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1. MANUFACTURER SPECIFIC COMMANDS

1.1 Reading of KTV

Reading of KTV Ratio is done with the 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 | 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 Reading of KTA

Reading of KTA Ratio is done with the 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 | 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 reset

1.3 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 baud rate after bytes 01 FF 42.

XX = 01 => baud 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

1.4 Reading of Active Power

Reading of P, P1, P2, P3 is done with the 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**

1.5 Reading of Phase Voltages

Reading of V1,V2, V3 is done with the following SND_UD telegram :

| 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.

Resolution 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**

1.6 Reading of Phase Currents

Reading of I1,I2, I3 is done with the following SND_UD telegram :

| 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

1.7 Reading of Phase to Phase Voltages

Reading of V12, V23, V31 is done with the following SND_UD telegram :

| 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.

Resolution is 0.1 V

Reading example of V12

| | |
|---------|---|
| SND_UD | 68 07 07 68 73 FE 51 88 01 FD 60 A8 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**

1.8 Reading of Partial Reactive Energy

Reading of Partial Reactive Energy is done with the following SND_UD telegram :

| 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, its 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

1.9 Reading of Primary Address

Reading of Primary Address is done with the following SND_UD telegram :

| 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 |

Answer : 01 7A 01 (in blue) : last 01 is the device primary address

1.10 Reading of Secondary Address

Reading of Secondary Address is done with the following SND_UD telegram :

| 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

X1X0 X3X2 X5X4 X7X6 => X7X6 X5X4 X3X2 X1X0: 8 BCD digits.

E.g.

Secondary address : **78 56 34 12** (8 BCD digits) but LSB before and MSB at the end so :

Real value : **12 34 56 78**

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**

Real value [12345678](#)

1.11 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 | |

1.12 Selection through secondary address

A M-Bus network can manage up to 250 primary addresses, from 1 to 250, instead 0 is used for a not configured device. If there are more than 250 devices, it is necessary to make an extension with secondary address.

Master sends the following SND_UD telegram to select the device with the requested secondary address :

| 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 | X1X0 X3X2 X5X4 X7X6 | 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 the Secondary Address X7X6X5X4X3X2X1X0, with the right Manufacturer code, Device version and Medium, it responds with an ACK (0xE5) char, otherwise no answer will be sent.

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

Secondary address :

```
M => S [68][0b][0b][68][53][fd][52] [02][00][00][00] [a5][25][14][02][8d][16]
S => M [E5]
```

2. MODE 1 PROTOCOL

This is the single telegram protocol.

2.1 STANDARD M-Bus TELEGRAMS

2.1.1 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 = (10h+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 = (10h+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 bit1 bit0=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 bit1 bit0=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 which one occurred, are communicated :

| Bit set | EN 1434-3 |
|-----------|---------------------------|
| Bit 7 = 1 | Specific to manufacturer |
| Bit 6 = 1 | Specific to manufacturer |
| Bit 5 = 1 | Specific to manufacturer |
| Bit 4 = 1 | Temporary Error |
| Bit 3 = 1 | Permanent Error |
| Bit 2 = 1 | Power low |
| Bit 1 = 1 | Application layer error 1 |
| Bit 0 = 1 | Application layer error 0 |

(**) Peak Active power

Parameter : XXXXXXXX is 32 bit Integer, LSB before.

| KT = KTA * KTV | Unit | VIF |
|-----------------------|-------------|------------|
| < 6000 | 1 W | 2Bh |
| >= 6000 | 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 |

3. MODE 2 PROTOCOL

3.1 SUMMARY OF M-Bus COMMANDS

See in the following table the summary of the 3 basic telegrams.

