



Open Metering System Specification

Message examples

**Annex N to
Volume 2 Primary Communication
Issue 5.0.1**

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N.1 Overview Tables

Wireless examples:

| Message Type | Security Profile | Chapter |
|--|------------------|---------|
| SND-NR | A | N.2.1 |
| SND-NR | B | N.2.3 |
| REQ-UD2/RSP-UD | B | N.2.4 |
| SND-NR | D | N.2.6 |
| REQ-UD2/RSP-UD (fragmented) | B | N.3 |
| REQ-UD2/RSP-UD (fragmented) | D | N.5 |
| ACC-NR | No | N.6.2 |
| SND-NR (partial encrypted) | A | N.6.3 |
| SND-IR/CNF-IR | A | N.7 |
| SND-UD/ACK | A | N.8 |
| RSP-UD | A | N.9 |
| RSP-UD (APL-error) | No | N.9 |
| ACC-DMD/ACK | No | N.10 |
| SND-NKE | No | N.11 |
| SND-NR (wM-Bus) | B+ASP10 | N.12.1 |
| SND-UD2 (wM-Bus) | B+ASP10 | N.12.2 |
| RSP-UD (wM-Bus Set Breaker - successful) | B+ASP10 | N.12.3 |
| RSP-UD (wM-Bus Set Breaker - failure) | B+ASP10 | N.12.4 |
| SND-NR (with TAF7 Data with compact profile) | B | N.13 |

Wired examples:

| Message Type | Security Profile | Chapter |
|-----------------------------|------------------|---------|
| RSP-UD | No | N.2.2 |
| RSP-UD | B | N.2.5 |
| REQ-UD2/RSP-UD (fragmented) | A | N.4 |
| RSP_UD (partial encrypted) | A | N.6.4 |

N.2 Gas Meter with different Security profiles

N.2.1. wM-Bus Meter with Security profile A

This example shows a synchronous transmission of wM-Bus Meter with integrated radio interface (short TPL) using Security Profile A.

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| Gas meter example | |
|---|------------------|
| Medium | Gas |
| Manufacturer | ELS |
| Ident number | 12345678 |
| Version | 51 |
| Forward absolute meter volume, temperature converted | 28504,27 m³ |
| date and time of read out | 31.05.2008 23:50 |
| Error code binary | 0 |

| AES Key according to FIPS 197 (see 9.1): |
|--|
| = manu. spec. at least 8 bytes unique for each meter |
| = 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 11 |

| AES CBC Initial Vector according to FIPS 197 (LSB first): |
|---|
| = M Field + A Field + 8 bytes Acces No |
| = 93 15 78 56 34 12 33 03 2A 2A 2A 2A 2A 2A 2A 2A |

SND-NR (wM-Bus)

| Byte No | | OMS wM-Bus frame | Gas meter example | | Layer | |
|---------|--------------|--|-------------------|-------------|-----------------------|-------------------------|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | |
| | | | plain | AES coded | | |
| 1 | L Field | Length of data (46 bytes) | | 2Eh | Data Link Layer (DLL) | |
| 2 | C Field | Send - No Reply | | 44h | | |
| 3 | M Field | Manufacturer code | | 93h | | |
| 4 | M Field | Manufacturer code | | 15h | | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | | |
| 6 | A Field | Ident No (BCD) | | 56h | | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | | |
| 9 | A Field | Version (or Generation number) | | 33h | | |
| 10 | A Field | Device type (Medium=Gas) | | 03h | | |
| 11 | CRC 1 | | | 33h | | |
| 12 | CRC 1 | | | 63h | | |
| 13 | CI Field | 7Ah (short header) | | 7Ah | Transport Layer (TPL) | |
| 14 | Access No. | Shared Access number of Meter | | 2Ah | | |
| 15 | Status | M-Bus state contents errors and alerts | | 00h | | |
| 16 | Config Field | NNNNCCRhb (2 encr. blocks) | | 20h | | |
| 17 | Config Field | BASMMMMMb (unidir., sync., AES) | | 25h | | |
| 18 | AES-Verify | Encryption verification | 2Fh | 59h | TPL | |
| 19 | AES-Verify | Encryption verification | 2Fh | 23h | | |
| 20 | DR1 | DIF (8 digit BCD) | 0Ch | C9h | # 1 | Application Layer (APL) |
| 21 | DR1 | VIF (Volume 0,01 m³) | 14h | 5Ah | | |
| 22 | DR1 | Value LSB | 27h | AAh | | |
| 23 | DR1 | Value | 04h | 26h | | |
| 24 | DR1 | Value (= 28504,27 m³) | 85h | D1h | | |
| 25 | DR1 | Value MSB | 02h | B2h | | |
| 26 | DR2 | DIF (Time at readout; Type F) | 04h | E7h | | |
| 27 | DR2 | VIF (Date, Time) | 6Dh | 49h | | |
| 28 | DR2 | Value LSB | 32h | 3Bh | DLL | |
| 29 | CRC 2 | | | C2h | | |
| 30 | CRC 2 | | | ADh | | |
| 31 | DR2 | Value | 37h | 01h | # 1 | APL |
| 32 | DR2 | Value (31.05.2008 23:50) | 1Fh | 3Eh | | |
| 33 | DR2 | Value MSB | 15h | C4h | | |
| 34 | DR3 | DIF (2 byte integer) | 02h | A6h | | |
| 35 | DR3 | VIF (VIF-Extension Table FD) | FDh | F6h | | |
| 36 | DR3 | VIFE (error flag) | 17h | D3h | | |
| 37 | DR3 | Value LSB | 00h | 52h | | |
| 38 | DR3 | Value MSB (= 0) | 00h | 9Bh | | |
| 39 | Dummy | Fill Byte due to AES | 2Fh | 52h | # 2 | |
| 40 | Dummy | Fill Byte due to AES | 2Fh | 0Eh | | |
| 41 | Dummy | Fill Byte due to AES | 2Fh | DFh | | |
| 42 | Dummy | Fill Byte due to AES | 2Fh | F0h | | |
| 43 | Dummy | Fill Byte due to AES | 2Fh | EAh | | |
| 44 | Dummy | Fill Byte due to AES | 2Fh | 6Dh | | |
| 45 | Dummy | Fill Byte due to AES | 2Fh | EFh | | |

