In according with EN1434-3

1. Manufacturer Specific M-Bus commands

1.1 Editing data

1.1.1 Reading of KTV

To read KTV it is necessary to send a SND_UD telegram and then a REQ_UD2 :

Field Name	**Number of byte**	**Value**	**Meaning**
Start	1	68h	Start
L-f	1	06h	*Header*
L-f	1	06h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	08h	Selection for Readout
VIF	1	FFh	
VIFE	1	12h	KTV
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of KTV=100 (10.0) :

SND_UD	68 06 06 68 73 FE 51 08 FF 12 DB 16
E5h	E5
REQ_UD2	10 5B FE 59 16
RSP_UD	68 14 14 68 08 00 72 00 00 00 00 A8 15 00 02 5C 00 00 00 02 FF 12 64 00 0C 16

1.1.2 Reading of KTA

To read KTA it is necessary to send a SND_UD telegram and then a REQ_UD2 :

Field Name	**Number of byte**	**Value**	**Meaning**
Start	1	68h	Start
L-f	1	06h	*Header*
L-f	1	06h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	08h	Selection for Readout
VIF	1	FFh	
VIFE	1	11h	KTA
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of KTA = 10 :

SND_UD	68 06 06 68 53 FE 51 08 FF 11 BA 16
E5h	E5
REQ_UD2	10 5B FE 59 16
RSP_UD	68 14 14 68 08 00 72 00 00 00 00 A8 15 00 02 5D 00 00 00 02 FF 11 0A 00 B2 16

NOTE : *If KTV or KTA are changed, Energy registers and Max Power Demand are resetted.*

1.1.4 Reading of Baud rate

To read Baud rate it is necessary to send a SND_UD telegram and then a REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	06h	*Header*
L-f	1	06h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	08h	Selection for Readout
VIF	1	FFh	
VIFE	1	42h	Baud rate
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of Baud rate of 600 bit/s

SND_UD	68 06 06 68 53 FE 51 08 FF 42 EB 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 13 13 68 08 FD 72 01 00 00 00 A8 15 00 02 94 00 00 00 01 FF 42 01 0E 16

In the received telegram there is the baude rate after bytes 01 FF 42.

XX = 01 => baude 600 bit/s

00 300 bit/s
01 600 bit/s
02 1200 bit/s
03 2400 bit/s
04 4800 bit/s
05 9600 bit/s

1.2 Standard M-Bus telegrams

1.2.1 Standard Data (Answer for REQ_UD2)

Initialization of Slave (SND_NKE)

To start or initialize the communication Master sends this telegram to Slave :

SND_NKE	
CODE	**Description**
10h	Start
40h	C field : initialization
PADR	A field : device address 0..250 /254/255
CS	CheckSum = (40h+PADR) mod 100h
16h	Stop

If Slave receives SND_NKE it resets TC counter of sending telegrams and answers with E5.

Request for Data (REQ_UD2)

REQ_UD2	
CODE	**Description**
10h	Start
5B/7Bh	C field : Request for Data
PADR	A field : device address 0..250 /254
CS	CheckSum = (5B/7Bh+PADR) mod 100h
16h	Stop

When Master sends this telegram to a Slave, it answers a Standard Frame with variable data structure giving following informations :

Total Active Energy
Partial Active Energy
Total Reactive Energy
Peak Active Power
Error flags

Standard Frame

DATA	*DESCRIPTION*	*LENGHT*	*DATA TYPE*
1	*Total Active Energy*	*4*	*Type A , 8 BCD digits*
2	*Partial Active Energy*	*4*	*Type A , 8 BCD digits*
3	*Total Reactive Energy*	*4*	*Type A , 8 BCD digits*
4	*Peak Active Power*	*4*	*Type B , 32-bit Integer*
5	*Error flags*	*1*	*Type C, 8-bit UINT (*)*

(*) UINT : unsigned integer
Error flags gives the error status

Abbreviations

NAME	Meaning
LEN	length in byte
PADR	Primary Address
IDENT	Secondary Address
MAN	Manufacturer
GEN	Generation Version
MED	Medium (water, electricity..)
TC	Telegram Counter
STAT	Status
L-f	Length field
C-f	Control field
CI-f	Control Information field
A-f	Address field
DIF	Data information field
VIF	Value information field