| RSP_UD - 1st message | | | | | | | | | | |
|----------------------|----------------------------------|------|------|---------|---------|---------|--|------|------|--------|
| Symbol | Sequence | UNIT | DIF | DIFE(1) | DIFE(2) | DIFE(3) | | VIF | VIFE | FORMAT |
| Et+ | Active positive energy | 0 | 0x04 | | | | | 0x84 | 0x3B | INT 32 |
| P+ | Active positive power | 0 | 0x04 | | | | | 0xAB | 0x3B | INT 32 |
| P- | Active negative power | 0 | 0x04 | | | | | 0xAB | 0x3C | INT 32 |
| Er+ | Reactive positive energy | 1 | 0x84 | 0x40 | | | | 0x84 | 0x3B | INT 32 |
| Q+ | Reactive positive power | 1 | 0x84 | 0x40 | | | | 0xAB | 0x3B | INT 32 |
| Q- | Reactive negative power | 1 | 0x84 | 0x40 | | | | 0xAB | 0x3C | INT 32 |
| Part Et+ | Active partial positive energy | 2 | 0x84 | 0x80 | 0x40 | | | 0x84 | 0x3B | INT 32 |
| Part Er+ | Reactive partial positive energy | 3 | 0x84 | 0xC0 | 0x40 | | | 0x84 | 0x3B | INT 32 |
| Pd | Average Power Demand | 4 | 0x84 | 0x80 | 0x80 | 0x40 | | 0xAB | 0x3C | INT 32 |
| RFU | Reserved | 5 | 0x84 | 0xC0 | 0x80 | 0x40 | | 0x84 | 0x3C | INT 32 |
| RSP_UD - 2nd message | | | | | | | | | | |
| Symbol | Sequence | UNIT | DIF | DIFE(1) | DIFE(2) | DIFE(3) | | VIF | VIFE | FORMAT |
| L1-N | V1 | 2 | 0x84 | 0x80 | 0x40 | | | 0xFD | 0x48 | INT 32 |
| I1 | I1 | 2 | 0x84 | 0x80 | 0x40 | | | 0xFD | 0x59 | INT 32 |
| P1+ | P1 | 2 | 0x84 | 0x80 | 0x40 | | | 0xAB | 0x3B | INT 32 |
| P1- | P1-negative | 2 | 0x84 | 0x80 | 0x40 | | | 0xAB | 0x3C | INT 32 |
| L2-N | V2 | 3 | 0x84 | 0xC0 | 0x40 | | | 0xFD | 0x48 | INT 32 |
| I2 | I2 | 3 | 0x84 | 0xC0 | 0x40 | | | 0xFD | 0x59 | INT 32 |
| P2+ | P2 | 3 | 0x84 | 0xC0 | 0x40 | | | 0xAB | 0x3B | INT 32 |
| P2- | P2-negative | 3 | 0x84 | 0xC0 | 0x40 | | | 0xAB | 0x3C | INT 32 |
| L3-N | V3 | 4 | 0x84 | 0x80 | 0x80 | 0x40 | | 0xFD | 0x48 | INT 32 |
| I3 | I3 | 4 | 0x84 | 0x80 | 0x80 | 0x40 | | 0xFD | 0x59 | INT 32 |
| P3+ | P3 | 4 | 0x84 | 0x80 | 0x80 | 0x40 | | 0xAB | 0x3B | INT 32 |
| P3- | P3-negative | 4 | 0x84 | 0x80 | 0x80 | 0x40 | | 0xAB | 0x3C | INT 32 |
| L1-L2 | V12 | 5 | 0x84 | 0xC0 | 0x80 | 0x40 | | 0xFD | 0x48 | INT 32 |
| Q1+ | Q1 | 5 | 0x84 | 0xC0 | 0x80 | 0x40 | | 0xAB | 0x3B | INT 32 |
| Q1- | Q1-negative | 5 | 0x84 | 0xC0 | 0x80 | 0x40 | | 0xAB | 0x3C | INT 32 |
| L2-L3 | V23 | 6 | 0x84 | 0x80 | 0xC0 | 0x40 | | 0xFD | 0x48 | INT 32 |
| Q2+ | Q2 | 6 | 0x84 | 0x80 | 0xC0 | 0x40 | | 0xAB | 0x3B | INT 32 |
| Q2- | Q2-negative | 6 | 0x84 | 0x80 | 0xC0 | 0x40 | | 0xAB | 0x3C | INT 32 |
| L1-L3 | V13 | 7 | 0x84 | 0xC0 | 0xC0 | 0x40 | | 0xFD | 0x48 | INT 32 |
| Q3+ | Q3 | 7 | 0x84 | 0xC0 | 0xC0 | 0x40 | | 0xAB | 0x3B | INT 32 |