| | | | | | | |
|----|-------|----------------------|-----|-----|-----|-----|
| 46 | Dummy | Fill Byte due to AES | 2Fh | C9h | | |
| 47 | CRC 3 | | | 55h | DLL | |
| 48 | CRC 3 | | | B2h | | |
| 49 | Dummy | Fill Byte due to AES | 2Fh | 9Dh | # 2 | APL |
| 50 | Dummy | Fill Byte due to AES | 2Fh | 6Dh | | |
| 51 | Dummy | Fill Byte due to AES | 2Fh | 69h | | |
| 52 | Dummy | Fill Byte due to AES | 2Fh | EBh | | |
| 53 | Dummy | Fill Byte due to AES | 2Fh | F3h | | |
| 54 | CRC 4 | | | ECh | DLL | |
| 55 | CRC 4 | | | 8Ah | | |

N.2.2. M-Bus Meter with no encryption:

This is an example of a RSP-UD after a REQ-UD2 (Meter ID and data are identical to wM-Bus Meter with Security profile A).

RSP-UD (M-Bus)

| Byte No | OMS M-Bus frame | | Gas meter example | Layer |
|---------|-----------------|--|-------------------|-------------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | Start | Start byte | 68h | Data Link Layer (DLL) |
| 2 | L Field | Length of data (32 bytes) | 20h | |
| 3 | L Field | Length of data (32 bytes) | 20h | |
| 4 | Start | Start byte | 68h | |
| 5 | C Field | Respond user data | 08h | |
| 6 | A-Field | Secondary addressing mode | FDh | |
| 7 | CI Field | 72h (long header) | 72h | Transport Layer (TPL) |
| 8 | Ident.Nr. | Ident No LSB (BCD) | 78h | |
| 9 | Ident.Nr. | Ident No (BCD) | 56h | |
| 10 | Ident.Nr. | Ident No (BCD) (=12345678) | 34h | |
| 11 | Ident.Nr. | Ident No MSB (BCD) | 12h | |
| 12 | Manufr | Manufacturer code | 93h | |
| 13 | Manufr | Manufacturer code | 15h | |
| 14 | Version | Version (or Generation number) | 33h | |
| 15 | Device type | Device type (Medium=Gas) | 03h | |
| 16 | Access No. | Access number of Meter | 2Ah | |
| 17 | Status | M-Bus state contents errors and alerts | 00h | |
| 18 | Config Field | 0000CCRHB | 00h | Application Layer (APL) |
| 19 | Config Field | BASMMMMMMb | 00h | |
| 20 | DR1 | DIF (8 digit BCD) | 0Ch | |
| 21 | DR1 | VIF (Volume 0,01 m³) | 14h | |
| 22 | DR1 | Value LSB | 27h | |
| 23 | DR1 | Value | 04h | |
| 24 | DR1 | Value (= 28504,27 m³) | 85h | |
| 25 | DR1 | Value MSB | 02h | |
| 26 | DR2 | DIF (Time at readout; Type F) | 04h | |
| 27 | DR2 | VIF (Date, Time) | 6Dh | |
| 28 | DR2 | Value LSB | 32h | |
| 29 | DR2 | Value | 37h | |
| 30 | DR2 | Value (31.05.2008 23:50) | 1Fh | |
| 31 | DR2 | Value MSB | 15h | |
| 32 | DR3 | DIF (2 byte integer) | 02h | |
| 33 | DR3 | VIF (FD-Table) | FDh | |
| 34 | DR3 | VIFE (error flag) | 17h | |
| 35 | DR3 | Value LSB | 00h | |
| 36 | DR3 | Value MSB (= 0) | 00h | |
| 37 | Checksum | | 89h | DLL |
| 38 | Stop | Stop byte | 16h | |

N.2.3. wM-Bus Meter with integrated radio and Security profile B

This example shows a synchronous transmission of a Gas Meter with an integrated unidirectional radio interface using security profile B.

| Gas meter example | |
|---|-------------------------|
| Medium | Gas |
| Manufacturer | ELS |
| Ident number | 12345678 |
| Version | 51 |
| Forward absolute meter volume, temperature converted | 28504,27 m ³ |
| Date and time of read out | 31.05.2008 23:50 |
| Error code binary | 0 |

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| |
|-------------------------------|
| ToDo: |
| 1. Calculate Session Keys |
| 2. Encrypt Message using Kenc |
| 3. Calculate MAC using Kmac |
| 4. Calculate CRCs |

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F |

| MAC Session Key Kmac |
|--|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C9 CD 19 FF 5A 9A AD 5A 6B BD A1 3B D2 C4 C7 AD |

SND-NR (wM-Bus)