RSP_UD			
Field Name	**Byte Number**	**Value**	**Meaning**
Start	1	68	Start byte
L-f	1	LEN	Frame number byte
L-f	1	LEN	Frame number byte
Start	1	68	Start byte
C-f	1	08	RSP_UD
A-f	1	***PADR***	0..250
CI-f	1	72	Variable structure,LSB is trasmitted first
Secondary address	4	**IDENT**	XXXXXXXX (8 BCD digits)
Manufacturer code	2	A5 25	"IME" = 25A5
Device version	1	GEN	Version
Medium	1	02	Electricity
Access number	1	TC	*incremented by 1 for any aswered telegram*
Status	1	STAT	Status for EN 1434-3 (*)
Signature	2	00 00	*Not used*
DIF	1	8C	Istantaneous Value, 8 BCD digits
DIFE	1	10	(1=0001 b Tariff bit1bit0=01)
VIF	1	01..06/81..86	Format XXXXX.XXX kWh/MWh
VIFE	0/1	--/7D	
Value	4	xxxxxxxx	Total Active Energy
DIF	1	8C	Istantaneous Value, 8 BCD digits
DIFE	1	20	(2=0010 b Tariff bit1bit0=10)
VIF	1	01..06/81..86	Format XXXXX.XXX kWh/MWh
VIFE	0/1	--/7D	
Value	4	xxxxxxxx	Partial Active Energy
DIF	1	8C	Istantaneous Value, 8 BCD digits
DIFE	1	50	(5= 0101 b Tariff bit1 bit0 = 01)
VIF	1	01..06/81..86	(01 b Unit bit0 = 01) =>Unit 1
VIFE	0/1	--/7D	Format XXXXX.XXX kVArh/MVArh
Value	4	xxxxxxxx	Total Reactive Energy
DIF	1	C4	Istantaneous Value, 32-bit integer
DIFE	1	00	(C = 1100 b Storage bit0 = 1) => Storage = 1
VIF	1	zz	Power W/kW/MW
Value	4	xxxxxxxx	Peak Active Power (**)
DIF	1	01	Istantaneous Value, 8-bit integer
VIF	1	FD	Error flags (***)
VIFE	1	17	
Value	1	yy	Error on 8 bit B7..B0
Checksum	1	CS	
Stop	1	16	

(*) Status

With this field various information about the status of counter, and faults wich have occurred, are communicated :

Bit setted	EN 1434-3	NEMO96HD
Bit 7 = 1	Specific to manifacturer	Not used
Bit 6 = 1	Specific to manifacturer	Not used
Bit 5 = 1	Specific to manifacturer	Not used
Bit 4 = 1	Temporary Error	Not used
Bit 3 = 1	Permanent Error	Not used
Bit 2 = 1	Power low	Not used
Bit 1 = 1	Application layer error 1	Not used
Bit 0 = 1	Application layer error 0	Not used

(**) Peack Active power

Parameter : XXXXXXXX is 32 bit Integer, LSB before.

KT = KTA * KTV	Unit	VIF
< 5000	1 W	2Bh
>= 5000	0,1 kW	2Dh

(***) Error flags

Parameter : YY = b7b6b5b4b3b2b1b0 is a bit mapped 8 bit Integer.

BIT number	Description
b7 = 1	Not used
b6 = 1	Not used
b5 = 1	Not used
b4 = 1	Not used
b3 = 1	Not used
b2 = 1	Not used
b1 = 1	Not used
b0 = 1	Not used

1.2.3 Reading of Instantaneous Active Power :

Reading of P, P1, P2, P3 is made with following SND_UD telegram :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	06h	*Header*
L-f	1	06h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	88h	Selection for Readout
DIFE	1	0Xh	Parameter
VIF	1	28h	
Check Sum	1	CS	
Stop	1	16h	Stop

DIFE :

0X h : 00 h -> P
01 h -> P1
02 h -> P2
03 h -> P3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer, before LSB .