| | | | | | | | | | | |
|------|-----------------------------|-------------|------------|----------------|----------------|----------------|----------------|------------|-------------|--------|
| Q3- | Q3-negative | 7 | 0x84 | 0xC0 | 0xC0 | 0x40 | | 0xAB | 0x3C | INT 32 |
| | RSP_UD - 3rd message | | | | | | | | | |
| | Sequence | UNIT | DIF | DIFE(1) | DIFE(2) | DIFE(3) | DIFE(4) | VIF | VIFE | |
| PF | Power factor | 8 | 0x82 | 0x80 | 0x80 | 0x80 | 0x40 | 0xEE | 0x3B | INT 16 |
| PF- | Power factor - | 8 | 0x82 | 0x80 | 0x80 | 0x80 | 0x40 | 0xEE | 0x3C | INT 16 |
| Fr | Frequency | 9 | 0x82 | 0xC0 | 0x80 | 0x80 | 0x40 | 0x6E | | INT 16 |
| CT | Current ratio (KTA) | 10 | 0x84 | 0x80 | 0xC0 | 0x80 | 0x40 | 0x6E | | INT 32 |
| VT | Voltage ratio (KTV) | 11 | 0x84 | 0xC0 | 0xC0 | 0x80 | 0x40 | 0x6E | | INT 32 |
| PF1 | Power factor L1 | 12 | 0x82 | 0x80 | 0x80 | 0xC0 | 0x40 | 0xEE | 0x3B | INT 16 |
| PF1- | Power factor L1- | 12 | 0x82 | 0x80 | 0x80 | 0xC0 | 0x40 | 0xEE | 0x3C | INT 16 |
| PF2 | Power factor L2 | 13 | 0x82 | 0xC0 | 0x80 | 0xC0 | 0x40 | 0xEE | 0x3B | INT 16 |
| PF2- | Power factor L2- | 13 | 0x82 | 0xC0 | 0x80 | 0xC0 | 0x40 | 0xEE | 0x3C | INT 16 |
| PF3 | Power factor L3 | 14 | 0x82 | 0x80 | 0xC0 | 0xC0 | 0x40 | 0xEE | 0x3B | INT 16 |
| PF3- | Power factor L3- | 14 | 0x82 | 0x80 | 0xC0 | 0xC0 | 0x40 | 0xEE | 0x3C | INT 16 |

3.3 STANDARD DATA TELEGRAMS

Details of the telegrams (all values are hexadecimal).

3.3.1 Details of telegrams 1

| RSP_UD | | | | |
|-------------------|----------|-------------|--|---|
| Field Name | Byte n. | 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 | |
| Et + | DIF | 1 | 04 | Instantaneous Value, 32 bit Integer |
| | VIF | 1 | 84 | Units kWh with resolution 10 Wh |
| | VIFE (1) | 1 | 3B | |
| | Value | 4 | xxxxxxxx | 3-phase Active Positive Energy |
| P + | DIF | 1 | 04 | Instantaneous Value, 32-bit Integer |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | 3-phase Active Positive Power |
| P - | DIF | 1 | 04 | Instantaneous Value, 32-bit Integer |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | 3-phase Active Negative Power |
| Er + | DIF | 1 | 84 | Instantaneous Value, 32 bit Integer |
| | DIFE (1) | 1 | 40 | Unit 1 |
| | VIF | 1 | 84 | kvarh with resolution 10 varh |
| | VIFE (1) | 1 | 3B | Accumulation only if positive |
| | Value | 4 | xxxxxxxx | 3-phase Reactive Positive Energy |
| Q + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 40 | Unit 1 |
| | VIF | 1 | AB | var |
| | VIFE (1) | 1 | 3B | Accumulation only if positive |
| | Value | 4 | xxxxxxxx | 3-phase Reactive Positive Power |
| Q - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 40 | Unit 1 |
| | VIF | 1 | AB | var |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | 3-phase Reactive Negative Power |
| Part Et + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 40 | |
| | VIF | 1 | 84 | kWh with resolution 10Wh |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | 3-phase Partial Active Positive Energy |
| PartEr + | DIF | 1 | 84 | Instantaneous Value, 32 bit Integer |
| | DIFE (1) | 1 | C0 | |
| | VIF | 1 | 40 | kVArh with resolution 0,01k/0,1k VArh |
| | VIFE | 1 | 84 | |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |

| | | | | |
|--------------|----------|----------|-----------|---|
| Power Demand | Value | 4 | xxxxxxx | 3-phase Partial Reactive Positive Energy |
| | DIF | 1 | 84 | Instantaneous Value, 32 bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 4 |
| | VIF | 1 | 84 | |
| | VIFE (1) | 1 | 3C | |
| | Value | 4 | xxxxxxx | Active Power Demand |
| Reserved | DIF | 1 | 84 | Instantaneous Value, size 32 bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 5 |
| | VIF | 1 | 84 | |
| | VIFE (1) | 1 | 3C | |
| | Value | 4 | xxxxxxx | |
| | DIF | 1 | 1F | more records will follow in next telegram |
| Value | 5 | 00000000 | PAD bytes | |
| Checksum | 1 | CS | | |
| Stop | 1 | 16 | | |

3.3.2 Details of telegrams 2

| 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 |

| | | | | |
|--------|----------|---|----------|---|
| L1 - N | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L1-N |
| I1 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 59 | mA |
| | Value | 4 | xxxxxxxx | Current L1 |
| P1 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Active Power Line 1 |
| P1 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 40 | Unit 2 |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Active Power Line 1 |
| L2 - N | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE | 1 | C0 | |
| | DIFE | 1 | 40 | Unit 3 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L2-N |
| I2 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 40 | Unit 3 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 59 | mA |
| | Value | 4 | xxxxxxxx | Current L2 |
| P2 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 40 | Unit 3 |
| | VIF | 1 | AB | W |

| | | | | |
|---------|----------|---|----------|---|
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Active Power Line 2 |
| P2 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (1) | 1 | 40 | Unit 3 |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Active Power Line 2 |
| L3 - N | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 4 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L3-N |
| | | | | |
| I3 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 4 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 59 | mA |
| | Value | 4 | xxxxxxxx | Current L3 |
| | | | | |
| P3 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 4 |
| | VIF | 1 | AB | W |
| | VIFE | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Active Power Line 3 |
| | | | | |
| P3 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 4 |
| | VIF | 1 | AB | W |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Active Power Line 3 |
| | | | | |
| L1 - L2 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 5 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L1-L2 |
| | | | | |
| Q1 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 5 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Reactive Power Line 1 |
| | | | | |

| | | | | |
|----------|----------|----------|---|---|
| Q1 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 40 | Unit 5 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Reactive Power Line 1 |
| L2 - L3 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 6 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L2-L3 |
| Q2 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 6 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Reactive Power Line 2 |
| Q2 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 6 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Reactive Power Line 1 |
| L1 - L3 | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 7 |
| | VIF | 1 | FD | Extension of VIF code |
| | VIFE (1) | 1 | 48 | 0.1 V |
| | Value | 4 | xxxxxxxx | Voltage L1-L3 |
| Q3 + | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 7 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3B | Accumulation only if positive contribution |
| | Value | 4 | xxxxxxxx | Positive Reactive Power Line 3 |
| Q3 - | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 40 | Unit 7 |
| | VIF | 1 | AB | Var |
| | VIFE (1) | 1 | 3C | Accumulation of abs value only if negative contribution |
| | Value | 4 | xxxxxxxx | Negative Reactive Power Line 3 |
| DIF | 1 | 1F | More records will follow in next telegram | |
| Value | 5 | 00000000 | PAD bytes | |
| Checksum | 1 | CS | | |
| Stop | 1 | 16 | | |