| Byte No | OMS wM-Bus frame | | Gas meter example | | Layer |
|---------|------------------|--|-------------------|-------------|--|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (67 bytes) | | 43h | Data Link Layer (DLL) |
| 2 | C Field | Send - No Reply | | 44h | |
| 3 | M Field | Manufacturer code | | 93h | |
| 4 | M Field | Manufacturer code | | 15h | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 33h | |
| 10 | A Field | Device type (Gas) | | 03h | |
| 11 | CRC 1 | | | 7Ah | ELL |
| 12 | CRC 1 | | | C9h | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control | | 20h | Authentication and Fragmentation Layer (AFL) |
| 15 | Access No. | ELL-Access Counter of Meter | | 75h | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 20 | MCL | Message Control Field | | 25h | |
| 21 | MCR | Message Counter C (LSB) | | B3h | |
| 22 | MCR | Message Counter C | | 0Ah | |
| 23 | MCR | Message Counter C (e.g. = 2739) | | 00h | |
| 24 | MCR | Message Counter C (MSB) | | 00h | |
| 25 | MAC | AES-CMAC (MSB) | | 21h | AFL |
| 26 | MAC | AES-CMAC | | 92h | |
| 27 | MAC | AES-CMAC | | 4Dh | |
| 28 | MAC | AES-CMAC | | 4Fh | |
| 29 | CRC 2 | | | BAh | DLL |
| 30 | CRC 2 | | | 37h | |
| 31 | MAC | AES-CMAC | | 2Fh | AFL |
| 32 | MAC | AES-CMAC | | B6h | |
| 33 | MAC | AES-CMAC | | 6Eh | |
| 34 | MAC | AES-CMAC (LSB) | | 01h | |
| 35 | CI Field | 7Ah (short header) | | 7Ah | Transport Layer (TPL) |
| 36 | Access No. | TPL Access Counter of Meter | | 75h | |
| 37 | Status | Meter status | | 00h | |
| 38 | Config Field | NNNNPIIIb | | 20h | |
| 39 | Config Field | CCZMMMMMb | | 07h | |
| 40 | CFE | 0VDDKKKKb | | 10h | |
| 41 | AES-Verify | Decryption verification | 2Fh | 90h | # 1 |
| 42 | AES-Verify | Decryption verification | 2Fh | 58h | |
| 43 | DR1 | DIF (8 digit BCD) | 0Ch | 47h | |
| 44 | DR1 | VIF (Volume 0,01 m³) | 14h | 5Fh | |
| 45 | DR1 | Value LSB | 27h | 4Bh | APL |

| | | | | | | |
|----|-------|-------------------------------|-----|-----|--|-----|
| 46 | DR1 | Value | 04h | C9h | | |
| 47 | CRC 3 | | | D1h | | |
| 48 | CRC 3 | | | 28h | | DLL |
| 49 | DR1 | Value (= 28504,27 m³) | 85h | 1Dh | | |
| 50 | DR1 | Value MSB | 02h | F8h | | |
| 51 | DR2 | DIF (Time at readout; Type F) | 04h | 78h | | |
| 52 | DR2 | VIF (Date, Time) | 6Dh | B8h | | |
| 53 | DR2 | Value LSB | 32h | 0Ah | | |
| 54 | DR2 | Value | 37h | 1Bh | | |
| 55 | DR2 | Value (31.05.2008 23:50) | 1Fh | 0Fh | | |
| 56 | DR2 | Value MSB | 15h | 98h | | |
| 57 | DR3 | DIF (2 byte integer) | 02h | B6h | | |
| 58 | DR3 | VIF (VIF-Extension Table FD) | FDh | 29h | | |
| 59 | DR3 | VIFE (error flag) | 17h | 02h | | |
| 60 | DR3 | Value LSB | 00h | 4Ah | | |
| 61 | DR3 | Value MSB (= 0) | 00h | ACh | | |
| 62 | Dummy | Fill Byte due to AES | 2Fh | 72h | | |
| 63 | Dummy | Fill Byte due to AES | 2Fh | 79h | | |
| 64 | Dummy | Fill Byte due to AES | 2Fh | 42h | | |
| 65 | CRC 4 | | | 93h | | |
| 66 | CRC 4 | | | 98h | | DLL |
| 67 | Dummy | Fill Byte due to AES | 2Fh | BFh | | |
| 68 | Dummy | Fill Byte due to AES | 2Fh | C5h | | |
| 69 | Dummy | Fill Byte due to AES | 2Fh | 49h | | |
| 70 | Dummy | Fill Byte due to AES | 2Fh | 23h | | |
| 71 | Dummy | Fill Byte due to AES | 2Fh | 3Ch | | |
| 72 | Dummy | Fill Byte due to AES | 2Fh | 01h | | |
| 73 | Dummy | Fill Byte due to AES | 2Fh | 40h | | |
| 74 | Dummy | Fill Byte due to AES | 2Fh | 82h | | |
| 75 | Dummy | Fill Byte due to AES | 2Fh | 9Bh | | |
| 76 | Dummy | Fill Byte due to AES | 2Fh | 93h | | |
| 77 | CRC 5 | | | BAh | | |
| 78 | CRC 5 | | | A1h | | DLL |

N.2.4. wM-Bus Meter with radio adapter and Security profile B

This example shows the communication of a Gas Meter with a bidirectional radio adapter (long TPL) which communicates with a foreign gateway applying long ELL.

| Gas meter example | |
|---|-------------------------|
| Medium | Gas |
| Manufacturer | ELS (1593h) |
| Ident number | 12345678 |
| Version | 51 |
| Forward absolute meter volume, temperature converted | 28504,27 m ³ |
| Date and time of read out | 31.05.2008 23:50 |
| Error code binary | 0 |

| RF adapter example | |
|-------------------------|-----------------|
| Medium/device type | Radio converter |
| Manufacturer | RAD (4824h) |
| Ident number RF-Adapter | 11223344 |
| Version | 3 |

| Gateway example | |
|--------------------|------------------|
| Medium/device type | Comm. controller |
| Manufacturer | XYZ (633A) |
| Ident number | 33445566 |
| Version | 10 (e.g. V 1.0) |

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The Message Counter, the individual Master Key Mk and both derived keys Kenc and Kmac are identical to example N.2.3 wM-Bus Meter with integrated radio and Security profile B.