For any KT value we have the following unit for Power :

KT = KTA * KTV	Unit	VIF
< 5000	1 W	2Bh
>= 5000	0,1 kW	2Dh

Reading example of Active Power :

SND_UD	68 06 06 68 73 FE 51 88 00 28 72 16
E5h	E5
REQ_UD2	10 5B FE 59 16
RSP_UD	68 16 16 68 08 01 72 00 00 00 00 A8 15 00 02 6B 00 00 00 84 00 2B 0E B0 03 00 7C 16

Received data 0E B0 03 00 h
Hexadecimal value = 00 03 B0 0E h
Decimal value = 241678 d

1.2.4 Reading of istantaneous phase voltages

To read V1,V2, V3 send the following SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	07h	*Header*
L-f	1	07h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	88h	Selection for Readout
DIFE	1	0Xh	Parameter
VIF	1	FDh	
VIFE	1	40h	Voltages
Check Sum	1	CS	
Stop	1	16h	Stop

DIFE :

0X h : 01 h -> V1
02 h -> V2
03 h -> V3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer before LSB.

Risolution is 0.1 V

Reading example of V1 :

SND_UD	68 07 07 68 73 FE 51 88 01 FD 40 88 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 17 17 68 08 01 72 11 11 11 11 A8 15 00 02 6F 00 00 00 84 01 FD 48 ED 59 00 00 FC 16

Received data ED 59 00 00 h
Hexadecimal value = 00 00 59 ED h
Decimal value = 23021 d

1.2.5 Reading of Istantaneous phase currents

To read I1, I2, I3 send the following SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	07h	*Header*
L-f	1	07h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	88h	Selection for Readout
DIFE	1	0Xh	Parameter
VIF	1	FDh	
VIFE	1	50h	Currents
Check Sum	1	CS	
Stop	1	16h	Stop

DIFE :

0X h : 01 h -> I1
02 h -> I2
03 h -> I3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer before LSB.

KTA	Risolution
1 <= KTA < 10	0.001 A
10 <= KTA < 100	0.01 A
100 <= KTA < 10000	0.1 A

Reading example of I1 :

SND_UD	68 07 07 68 53 01 51 88 01 FD 50 7B 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 17 17 68 08 01 72 11 11 11 11 A8 15 00 02 72 00 00 00 84 01 FD 59 AC 88 00 00 FF 16

Received data AC 88 00 00 h
Hexadecimal value = 00 00 88 AC h
Decimal value = 34988 d

1.2.6 Reading of istantaneous chained voltages

To read V12,V23, V31 send the following SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	07h	*Header*
L-f	1	07h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	88h	Selection for Readout
DIFE	1	0Xh	Parameter
VIF	1	FDh	
VIFE	1	60h	Chained Voltages
Check Sum	1	CS	
Stop	1	16h	Stop

DIFE :

0X h : 01 h -> V12
02 h -> V23
03 h -> V31

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer before LSB.

Risolution is 0.1 V

Reading example of V12

SND_UD	68 07 07 68 73 FE 51 88 01 FD 60 88 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 17 17 68 08 01 72 11 11 11 11 A8 15 00 02 6F 00 00 00 84 01 FD **48** ED 59 00 00 FC 16

Received data ED 59 00 00 h
Hexadecimal value = 00 00 59 ED h
Decimal value = 23021 d

1.2.7 Reading of Reactive partial Energy

To read Reactive Partial Energy send the following SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	07h	*Header*
L-f	1	07h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	88h	Selection for Readout
DIFE	1	00h	Parameter
VIF	1	FDh	
VIFE	1	70h	Reactive partial Energy
Check Sum	1	CS	
Stop	1	16h	Stop

When reading the value 0xYYYYYYYY after a REQ_UD2 message, it unit is defined as following :

KTA*KTV < 10 10 Varh
KTA*KTV < 100 100 Varh
KTA*KTV < 1000 1 kVarh
KTA*KTV < 10000 10 kVarh
KTA*KTV >= 10000 100 kVarh

1.2.8 Reading of Primary Address

To read Primary Address send a SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	05h	*Header*
L-f	1	05h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***FE***	Broadcast Address
CI-f	1	51h	Data send
DIF	1	08h	Selection for Readout
VIF	1	7Ah	
Check Sum	1	CS	
Stop	1	16h	Stop

