Time for Power/Clock low to force register reset		2000	ms

Note 1: A Synchronous Link capable device responds more than 99% of requests within TPOR max.

4.3.5 Short protocol for Synchronous Link

The synchronous communication is intended for transmission units with the requirement of frequently reading the meter using low power and without the need to read the full meter information at every reading. For this reason a short data protocol is used.

The short protocol reading is:

<STX>A(ReadingUnits)<ETX>BCC<CR><LF>

Symbol	Description
A	Protocol Type. Currently, only A is used, other characters are reserves for future use.
Reading	String with up to 10 digits and an eventual decimal separator '.' or ','. Internal errors are indicated in the reading by a character '?' in place of a digit (Roller error) or in place of all digits (Register error)
Units	A unit designator, which may be *m3
BCC	Block check character

The short protocol is repeated typically four times, the idea is that the transmission units switches power off when it could interpret one reading.

Annex A Examples (Mode M-Bus according to OMS)

A.1 SND_NKE

	Field	Hex	Remark
0	Start Character	10	Sort frame
1	C-Field	40	SND_NKE
2	Primary Address	01	e.g. 01
3	Checksum	CS	
4	Stop Character	16	

Example 1: SND_NKE

A.2 REQ_UD1

	Field	Hex	Remark
0	Start Character	10	Start byte sort telegram
1	C	5A	Request User Data (counter sending) FCB=0
2	A	01	Primary Address
3	CS	CS	Checksum
4	Stop Character	16	Always 16

Example 2: REQ_UD1

A.3 REQ_UD2

	Field	Hex	Remark
0	Start Character	10	Start byte sort telegram
1	C	5B	Request User Data (counter sending) FCB=0
2	A	01	Primary Address
3	CS	CS	Checksum
4	Stop Character	16	Always 16

Example 3: REQ_UD2

A.4 SND_UD Set Baud Rate

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	03		Length
2	L	03		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	01		Primary Address
6	CI	BB		Set Baud Rate to 2400 baud
7	CS	CS		Checksum
8	Stop Character	16		Always 16

Example 4: Set Baud Rate to 2400

A.5 SND_UD Set Baud Rate

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	03		Length
2	L	03		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	01		Primary Address
6	CI	B8		Set Baud Rate to 300 baud
7	CS	CS		Checksum
8	Stop Character	16		Always 16

Example 5: Set Baud Rate to 300

A.6 SND_UD Application Reset

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	03		Length
2	L	03		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	01		Primary Address
6	CI	50		Application Reset
7	CS	CS		Checksum
8	Stop Character	16		Always 16

Example 6: Application Reset

A.7 SND_UD Slave Select

	Field	Hex		Remark
		clear	encrypted	
0	Start Character	68		Start byte long telegram
1	L	0B		Length
2	L	0B		Length
3	Start Character	68		Start byte long telegram
4	C	53		FCB=0
5	A	FD		Secondary Addressing
6	CI	52		Slave Select
7	Identification Number	78		Identification Number, e.g. 12345678
8		56		
9		34		
10		12		
11	Manufacturer ID	93		Manufacturer ID e.g. “ELS”
12		15		
13	Version	81		
14	Medium	03		
15	CS	CS		Checksum
16	Stop Character	16		Always 16

Example 7: Slave Select

A.8 Standard Data Record with ACM M-BUS WIRE

Example 8 shows a RSP_UD telegram of a meter (e.g. Communication Module: **ACM M-Bus Wire**)

	Field	Hex clear		Remark
0	Start	68		Start byte long telegram
1	L	0xLL		Length
2	L	0xLL		Length
3	Start	68		Start byte long telegram
4	C	08		Sending „requested data“
5	A	01		Primary Address
6	CI	72		Answer with variable data frame
7	Identification Number	78		Identification Number, e.g. 12345678
8		56		
9		34		
10		12		
11	Manufacturer ID	93		Manufacturer ID according to IEC 870, e.g. “ELS”
12		15		
13	Generation	81		Multiprotocol
14	Medium	03		Medium = gas
15	Access No	01		Access Number = 01
16	Status	00		Error Status
17	Signature	00		No encryption
18		00		
19	DIF	-	0D	No Ownership Number | variable length
20	VIF	-	FD	No Ownership Number | Customer
21	VIFE	-	11	No Ownership Number | Second Extension
22	LVAR	-	05	No Ownership Number | ASCII String length
23	Ownership Number	-	42	No Ownership Number | Ownership Number max. length: 20 characters e.g. 123AB
24		-	41	
25		-	33	
26		-	32	
27		-	31	

	Field	Hex clear		Remark	
28	DIF	0C	0C	Data format 8 Digit BCD	
29	VIF	93… 96	13… 16	No Temperature compensation	Temperature compensation
30	VIFE	3A	-	No Temperature compensation	-
31	Volume	21		Volume e.g. 07654321	
32		43			
33		65			
34		07			
35	CS	CS		Checksum	
36	Stop	16		Stop byte	

Example 8: RSP_UD telegram of an Elster Gas Meter with ACM M-Bus Wire