REQ-UD2 (wM-Bus)

| Byte No | OMS wM-Bus frame | | GW -> Gas | Layer |
|---------|------------------|--|-------------|-----------------------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (33 bytes) | 21h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 7Bh | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 5Dh | |
| 12 | CRC 1 | | 17h | |
| 13 | CI Field | Extended Link Layer (long) | 8Eh | ELL |
| 14 | CC Field | Communication Control | 84h | |
| 15 | Access No. | ELL-Access number of GW | 75h | |
| 16 | M Field | Manufacturer code | 24h | |
| 17 | M Field | Manufacturer code | 48h | |
| 18 | A Field | Ident No LSB (BCD) | 44h | |
| 19 | A Field | Ident No (BCD) | 33h | |
| 20 | A Field | Ident No (BCD) (= 11223344) | 22h | |
| 21 | A Field | Ident No MSB (BCD) | 11h | |
| 22 | A Field | Version (or Generation number) | 03h | |
| 23 | A Field | Device type (Communication controller) | 37h | |
| 24 | CI Field | GW -> Meter | 80h | TPL |
| 25 | Ident.Nr. | Meter-ID | 78h | |
| 26 | Ident.Nr. | Meter-ID | 56h | |
| 27 | Ident.Nr. | Meter-ID | 34h | |
| 28 | Ident.Nr. | Meter-ID | 12h | |
| 29 | CRC 2 | | 80h | DLL |
| 30 | CRC 2 | | A4h | |
| 31 | Manufr | Meter-Manufacturer-ID | 93h | TPL |
| 32 | Manufr | Meter-Manufacturer-ID | 15h | |
| 33 | Version | Meter-Version | 33h | |
| 34 | Device type | Meter-Device-Type | 03h | |
| 35 | Access No. | TPL-Access number of GW | 75h | |
| 36 | Status | GW State RSSI level (-84dBm) | 17h | |
| 37 | Config Field | 0000CCRhb | 00h | |
| 38 | Config Field | BASMMMMMb | 00h | |
| 39 | CRC 3 | | CDh | DLL |
| 40 | CRC 3 | | CDh | |

RSP-UD (wM-Bus)

| Byte No | | OMS wM-Bus frame | Gas -> GW | | Layer |
|---------|------------|--|-------------|-------------|--|
| | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (83 bytes) | | 53h | Data Link Layer (DLL) |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code | | 24h | |
| 4 | M Field | Manufacturer code | | 48h | |
| 5 | A Field | Ident No LSB (BCD) | | 44h | |
| 6 | A Field | Ident No (BCD) | | 33h | |
| 7 | A Field | Ident No (BCD) (= 11223344) | | 22h | |
| 8 | A Field | Ident No MSB (BCD) | | 11h | |
| 9 | A Field | Version (or Generation number) | | 03h | |
| 10 | A Field | Device type (Radio converter) | | 37h | |
| 11 | CRC 1 | | | D0h | ELL |
| 12 | CRC 1 | | | 46h | |
| 13 | CI Field | Extended Link Layer (long) | | 8Eh | |
| 14 | CC Field | Communication Control | | 80h | |
| 15 | Access No. | ELL-Access number of GW | | 75h | |
| 16 | M Field | Manufacturer code | | 3Ah | |
| 17 | M Field | Manufacturer code | | 63h | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | |
| 19 | A Field | Ident No (BCD) | | 55h | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | AFL |
| 22 | A Field | Version (or Generation number) | | 0Ah | |
| 23 | A Field | Device type (Communication controller) | | 31h | |
| 24 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 25 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | AFL |
| 26 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 27 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 28 | MCL | Message Control Field | | 25h | |
| 29 | CRC 2 | | | E0h | DLL |
| 30 | CRC 2 | | | 0Ah | |
| 31 | MCR | Message Counter C (LSB) | | B3h | Authentication and Fragmentation Layer (AFL) |
| 32 | MCR | Message Counter C | | 0Ah | |
| 33 | MCR | Message Counter C (e.g. = 2739) | | 00h | |
| 34 | MCR | Message Counter C (MSB) | | 00h | |
| 35 | MAC | AES-CMAC (MSB) | | AFh | |
| 36 | MAC | AES-CMAC | | 5Dh | |
| 37 | MAC | AES-CMAC | | 74h | |
| 38 | MAC | AES-CMAC | | DFh | |
| 39 | MAC | AES-CMAC | | 73h | |
| 40 | MAC | AES-CMAC | | A6h | |
| 41 | MAC | AES-CMAC | | 00h | TPL |
| 42 | MAC | AES-CMAC (LSB) | | D9h | |
| 43 | CI Field | 72h (long header) | | 72h | |
| 44 | Ident.Nr. | Ident No LSB (BCD) | | 78h | |

