TELEGRAM 1

FIELD NAME							LENGTH [byte]	Type	Scale	Unit	Note	Description
DIF	DIFE	DIFE2	VIF	VIFE	VIFE2	VIFE3						
84h	90h	10h	FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 1	Positive Three-phase Active Energy (Total)
84h	90h	10h	FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 1	Negative Three-phase Active Energy (Total)
84h	90h	10h	FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 1	Positive Three-phase Reactive Energy (Total)
84h	90h	10h	FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 1	Negative Three-phase Reactive Energy (Total)
84h	10h		FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 1	Positive Three-phase Active Energy (Tariff 1)
84h	20h		FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 1	Positive Three-phase Active Energy (Tariff 2)
84h	10h		FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 1	Negative Three-phase Active Energy (Tariff 1)
84h	20h		FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 1	Negative Three-phase Active Energy (Tariff 2)
84h	10h		FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 1	Positive Three-phase Reactive Energy (Tariff 1)
84h	20h		FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 1	Positive Three-phase Reactive Energy (Tariff 2)
84h	10h		FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 1	Negative Three-phase Reactive Energy (Tariff 1)
84h	20h		FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 1	Negative Three-phase Reactive Energy (Tariff 2)
84h	A0h	10h	FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 1	Partial Positive Three-phase Active Energy
84h	A0h	10h	FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 1	Partial Negative Three-phase Active Energy
84h	A0h	10h	FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 1	Partial Positive Three-phase Reactive Energy
84h	A0h	10h	FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 1	Partial Negative Three-phase Reactive Energy
04h			FFh	90h	29h		4	signed integer	0,01			Pulse Input
02h			FFh	91h	2Bh		2	signed integer			Note 5	Pulse Unit
02h			FFh	92h	2Bh		2	signed integer	1		Note 6	KTA (Current Trasformer Ratio)
02h			FFh	93h	29h		2	signed integer	0,01		Note 6	KTV (Voltage Trasformer Ratio)

TELEGRAM 2

FIELD NAME							LENGTH [byte]	Type	Scale	Unit	Note	Description
DIF	DIFE	DIFE2	VIF	VIFE	VIFE2	VIFE3						
84h	B0h	10h	FFh	84h	2Bh		4	signed integer	1	W	Note 2	Three-phase Total Active Power
84h	80h	20h	FFh	84h	2Bh		4	signed integer	1	W	Note 2	Active Power L1
84h	90h	20h	FFh	84h	2Bh		4	signed integer	1	W	Note 2	Active Power L2
84h	A0h	20h	FFh	84h	2Bh		4	signed integer	1	W	Note 2	Active Power L3
84h	B0h	10h	FFh	85h	2Bh		4	signed integer	1	var	Note 2	Three-phase Total Reactive Power
84h	80h	20h	FFh	85h	2Bh		4	signed integer	1	var	Note 2	Reactive Power L1
84h	90h	20h	FFh	85h	2Bh		4	signed integer	1	var	Note 2	Reactive Power L2
84h	A0h	20h	FFh	85h	2Bh		4	signed integer	1	var	Note 2	Reactive Power L3
84h	B0h	10h	FFh	86h	2Bh		4	signed integer	1	VA	Note 2	Three-phase Total Apparent Power
84h	80h	20h	FFh	86h	2Bh		4	signed integer	1	VA	Note 2	Apparent Power L1
84h	90h	20h	FFh	86h	2Bh		4	signed integer	1	VA	Note 2	Apparent Power L2
84h	A0h	20h	FFh	86h	2Bh		4	signed integer	1	VA	Note 2	Apparent Power L3

TELEGRAM 3

FIELD NAME							LENGTH [byte]	Type	Scale	Unit	Note	Description
DIF	DIFE	DIFE2	VIF	VIFE	VIFE2	VIFE3						
84h	80h	20h	FFh	87h	48h		4	signed integer	0,1	V		1-N Voltage
84h	90h	20h	FFh	87h	48h		4	signed integer	0,1	V		2-N Voltage
84h	A0h	20h	FFh	87h	48h		4	signed integer	0,1	V		3-N Voltage
84h	80h	20h	FFh	88h	48h		4	signed integer	0,1	V		1-2 Voltage
84h	90h	20h	FFh	88h	48h		4	signed integer	0,1	V		2-3 Voltage
84h	A0h	20h	FFh	88h	48h		4	signed integer	0,1	V		3-1 Voltage
84h	80h	20h	FFh	89h	59h		4	signed integer	0,001	A		Phase 1 Current Value
84h	90h	20h	FFh	89h	59h		4	signed integer	0,001	A		Phase 2 Current Value
84h	A0h	20h	FFh	89h	59h		4	signed integer	0,001	A		Phase 3 Current Value
02h			FFh	8Ah	48h		2	signed integer	0,1	Hz		Frequency