3.3.3 Details of telegrams 3

| 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 answered telegram | |
| Status | 1 | STAT | Status for EN 1434-3 (*) | |
| Signature | 2 | 00 00 | Not used | |
| PF | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 80 | |
| | DIFE (4) | 1 | 40 | Unit 8 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3B | |
| | Value | 2 | xxxx | Three phase power factor |
| PF- | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 80 | |
| | DIFE (4) | 1 | 40 | Unit 8 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3C | |
| | Value | 2 | xxxx | Three phase power factor |
| Frequency | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | 80 | |
| | DIFE (4) | 1 | 40 | Unit 9 |
| | VIF | 1 | 6E | Dimensionless (50.0 => 500) |
| | Value | 2 | xxxx | Frequency |
| CT Ratio | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 80 | |
| | DIFE (4) | 1 | 40 | Unit 10 |
| | VIF | 1 | 6E | Dimensionless (2000 / 5 => 400) |
| | Value | 4 | xxxxxxxx | Current ratio (KTA) |

| | | | | |
|----------|----------|---|---------|-------------------------------------|
| VT ratio | DIF | 1 | 84 | Instantaneous Value, 32-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | C0 | |
| | DIFE (3) | 1 | 80 | |
| | DIFE (4) | 1 | 40 | Unit 11 |
| | VIF | 1 | 6E | Dimensionless (= 10 always) |
| | Value | 4 | xxxxxxx | Voltage ratio (KTV) |
| PF 1 | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 12 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3B | |
| | Value | 2 | xxxx | Phase Power Factor |
| PF1 - | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 12 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3C | |
| | Value | 2 | xxxx | |
| PF2 | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | C0 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 13 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3B | |
| | Value | 2 | xxxx | Phase Power Factor |
| PF2 - | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 13 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3C | |
| | Value | 2 | xxxx | |
| PF3 | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 14 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3B | |
| | Value | 2 | xxxx | Phase Power Factor |
| PF3 - | DIF | 1 | 82 | Instantaneous Value, 16-bit Integer |
| | DIFE (1) | 1 | 80 | |
| | DIFE (2) | 1 | 80 | |
| | DIFE (3) | 1 | C0 | |
| | DIFE (4) | 1 | 40 | Unit 14 |
| | VIF | 1 | EE | Dimensionless (1.00 => 100) |
| | VIFE (1) | 1 | 3C | |
| | Value | 2 | xxxx | |

| | | | |
|----------|---|-----------|---|
| DIF | 1 | 0F | Indicating that this is the last telegram |
| Value | 5 | 000000000 | PAD bytes |
| Checksum | 1 | CS | |
| Stop | 1 | 16 | |

4. MODE 3 PROTOCOL

This is the traditional IME protocol. There are many differences with respect the mode 2 protocol that is more standard and mainly they concern the way to communicate the energy values. In mode 3 the energy registers are transmitted in BCD format instead of double WORD as in mode 2.

4.1 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 = (10h+5B/7Bh+PADR) mod 100h |
| 16h | Stop |

When Master sends this telegram to a Slave, it answers a Standard Frame with RSP_UD multi-telegram, where the last DIF in the user data part of the telegram is 0x1F to indicate that there are more data in the next telegram.

Answer to Request for Data (REQ_UD2)