| | | | | | | |
|----|--------------|--|-----|-----|-----------------------|-------------------------|
| 45 | Ident.Nr. | Ident No (BCD) | | 56h | DLL | |
| 46 | Ident.Nr. | Ident No (BCD) | | 34h | | |
| 47 | CRC 3 | | | C0h | | |
| 48 | CRC 3 | | | 27h | | |
| 49 | Ident.Nr. | Ident No MSB (BCD) of meter | | 12h | Transport Layer (TPL) | |
| 50 | Manufr | Manufacturer code | | 93h | | |
| 51 | Manufr | Manufacturer code | | 15h | | |
| 52 | Version | Version (or Generation number) | | 33h | | |
| 53 | Device type | Device type (Medium = Gas) | | 03h | | |
| 54 | Access No. | TPL-Access number of GW | | 75h | | |
| 55 | Status | M-Bus state contents errors and alerts | | 00h | | |
| 56 | Config Field | NNNNPIIIb | | 20h | | |
| 57 | Config Field | CCZMMMMMb | | 07h | | |
| 58 | CFE | 0VDDKKKKb | | 10h | | |
| 59 | AES-Verify | Decryption verification | 2Fh | 90h | | |
| 60 | AES-Verify | Decryption verification | 2Fh | 58h | | |
| 61 | DR1 | DIF (8 digit BCD) | 0Ch | 47h | # 1 | APL |
| 62 | DR1 | VIF (Volume 0,01 m³) | 14h | 5Fh | | |
| 63 | DR1 | Value LSB | 27h | 4Bh | | |
| 64 | DR1 | Value | 04h | C9h | | |
| 65 | CRC 4 | | | 55h | DLL | |
| 66 | CRC 4 | | | CFh | | |
| 67 | DR1 | Value (= 28504,27 m³) | 85h | 1Dh | # 1 | Application Layer (APL) |
| 68 | DR1 | Value MSB | 02h | F8h | | |
| 69 | DR2 | DIF (Time at readout; Type F) | 04h | 78h | | |
| 70 | DR2 | VIF (Date, Time) | 6Dh | B8h | | |
| 71 | DR2 | Value LSB | 32h | 0Ah | | |
| 72 | DR2 | Value | 37h | 1Bh | | |
| 73 | DR2 | Value (31.05.2008 23:50) | 1Fh | 0Fh | | |
| 74 | DR2 | Value MSB | 15h | 98h | | |
| 75 | DR3 | DIF (2 byte integer) | 02h | B6h | | |
| 76 | DR3 | VIF (VIF-Extension Table FD) | FDh | 29h | | |
| 77 | DR3 | VIFE (error flag) | 17h | 02h | # 2 | |
| 78 | DR3 | Value LSB | 00h | 4Ah | | |
| 79 | DR3 | Value MSB (= 0) | 00h | ACh | | |
| 80 | Dummy | Fill Byte due to AES | 2Fh | 72h | | |
| 81 | Dummy | Fill Byte due to AES | 2Fh | 79h | | |
| 82 | Dummy | Fill Byte due to AES | 2Fh | 42h | | |
| 83 | CRC 5 | | | 93h | DLL | |
| 84 | CRC 5 | | | 98h | | |
| 85 | Dummy | Fill Byte due to AES | 2Fh | BFh | # 2 | APL |
| 86 | Dummy | Fill Byte due to AES | 2Fh | C5h | | |
| 87 | Dummy | Fill Byte due to AES | 2Fh | 49h | | |
| 88 | Dummy | Fill Byte due to AES | 2Fh | 23h | | |
| 89 | Dummy | Fill Byte due to AES | 2Fh | 3Ch | | |
| 90 | Dummy | Fill Byte due to AES | 2Fh | 01h | | |
| 91 | Dummy | Fill Byte due to AES | 2Fh | 40h | | |
| 92 | Dummy | Fill Byte due to AES | 2Fh | 82h | | |

| | | | | | | |
|----|-------|----------------------|-----|-----|-----|--|
| 93 | Dummy | Fill Byte due to AES | 2Fh | 9Bh | | |
| 94 | Dummy | Fill Byte due to AES | 2Fh | 93h | | |
| 95 | CRC 6 | | | BAh | DLL | |
| 96 | CRC 6 | | | A1h | | |

N.2.5. M-Bus Meter with Security profile B

This example shows the communication of a wired M-Bus Gas Meter with Security profile B.

| Gas meter example | |
|---|------------------|
| Primary address | 3 |
| Medium | Gas |
| Manufacturer | ELS |
| Ident number | 12345678 |
| Version | 51 |
| Forward absolute meter volume, temperature converted | 28504,27 m³ |
| Date and time of read out | 31.05.2008 23:50 |

5

| |
|-------------------------------|
| ToDo: |
| 1. Calculate Session Keys |
| 2. Encrypt Message using Kenc |
| 3. Calculate MAC using Kmac |
| 4. Calculate CS |

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F |

| MAC Session Key Kmac |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C9 CD 19 FF 5A 9A AD 5A 6B BD A1 3B D2 C4 C7 AD |

RSP-UD (M-Bus)

| Byte No | OMS M-Bus frame | | Gas meter example | | Layer |
|---------|-----------------|--|-------------------|-------------|--|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | Start | Start byte | | 68h | Data Link Layer (DLL) |
| 2 | L Field | Length of data (49 bytes) | | 31h | |
| 3 | L Field | Length of data (49 bytes) | | 31h | |
| 4 | Start | Start byte | | 68h | |
| 5 | C Field | Respond user data | | 08h | Authentication and Fragmentation Layer (AFL) |
| 6 | A Field | Addressing by secondary adress | | 03h | |
| 7 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 8 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 9 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 10 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 11 | MCL | Message Control Field | | 25h | |
| 12 | MCR | Message Counter C (LSB) | | B3h | |
| 13 | MCR | Message Counter C | | 0Ah | |
| 14 | MCR | Message Counter C (e.g. = 2739) | | 00h | |
| 15 | MCR | Message Counter C (MSB) | | 00h | |
| 16 | MAC | AES-CMAC (MSB) | | A0h | |
| 17 | MAC | AES-CMAC | | 85h | |
| 18 | MAC | AES-CMAC | | 18h | |
| 19 | MAC | AES-CMAC | | CCh | |
| 20 | MAC | AES-CMAC | | B0h | |
| 21 | MAC | AES-CMAC | | 22h | |
| 22 | MAC | AES-CMAC | | C5h | |
| 23 | MAC | AES-CMAC (LSB) | | FDh | |
| 24 | CI Field | 72h (long header) | | 72h | Transport Layer (TPL) |
| 25 | Ident.Nr. | Ident No LSB (BCD) | | 78h | |
| 26 | Ident.Nr. | Ident No (BCD) | | 56h | |
| 27 | Ident.Nr. | Ident No (BCD) | | 34h | |
| 28 | Ident.Nr. | Ident No MSB (BCD) of meter | | 12h | |
| 29 | Manufr | Manufacturer code | | 93h | |
| 30 | Manufr | Manufacturer code | | 15h | |
| 31 | Version | Version (or Generation number) | | 33h | |
| 32 | Device type | Device type (Medium = Water) | | 03h | |
| 33 | Access No. | TPL Access Counter of Meter | | 75h | |
| 34 | Status | Meter status | | 00h | |
| 35 | Config Field | NNNNPIIIb | | 10h | |
| 36 | Config Field | CCZMMMMMb | | 07h | |
| 37 | CFE | 0VDDKKKKb | | 10h | |
| 38 | AES-Verify | Decryption verification | 2Fh | D3h | # 1 APL |
| 39 | AES-Verify | Decryption verification | 2Fh | 71h | |
| 40 | DR1 | DIF (8 digit BCD) | 0Ch | C8h | |
| 41 | DR1 | VIF (Volume 0,01 m³) | 14h | 01h | |
| 42 | DR1 | Value LSB | 27h | D4h | |
| 43 | DR1 | Value | 04h | 09h | |
| 44 | DR1 | Value (= 28504,27 m³) | 85h | B0h | |
| 45 | DR1 | Value MSB | 02h | D9h | |