TELEGRAM 4

FIELD NAME							LENGTH [byte]	Type	Scale	Unit	Note	Description
DIF	DIFE	DIFE2	VIF	VIFE	VIFE2	VIFE3						
82h	B0h	10h	FFh	8Bh	28h		2	signed integer	0,001			Three-phase Power Factor (PF)
82h	B0h	10h	FFh	8Ch	2Bh		2	signed integer			Note 3	Power Factor (PF) sector
84h	10h		FFh	8Dh	2Bh		4	signed integer	1	W	Note 2	Total Active Power Requirement (MD)
84h	10h		FFh	8Eh	2Bh		4	signed integer	1	W	Note 2	Maximum Total Active Power Requirement Tariff 1 (PMD T1)
84h	20h		FFh	8Eh	2Bh		4	signed integer	1	W	Note 2	Maximum Total Active Power Requirement Tariff 2 (PMD T2)
84h	B0h	10h	FFh	8Fh	21h		4	signed integer	1	min		Run hour meter (TOT)
84h	10h		FFh	8Fh	21h		4	signed integer	1	min		Run hour meter (Tariff 1)
84h	20h		FFh	8Fh	21h		4	signed integer	1	min		Run hour meter (Tariff 2)

TELEGRAM 5 (*Only for IM-CE4TBMTMID*)

FIELD NAME							LENGTH [byte]	Type	Scale	Unit	Note	Description
DIF	DIFE	DIFE2	VIF	VIFE	VIFE2	VIFE3						
84h	90h	10h	FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 4	Positive Three-phase Active Energy (Total)
84h	90h	10h	FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 4	Negative Three-phase Active Energy (Total)
84h	90h	10h	FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 4	Positive Three-phase Reactive Energy (Total)
84h	90h	10h	FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 4	Negative Three-phase Reactive Energy (Total)
84h	10h		FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 4	Positive Three-phase Active Energy (Tariff 1)
84h	20h		FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 4	Positive Three-phase Active Energy (Tariff 2)
84h	10h		FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 4	Negative Three-phase Active Energy (Tariff 1)
84h	20h		FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 4	Negative Three-phase Active Energy (Tariff 2)
84h	10h		FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 4	Positive Three-phase Reactive Energy (Tariff 1)
84h	20h		FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 4	Positive Three-phase Reactive Energy (Tariff 2)
84h	10h		FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 4	Negative Three-phase Reactive Energy (Tariff 1)
84h	20h		FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 4	Negative Three-phase Reactive Energy (Tariff 2)
84h	A0h	10h	FFh	80h	84h	3Bh	4	signed integer	0,01	kWh	Note 4	Partial Positive Three-phase Active Energy
84h	A0h	10h	FFh	80h	84h	3Ch	4	signed integer	0,01	kWh	Note 4	Partial Negative Three-phase Active Energy
84h	A0h	10h	FFh	81h	84h	3Bh	4	signed integer	0,01	kvarh	Note 4	Partial Positive Three-phase Reactive Energy
84h	A0h	10h	FFh	81h	84h	3Ch	4	signed integer	0,01	kvarh	Note 4	Partial Negative Three-phase Reactive Energy

Note 1

Direct meter (KTA*KTV = 1): always 0,01 kWh/kvarh
Indirect meter: see table below

The VIFE2 changes value according to the KTA*KTV product. See table "VIFE2 details"

Transformer ratio	Measurement unit	Scale
1 ≤ KTA*KTV < 10	kWh/kvarh	0,01
10 ≤ KTA*KTV < 100	kWh/kvarh	0,1
100 ≤ KTA*KTV < 1000	kWh/kvarh	1
1000 ≤ KTA*KTV < 10000	MWh/Mvarh	0,01
10000 ≤ KTA*KTV < 100000	MWh/Mvarh	0,1
100000 ≤ KTA*KTV	MWh/Mvarh	1