Reading example of primary address 1 :

SND_UD	68 05 05 68 53 FE 51 08 7A 24 16
E5h	E5
REQ_UD2	10 7B FE 79 16
RSP_UD	68 12 12 68 08 01 72 00 00 00 00 A8 15 00 02 9E 00 00 00 01 7A 01 54 16

1.2.9 Writing and reading of Secondary Address

To write Secondary Address send a SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	09h	*Header*
L-f	1	09h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	0Ch	8 Bit Integer
VIF	1	79h	
Value	4	X1X0X3X2X5X4X7X6	LSB before
Check Sum	1	CS	
Stop	1	16h	Stop

To read Secondary Address send a SND_UD telegram and then REQ_UD2 :

Field Name	Number of byte	Value	Meaning
Start	1	68h	Start
L-f	1	05h	*Header*
L-f	1	05h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	51h	Data send
DIF	1	08h	
VIF	1	79h	
Check Sum	1	CS	
Stop	1	16h	Stop

Parameter : in SND_UD and in RSP_UD
X1X0X3X2X5X4X7X6 => X7X6X5X4X3X2X1X0: 8 BCD digits.

Writing example of secondary address 12345678 :

SND_UD	68 09 09 68 53 FE 51 0C 79 78 56 34 12 3B 16
E5h	E5

Reading example of secondary address 12345678 :

SND_UD	68 05 05 68 73 FE 51 08 79 43 16
E5h	E5
REQ_UD2	10 5B FE 59 16
RSP_UD	68 15 15 68 08 01 72 78 56 34 12 A8 15 00 02 0E 00 00 00 0C 79 78 56 34 12 F5 16

Received value = 78 56 34 12 h
Value 12345678

1.2.10 Application Reset

NEMO96HD allows application reset.
After this message NEMO96HD resets the answer counter, the pending selection frame, the error flags and responds with the ACK character (E5h) :

Field Name	**Number of byte**	**Value**	**Meaning**
Start	1	68h	
L-f	1	03h	*Header*
L-f	1	03h	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***PADR***	Primary Address
CI-f	1	50h	Application reset
Check Sum	1	CS	
Stop	1	16h	

1.3 Selection and Secondary Addressing

In an M-Bus network we can have at maximum 250 primary addresses, from 1 to 250, instead 0 is used for an unconfigurated device.

If there are more than 250 devices, we have to make an extension with secondary address.

Master sends the following SND_UD telegram to a Slave to select it :

Field Name	Number of byte	Value	Meaning
Start	1	68h	
L-f	1	0Bh	*Header*
L-f	1	0Bh	
Start	1	68h	
C-f	1	53h/73h	*SND_UD*
A-f	1	***FDh***	Primary Address
CI-f	1	52h	
Value	4	X1X0X3X2X5X4X7X6	Secondary Address
Manufacturer code	2	A5 25	"IME" = 25A5
Device version	1	GEN	Version
Medium	1	02	Electricity
Check Sum	1	CS	
Stop	1	16h	

If there is a Slave that has Secondary Address X7X6X5X4X3X2X1X0, with the right Manufacturer code, Device version and Medium it gives an ACK (0xE5) character as answer , otherwise there will be no answer.

If the Slave is correctly selected it change its state in "selected" . This means that it will answer to all commands REQ_UD2, made to the Slave with Primary Address 0xFD, with a RSP_UD. In other words Master uses Primary Address 253 (0xFD) to speak with Slave.

The Slave remains in a "selected" state until it receives either a selection command to a different Secondary Address or a SND_NKE command to Address 0xFD.

During the selection it is allowed to use 0xF wild card instead of any digit of Manufacturer code, Device version and Medium. For example 0xFFFF instead of 0xA525, 0xFF instead of 0x02 for the Medium.

The same is for the secondary address : for istance it is allowed to select device with secondary 12345678 with address 123FFF78 .In this way it is easy to make e wildcard search to understand secondary address of unknown device starting with address 0FFFFFFF up to 9FFFFFFF for the first digit. This for all digits until to last digit where we start from FFFFFFF0 up to FFFFFFF9.