| | | | | | | |
|----|----------|-------------------------------|-----|-----|-----|--|
| 46 | DR2 | DIF (Time at readout; Type F) | 04h | 28h | #1 | |
| 47 | DR2 | VIF (Date, Time) | 6Dh | D5h | | |
| 48 | DR2 | Value LSB | 32h | 65h | | |
| 49 | DR2 | Value | 37h | 97h | | |
| 50 | DR2 | Value (31.05.2008 23:50) | 1Fh | 59h | | |
| 51 | DR2 | Value MSB | 15h | C2h | | |
| 52 | Dummy | Fill Byte due to AES | 2Fh | ECh | | |
| 53 | Dummy | Fill Byte due to AES | 2Fh | 93h | DLL | |
| 54 | Checksum | | | 5Bh | | |
| 55 | Stop | Stop byte | | 16h | | |

N.2.6. wM-Bus Meter with integrated radio and Security profile D

This example shows a synchronous transmission of a Gas Meter with an integrated unidirectional radio interface using security profile D. The example is similar to the one shown in section N.2.3 except for the security profile.

5

| Gas meter example | |
|---|------------------|
| Medium | Gas |
| Manufacturer | ELS |
| Ident number | 12345678 |
| Version | 51 |
| Forward absolute meter volume, temperature converted | 28504,27 m³ |
| Date and time of read out | 31.05.2008 23:50 |
| Error code binary | 0 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message authenticated using Kenc
3. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F |

| Nonce |
|--|
| = 93 15 78 56 34 12 33 03 00 00 00 0A B3 |

| Associated data (7 bytes) |
|---------------------------|
| = 7A 75 00 11 2A 10 01 |

10

SND-NR (wM-Bus)

| Byte No | | OMS wM-Bus frame | Gas meter example | | Layer |
|---------|--------------|---------------------------------|-------------------|-------------|-------------------------|
| | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (48 bytes) | | 30h | Data Link Layer (DLL) |
| 2 | C Field | Send - No Reply | | 44h | |
| 3 | M Field | Manufacturer code | | 93h | |
| 4 | M Field | Manufacturer code | | 15h | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 33h | |
| 10 | A Field | Device type (Gas) | | 03h | |
| 11 | CRC 1 | | | B5h | ELL |
| 12 | CRC 1 | | | 6Bh | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control | | 20h | Transport Layer (TPL) |
| 15 | Access No. | ELL-Access Counter of Meter | | 75h | |
| 16 | CI Field | 7Ah (short header) | | 7Ah | |
| 17 | Access No. | TPL Access Counter of Meter | | 75h | |
| 18 | Status | Meter status | | 00h | |
| 19 | Config Field | NNNNNNNNb | | 11h | |
| 20 | Config Field | CCZMMMMMb | | 2Ah | |
| 21 | CFE | 0VDDKKKKb | | 10h | |
| 22 | CFE | 00IIIIIOOb | | 01h | |
| 23 | MCR | Message Counter C (LSB) | | B3h | APL |
| 24 | MCR | Message Counter C | | 0Ah | |
| 25 | MCR | Message Counter C (e.g. = 2739) | | 00h | |
| 26 | MCR | Message Counter C (MSB) | | 00h | |
| 27 | DR1 | DIF (8 digit BCD) | 0Ch | C8h | APL |
| 28 | DR1 | VIF (Volume 0,01 m³) | 14h | 82h | |
| 29 | CRC 2 | | | C5h | DLL |
| 30 | CRC 2 | | | 18h | |
| 31 | DR1 | Value LSB | 27h | 03h | Application Layer (APL) |
| 32 | DR1 | Value | 04h | 8Eh | |
| 33 | DR1 | Value (= 28504,27 m³) | 85h | 22h | |
| 34 | DR1 | Value MSB | 02h | 3Bh | |
| 35 | DR2 | DIF (Time at readout; Type F) | 04h | BCh | |
| 36 | DR2 | VIF (Date, Time) | 6Dh | 10h | |
| 37 | DR2 | Value LSB | 32h | 91h | |
| 38 | DR2 | Value | 37h | CEh | |
| 39 | DR2 | Value (31.05.2008 23:50) | 1Fh | B8h | |
| 40 | DR2 | Value MSB | 15h | C0h | |
| 41 | DR3 | DIF (2 byte integer) | 02h | A1h | |
| 42 | DR3 | VIF (VIF-Extension Table FD) | FDh | 00h | |
| 43 | DR3 | VIFE (error flag) | 17h | 9Dh | |
| 44 | DR3 | Value LSB | 00h | 38h | |

| | | | | | |
|----|-------|--------------------------|-----|-----|-----|
| 45 | DR3 | Value MSB (= 0) | 00h | 8Ah | |
| 46 | MAC | Authentication tag (MSB) | | 5Ah | |
| 47 | CRC 3 | | | 5Eh | DLL |
| 48 | CRC 3 | | | 96h | |
| 49 | MAC | Authentication tag | | F7h | TPL |
| 50 | MAC | Authentication tag | | 88h | |
| 51 | MAC | Authentication tag | | 3Ah | |
| 52 | MAC | Authentication tag | | 5Bh | |
| 53 | MAC | Authentication tag | | 5Ah | |
| 54 | MAC | Authentication tag | | 7Fh | |
| 55 | MAC | Authentication tag (LSB) | | D6h | |
| 56 | CRC 4 | | | 84h | DLL |
| 57 | CRC 4 | | | D8h | |

N.3 wM-Bus Water Meter with a fragmented message and Security Profile B

This example shows a bidirectional water meter, which responds a Compact Load Profile within three fragments to a special request of the GW (e.g. Application select). Data are secured by Security profile B.