Note 2

Direct meter (KTA*KTV = 1): always 1 W/var/VA
Indirect meter: see table below

The VIFE2 changes value according to the KTA*KTV product. See table "VIFE2 details"

Transformer ratio	Measurement unit	Scale
KTA*KTV < 5000	W/var/VA	1
KTA*KTV ≥ 5000	kW/kvar/kVA	0,01

Note 3

0: Resistive
1: Inductive
2: Capacitive

Note 4

Energy measured at the secondary of the current transformer

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Note 5
See table "Unit of pulse input"

Note 6
Only for indirect meter *KTA: 1 ÷ 9999* *KTV: 100 ÷ 30000*

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STARTING CONFIGURATION PARAMETERS

Parameter	Value	Programmabilty
Primary Address	0	YES
ID (Secondary Address)	00000000	YES
Baud Rate	2400	YES
Parity	EVEN	NO

SPECIAL PRIMARY ADDRESSES SUPPORTED

Address	Meaning	Description	Note
FFh	Broadcast Addressing	Address used by the master to send a broadcast frame to all slaves on the network	The device that receive the frame execute the command but doesn't respond anything
FEh	Test Addressing	Address used by the master for point to point tests on a slave	The slave's answer containts his own primary address
FDh	Optional Addressing	Address used by the master after a slave selection through his secondary address	The address can be used since the slave is in selection mode

DATA INFORMATION FORMAT (DIF) IN THE PROTOCOL

DIF	DIFE1	DIFE2	MEANING
8**n**h	10h		Tariff 1
8**n**h	20h		Tariff 2
8**n**h	30h		Tariff 3
8**n**h	80h	10h	Tariff 4
8**n**h	90h	10h	Total Register
8**n**h	A0h	10h	Partial Register
8**n**h	B0h	10h	1-Phase/3-Phase Measure
8**n**h	80h	20h	Line 1 / Line 12
8**n**h	90h	20h	Line 2 / Line 23
8**n**h	A0h	20h	Line 3 / Line 31

0x80 = Extension
0x0n = Data Format -->

Code	Meaning
01h	8 Bit
02h	16 Bit
03h	24 Bit
04h	32 Bit

VALUE INFORMATION FIELD (VIF) IN THE PROTOCOL (VIF and VIFEs are manufacturer specifications)

VIF	VIFE1	VIFE2	VIFE3	MEASURE	RESOLUTION
FFh	80h	84h	3Bh	Positive Active Energy	10 Wh
FFh	80h	84h	3Ch	Negative Active Energy	10 Wh
FFh	81h	84h	3Bh	Positive Reactive Energy	10 varh
FFh	81h	84h	3Ch	Negative Reactive Energy	10 varh
FFh	82h	04h		Apparent Energy	10 VAh
FFh	84h	2Bh		Active Power	1 W
FFh	85h	2Bh		Reactive Power	1 var
FFh	86h	2Bh		Apparent Power	1 VA
FFh	87h	48h		Phase Voltage	0,1 V
FFh	88h	48h		Chained Voltage	0,1 V
FFh	89h	59h		Current	1 mA
FFh	8Ah	48h		Frequency	0,1 Hz
FFh	8Bh	28h		Power Factor	0,001
FFh	8Ch	2Bh		Power Factor Sector	Note(1)
FFh	8Dh	2Bh		Medium Active Power	W
FFh	8Eh	2Bh		Peak Maximum Demand	W
FFh	8Fh	21h		Time	1 Minute
FFh	90h	29h		Pulse Input	0,01
FFh	91h	2Bh		Unit Of Pulse Input	Note(2)
FFh	92h	2Bh		KTA (Current Trasformer Ratio)	1
FFh	93h	29h		KTV (Voltage Trasformer Ratio)	0,01

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VIFE2 details:

VIFE2	Meaning
0xE000 **nnnn**	10^(nnnn-3) Wh Energy
0xE010 1**nnn**	10^(nnn-3) W Power (or adimensional)
0xE100 **nnnn**	10^(nnnn-9) V Voltage (or Hz Frequency)
0xE101 **nnnn**	10^(nnnn-12) A Current

Note(1): Possible value for power factor sector:

Value	Meaning
0	Resistive
1	Inductive
2	Capacitive

Note(2): Unit of pulse input:

Value	Unit	Value	Unit
0	Wh	12	Nm^3
1	kWh	13	KNm^3
2	MWh	14	MNm^3
3	varh	15	J
4	kvar	16	kJ
5	Mvar	17	MJ
6	VAh	18	cal
7	kVAh	19	kcal
8	MVAh	20	g
9	m^3	21	kg
10	km^3	22	T

REFER ALSO TO: http://www.m-bus.com/   - MBUS basic of serial bus
                                                   - MBUS protocol and layers specifications

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LIST OF COMMANDS AND ANSWERS

From master to slave

SND_NKE

Byte (HEX)	Length (Byte)	Description
10h	1	Start Field
40h	1	Control Field
From 0h To Fah	1	Primary Address
CKS	1	Checksum
16h	1	Stop Character

REQ_UD2

Byte (HEX)	Length (Byte)	Description
10h	1	Start
5Bh/7Bh	1	Control Field (FcBit)
From 0h To Fah	1	Primary Address
CKS	1	Checksum
16h	1	Stop Character

From slave to master

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

ANSWER

Byte (HEX)	Length (Byte)	Description
68h	1	Start
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
08h	1	Control Field
From 0h To FAh	1	Primary Address
72h	1	72h: LSB Trasmitted First
From 0h To 5F5E0FFh (DEC 99999999)	4	ID (Secondary Address) - 8 BCD Digits
A525h	2	Manufacturer Code "IME"
xxh	1	Device Version
02h	1	Electricity
xxh	1	Incremented by 1 for every telegram answered
xxh	1	Status[1]
0000h	2	Signature (Not Used)
Data	x	**See The Telegrams Tables**
1Fh/0Fh	1	Information of next telegrams
0000000000h	5	PAD Bytes
CKS	1	Checksum
16h	1	Stop Character

[1] Status byte indicates some possible errors in the device:

No error	00h
Permanent Error	08h
Temporarry Error	10h

SWITCHING BAUD RATE

Byte (HEX)	Length (Byte)	Description
68h	1	Start
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
53h/73h	1	Control Field
From 0h To FAh	1	Primary Address
From B8h To BDh	1	Baud Rate Code (From 300 Bit/s To 9600 Bit/s)
CKS	1	Checksum
16h	1	Stop Character

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

APPLICATION RESET

Byte (HEX)	Length (Byte)	Description
68h	1	Start
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
53h/73h	1	Control Field
From 0h To FAh	1	Primary Address
50h	1	CI Field
CKS	1	Checksum
16h	1	Stop Character

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

REFER ALSO TO: http://www.m-bus.com/ - MBUS basic of serial bus
                                                  - MBUS protocol and layers specifications

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From master to slave

From slave to master

SELECTION THROUGH SECONDARY ADDRESS

Byte (HEX)	Length (Byte)	Description
68h	1	Start
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
53h/73h	1	Control Field
FDh	1	Primary Address
52h	1	CI Field
From 0h To 5F5E0FFh (DEC 99999999)	4	ID (Secondary Address) - 8 BCD Digits
A525h	1	Manufacturer Code "IME"
xxh	1	Device Version
02h	1	Electricity
CKS	1	Checksum
16h	1	Stop Character

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

In the selection command is allowed to use the wildcard searching procedure (EN1434-3)

CHANGING PRIMARY ADDRESS

Byte (HEX)	Length (Byte)	Description
68h	1	Start Field
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
53h/73h	1	Control Field
From 0h To Fah	1	Primary Address
51h	1	CI Field
01h	1	DIF
7Ah	1	VIF
From 0h To FAh	1	New Address
CKS	1	Checksum
16h	1	Stop Character

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

CHANGING ID (Secondary Address)

Byte (HEX)	Length (Byte)	Description
68h	1	Start Field
L	1	Frame Byte Length
L	1	Frame Byte Length
68h	1	Start
53h/73h	1	Control Field
From 0h To Fah	1	Primary Address
51h	1	CI Field
0Ch	1	DIF
79h	1	VIF
From 0h To 5F5E0FFh (DEC 99999999)	4	ID (Secondary Address) - 8 BCD Digits
CKS	1	Checksum
16h	1	Stop Character

ANSWER

Byte (HEX)	Length (Byte)	Description
E5h	1	ACK

REFER ALSO TO: http://www.m-bus.com/ - MBUS basic of serial bus
                                                    - MBUS protocol and layers specifications

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