| Position | Description | Byte | Data type |
|----------|---------------------------------|------|------------------------------|
| 1 | Active Total Energy | 6 | Type A , 12 BCD digits |
| 2 | Active Positive Power 3-phase | 4 | Type H , IEEE Real |
| 3 | Reactive Total Energy | 6 | Type A , 12 BCD digits |
| 4 | Reactive Positive Power 3-phase | 4 | Type H , IEEE Real |
| 5 | Active Partial Energy | 6 | Type A , 12 BCD digits |
| 6 | Error flags | 1 | Type B , 8-bit Integer |
| 7 | Current I1 | 4 | Type H , IEEE Real |
| 8 | Current I2 | 4 | Type H , IEEE Real |
| 9 | Current I3 | 4 | Type H , IEEE Real |
| 10 | Voltage L1 | 4 | Type H , IEEE Real |
| 11 | Voltage L2 | 4 | Type H , IEEE Real |
| 12 | Voltage L3 | 4 | Type H , IEEE Real |
| 13 | Active Power L1 | 4 | Type H , IEEE Real with sign |
| 14 | Active Power L2 | 4 | Type H , IEEE Real with sign |
| 15 | Active Power L3 | 4 | Type H , IEEE Real with sign |
| 16 | Reactive Power L1 | 4 | Type H , IEEE Real with sign |
| 17 | Reactive Power L2 | 4 | Type H , IEEE Real with sign |
| 18 | Reactive Power L3 | 4 | Type H , IEEE Real with sign |
| 19 | Voltage L1-L2 | 4 | Type H , IEEE Real |
| 20 | Voltage L2-L3 | 4 | Type H , IEEE Real |
| 21 | Voltage L3-L1 | 4 | Type H , IEEE Real |
| 22 | Frequency | 4 | Type H , IEEE Real |
| 23 | Current Transform Ratio KTA | 2 | Type B , 16-bit Integer |
| 24 | Voltage Transform Ratio KTV | 2 | Type B , 16-bit Integer |

4.2 EXAMPLES OF TELEGRAMS 1,2,3

4.2.1 Telegram 1

Example of the 1st telegram (all values are hexadecimal).

| RSP_UD | | | |
|-------------------|----------------|--------------|--|
| Field Name | Byte n. | 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 transmitted 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 answered telegram |
| Status | 1 | STAT | Status for EN 1434-3 (*) |
| Signature | 2 | 00 00 | Not used |

| | | | | |
|-----------------|-------|---|--------------|---|
| 3-phase Et + | DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| | DIFE | 1 | 50 | Tariff 1 Unit 1 Storage number 0 |
| | VIF | 1 | 04/05 | Units kWh with resolution 0,01k/0,1k Wh |
| | Value | 6 | xxxxxxxxxxxx | 3-phase Active Positive Energy |
| P + | DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| | DIFE | 1 | 50 | Tariff 1 Unit 1 Storage number 0 |
| | VIF | 1 | 2B | Power W |
| 3-phase Er + | Value | 4 | xxxxxxxx | 3-phase Active Positive Power |
| | DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| | DIFE | 1 | 90 | Tariff 1 |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | 04/05 | Units kVArh with resolution 0,01k/0,1k VArh |
| | Value | 6 | xxxxxxxxxxxx | 3-phase Reactive Positive Energy |
| Q + | DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| | DIFE | 1 | 90 | Tariff 1 |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | 2B | Power Var |
| | Value | 4 | xxxxxxxx | 3-phase Reactive Positive Power |
| Part Et + | DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| | DIFE | 1 | 60 | Tariff 2 Unit 1 Storage number 0 |
| | VIF | 1 | 04/05 | Units kWh with resolution 0,01k/0,1k Wh |
| | Value | 6 | xxxxxxxxxxxx | 3-phase Partial Active Energy |

| | | | | |
|------------|----------|---|-----------|---|
| Err. flags | DIF | 1 | 01 | Instantaneous Value, 8-bit integer |
| | VIF | 1 | FD | Error flags (Not used - 00) |
| | VIFE | 1 | 17 | |
| | Value | 1 | Yy | Error on 8 bit B7..B0 |
| | DIF | 1 | 1F | more records will follow in next telegram |
| | Value | 5 | 000000000 | PAD bytes |
| | Checksum | 1 | CS | |
| | Stop | 1 | 16 | |
| | | | | |
| | | | | |

4.2.2 Telegram 2

Example of the 2nd telegram (all values are hexadecimal).