N.3.1 Input parameters

| Water meter example | |
|----------------------------|-------------|
| Medium | water |
| Manufacturer | ZRI |
| Ident number | 12345678 |
| Version | 1 |
| Current volume counter | 411,979 m3 |
| Current date | 18-Aug-2013 |
| Volume counter at due date | 383,294 m3 |
| Counter January 2012 | 345,290 m3 |
| Counter February 2012 | 347,950 m3 |
| Counter March 2012 | 351,889 m3 |
| Counter April 2012 | 355,023 m3 |
| Counter May 2012 | 358,491 m3 |
| Counter June 2012 | 362,701 m3 |
| Counter July 2012 | 365,879 m3 |
| Counter August 2012 | 371,289 m3 |
| Counter September 2012 | 373,119 m3 |
| Counter October 2012 | 375,105 m3 |
| Counter November 2012 | 377,569 m3 |
| Counter December 2012 | 381,672 m3 |

| SM-GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 33445566 |
| Version | 10 (e.g. V 1.0) |

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |

= EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F

| MAC Session Key Kmac |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C9 CD 19 FF 5A 9A AD 5A 6B BD A1 3B D2 C4 C7 AD |

| Notes |
|--|
| The selected fragment sizes have been chosen disproportionately short to obtain the clarity of example. To avoid inefficient channel use a larger fragments size should be selected. |

N.3.2 Calculate Message

To build a message following order has to be applied.

1. Derive Kenc and Kmac
- 5 2. Encrypt the message with Kenc
3. Calculate a 16 Byte CMAC with Kmac
(Note for a truncated CMAC the first 8 bytes are used only)
4. Separate message in several fragments
5. Add lower layers (AFL, ELL, DLL)
- 10 6. Calculate length and CRC

Encryption and Authentication over the Message

| unfragmented message | | Water meter example | |
|----------------------|--|---------------------|-------------|
| Field Name | Content | Bytes [hex] | Bytes [hex] |
| | | plain | AES coded |
| MCL | MLMP=1, MCMP=1, AES128-CMAC, 8 bytes | 65h | 65h |
| MCR | Message Counter (LSB) | B3h | B3h |
| MCR | Message Counter (eg. 2739) | 0Ah | 0Ah |
| MCR | Message Counter | 00h | 00h |
| MCR | Message Counter (MSB) | 00h | 00h |
| ML | Message Length (LSB) = 86 bytes | 56h | 56h |
| ML | Message Length (MSB) | 00h | 00h |
| CI Field | Short header | 7Ah | 7Ah |
| ACC | Access Counter | 05h | 05h |
| Status | Status byte | 00h | 00h |
| Config Field | NNNNPIIIb (5 blocks) | 50h | 50h |
| Config Field | CCZMMMMMb (Enc. mode 7, no signature in APL) | 07h | 07h |
| CFE | 0VDDKKKKb (dyn. Key) | 10h | 10h |
| Decr. Verify | Decryption verification | 2Fh | 30h |
| Decr. Verify | Decryption verification | 2Fh | 53h |
| DR1 | DIF storage #0, 8 digit BCD | 0Ch | 9Ah |
| DR1 | VIF volume liter | 13h | 7Ch |
| DR1 | Value current volume (LSB) | 79h | DBh |
| DR1 | Value current volume | 19h | 1Ch |
| DR1 | Value current volume | 41h | BCh |
| DR1 | Value current volume (MSB) | 00h | A6h |

Fields to be considered by the CMAC-Calculation

Fragment 1 (length = 26 bytes)

| | | | | | | | |
|-----|--|-----|-----|-----|---|--------------------------------|--------------------------------|
| DR2 | DIF storage #0, 16bit | 02h | D4h | # 1 | Fields to be considered by the CMAC-Calculation | Fragment 1 (length = 26 bytes) | |
| DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 3Ch | | | | |
| DR2 | Value current date (LSB) | B2h | B0h | | | | |
| DR2 | Value current date (MSB) | 18h | 2Dh | | | | |
| DR3 | DIF Storage #1, 8 digit BCD | 4Ch | 76h | | | | |
| DR3 | VIF volume liter | 13h | 2Ah | | | | |
| DR3 | Value due date volume (LSB) | 94h | 1Eh | | | | |
| DR3 | Value due date volume | 32h | 16h | | | | |
| DR3 | Value due date volume | 38h | 26h | # 2 | | | Fragment 2 (length = 33 bytes) |
| DR3 | Value due date volume (MSB) | 00h | FEh | | | | |
| DR4 | DIF base time, 16 bit | 82h | EFh | | | | |
| DR4 | DIFE storage #8, as required by EN13757-3, Annex I | 04h | 0Eh | | | | |
| DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | C4h | | | | |
| DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 90h | | | | |
| DR4 | Value base date (MSB) | 11h | 27h | | | | |
| DR5 | DIF base value, 8 digit BCD | 8Ch | 8Eh | | | | |
| DR5 | DIFE storage #8 | 04h | 41h | | | | |
| DR5 | VIF volume liter | 13h | A4h | | | | |
| DR5 | Value (LSB) | 90h | 8Bh | | | | |
| DR5 | Value | 52h | ADh | | | | |
| DR5 | Value | 34h | 14h | | | | |
| DR5 | Value (MSB) | 00h | 38h | | | | |
| DR6 | DIF variable length | 8Dh | BDh | | | # 3 | |
| DR6 | DIFE storage #8 | 04h | E3h | | | | |
| DR6 | VIF volume liter | 93h | 8Dh | | | | |
| DR6 | orthogonal VIFE, compact profile without registers | 1Fh | 4Dh | | | | |
| DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 11h | | | | |
| DR6 | Spacing control: signed difference, month, 6 digit BCD | FBh | 66h | | | | |
| DR6 | Spacing value: month, acc. to Annex I table I.9 | FEh | 30h | | | | |
| DR6 | Value (LSB) | 60h | 5Dh | | | | |
| DR6 | Value n-11 (February) | 26h | EFh | | | | |
| DR6 | Value (MSB) | 00h | F6h | | | | |
| DR6 | Value (LSB) | 39h | 39h | | | | |
| DR6 | Value n-10 (March) | 39h | 2Bh | | | | |
| DR6 | Value (MSB) | 00h | 6Bh | | | | |
| DR6 | Value (LSB) | 34h | E3h | | | | |
| DR6 | Value n-9 (April) | 31h | 1Ah | | | | |
| DR6 | Value (MSB) | 00h | 9Fh | | | | |
| DR6 | Value (LSB) | 68h | C8h | | | | |
| DR6 | Value n-8 (May) | 34h | 12h | # 4 | | | |
| DR6 | Value (MSB) | 00h | 75h | | | | |
| DR6 | Value (LSB) | 10h | 7Bh | | | | |
| DR6 | Value n-7 (June) | 42h | E8h | | | | |
| DR6 | Value (MSB) | 00h | 05h | | | | |
| DR6 | Value (LSB) | 78h | B4h | | | | |