| RSP_UD | | | | |
|---------------|-------------------|----------------|--------------|---|
| | Field Name | Byte n. | 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 |
| I 1 | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | DA | Units A with resolution mA |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 01 | Line 1 |
| | Value | 4 | xxxxxxxx | Current L1 |
| I 2 | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | DA | Units A with resolution mA |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 02 | Line 2 |
| | Value | 4 | xxxxxxxx | Current L2 |
| I 3 | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | DA | Units A with resolution mA |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 03 | Line 3 |
| | Value | 4 | xxxxxxxx | Current L3 |
| L1 - N | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | C8 | Units V with resolution 100 mV |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 01 | Line 1 |
| | Value | 4 | xxxxxxxx | Voltage L1-N |
| L2 - N | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | C8 | Units V with resolution 100 mV |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 02 | Line 2 |
| | Value | 4 | xxxxxxxx | Voltage L2-N |
| L3 - N | DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | C8 | Units V with resolution 100 mV |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 03 | Line 3 |
| | Value | 4 | xxxxxxxx | Voltage L3-N |
| | DIF | 1 | 1F | more records will follow in next telegram |
| | Value | 5 | 00000000 | PAD bytes |
| | Checksum | 1 | CS | |

| | | | |
|------|---|----|--|
| Stop | 1 | 16 | |
|------|---|----|--|

4.2.3 Telegram 3

Example of the 3rd telegram (all values are hexadecimal).

| RSP_UD | | | | |
|-------------------|----------------|--------------|--|--|
| Field Name | Byte n. | 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 | |
| P1 | DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| | DIFE | 1 | 40 | Unit 1 |
| | VIF | 1 | AB/AD | Power W/ 0,1 kW |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 01 | Active Power Line 1 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |
| P2 | DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| | DIFE | 1 | 40 | Unit 1 |
| | VIF | 1 | AB/AD | Power W/ 0,1 kW |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 02 | Active Power Line 2 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |
| P3 | DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| | DIFE | 1 | 40 | Unit 1 |
| | VIF | 1 | AB/AD | Power W/ 0,1 kW |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 03 | Active Power Line 3 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |
| Q1 | DIF | 1 | 85 | Istantaneous Value, size 32-bit Real |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | AB/AD | Power Var / 0,1 kVAr |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 01 | Reactive Power L1 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |
| Q2 | DIF | 1 | 85 | Istantaneous Value, size 32-bit Real |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | AB/AD | Power VAr/ 0,1 kVAr |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 02 | Reactive Power L2 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |

| | | | | |
|---------|-------|---|----------|--|
| Q 3 | DIF | 1 | 85 | Instantaneous Value, size 32-bit Real |
| | DIFE | 1 | 80 | |
| | DIFE | 1 | 40 | Unit 2 |
| | VIF | 1 | AB/AD | Power Var / 0,1 kVAr |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 03 | Reactive Power L3 |
| | Value | 4 | xxxxxxxx | b31 = sign b30-b23 exponent b22-b0 value |
| L1 - L2 | DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | C8 | Units V with resolution 0,1V |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 04 | |
| | Value | 4 | xxxxxxxx | Voltage L1-L2 |
| L2 - L3 | DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | C8 | Units V with resolution 0,1V |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 05 | |
| | Value | 4 | xxxxxxxx | Voltage L2-L3 |
| L3 - L1 | DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| | VIF | 1 | FD | Extension of VIF-codes |
| | VIFE | 1 | 8 | Units V with resolution 0,1V |
| | VIFE | 1 | FF | Next byte is manufacturer specific |
| | VIFE | 1 | 06 | |
| | Value | 4 | xxxxxxxx | Voltage L3-L1 |

| | | | | |
|-----------|----------|----|----------|---|
| Frequency | DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| | VIF | 1 | FF | Next byte is Manufacturer specific |
| | VIFE | 1 | 5A | Units Hz with resolution 0.1 Hz |
| | Value | 4 | xxxxxxxx | Frequency |
| KTA | DIF | 1 | 02 | Instantaneous Value, size 16-bit integer |
| | VIF | 1 | FD | |
| | VIFE | 1 | 3A | dimensionless |
| | Value | 2 | xxxx | Current Transform KTA |
| KTV | DIF | 1 | 02 | Instantaneous Value, size 16-bit integer |
| | VIF | 1 | FD | |
| | VIFE | 1 | 3A | dimensionless |
| | Value | 2 | xxxx | Voltage Transform KTV *10 |
| | DIF | 1 | 0F | Indicating that this is the last telegram |
| | Value | 5 | 00000000 | PAD bytes |
| | Checksum | 1 | CS | |
| Stop | 1 | 16 | | |