| | | | | | | |
|-------|-----------------------------------|-----|-----|-----|---|--------------------------------|
| DR6 | Value n-6 (July) | 31h | 06h | # 4 | Fields to be considered by the CMAC-Calculation | Fragment 3 (length = 27 bytes) |
| DR6 | Value (MSB) | 00h | CCh | | | |
| DR6 | Value (LSB) | 10h | 3Eh | | | |
| DR6 | Value n-5 (August) | 54h | 04h | | | |
| DR6 | Value (MSB) | 00h | 57h | | | |
| DR6 | Value (LSB) | 30h | C7h | | | |
| DR6 | Value n-4 (September) | 18h | 25h | | | |
| DR6 | Value (MSB) | 00h | B4h | | | |
| DR6 | Value (LSB) | 86h | B2h | | | |
| DR6 | Value n-3 (October) | 19h | 9Bh | | | |
| DR6 | Value (MSB) | 00h | E7h | | | |
| DR6 | Value (LSB) | 64h | FEh | | | |
| DR6 | Value n-2 (November) | 24h | F0h | # 5 | | |
| DR6 | Value (MSB) | 00h | 78h | | | |
| DR6 | Value (LSB) | 03h | 77h | | | |
| DR6 | Value n-1 (December) | 41h | 71h | | | |
| DR6 | Value (MSB) | 00h | 87h | | | |
| DR7 | DIF 16bit | 02h | CCh | | | |
| DR7 | VIF from FD table | FDh | EFh | | | |
| DR7 | VIFE error flags, device specific | 17h | 8Eh | | | |
| DR7 | Value error flags byte A | 00h | 2Ah | | | |
| DR7 | Value error flags byte B | 00h | F5h | | | |
| Dummy | Idle filler | 2Fh | 1Ch | | | |
| Dummy | Idle filler | 2Fh | C7h | | | |
| Dummy | Idle filler | 2Fh | 29h | | | |
| Dummy | Idle filler | 2Fh | EFh | | | |
| Dummy | Idle filler | 2Fh | 7Ah | | | |
| MAC | MAC (MSB) | | BEh | | | |
| MAC | MAC | | 47h | | | |
| MAC | MAC | | EDh | | | |
| MAC | MAC | | 4Ch | | | |
| MAC | MAC | | 9Ch | | | |
| MAC | MAC | | C1h | | | |
| MAC | MAC | | 1Ah | | | |
| MAC | MAC | | 78h | | | |
| MAC | MAC | | 58h | | | |
| MAC | MAC | | 14h | | | |
| MAC | MAC | | 48h | | | |
| MAC | MAC | | F6h | | | |
| MAC | MAC | | 77h | | | |
| MAC | MAC | | 46h | | | |
| MAC | MAC | | 00h | | | |
| MAC | MAC (LSB) | | EEh | | | |

N.3.3 First fragment

After the REQ-UD2 the first fragment is responded. The Message length indicates the total length of the unfragmented message. The More Fragment Bit (MF=1) in the AFL informs the GW that more fragments has to be requested.

5

REQ-UD2 (wM-Bus - Fragment 1)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 7Bh | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 82h | ELL |
| 12 | CRC 1 | | 2Eh | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control | 84h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | 11h | |
| 16 | CI Field | GW -> Meter | 80h | |
| 17 | Ident.Nr. | Meter-ID | 78h | |
| 18 | Ident.Nr. | Meter-ID | 56h | |
| 19 | Ident.Nr. | Meter-ID | 34h | |
| 20 | Ident.Nr. | Meter-ID | 12h | |
| 21 | Manufr | Meter-Manufacturer-ID | 49h | |
| 22 | Manufr | Meter-Manufacturer-ID | 6Ah | |
| 23 | Version | Meter-Version | 01h | |
| 24 | Device type | Meter-Device-Type | 07h | |
| 25 | Access No. | Access Number of GW | 05h | DLL |
| 26 | Status | GW State RSSI level (-84dBm) | 17h | |
| 27 | Config Field | 0000CCRHb | 00h | |
| 28 | Config Field | BASMMMMMb (no encr.) | 00h | |
| 29 | CRC 2 | | CBh | DLL |
| 30 | CRC 2 | | 20h | |

RSP-UD (wM-Bus - Fragment1)

| Byte No | | OMS wM-Bus frame (first fragment) | MTR->GW | | Layer | |
|---------|--------------|---|-------------|-------------|-------|---|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | |
| | | | plain | AES coded | | |
| 1 | L Field | Length of data (57 bytes) | | 39h | DLL | |
| 2 | C Field | Respond user data | | 08h | | |
| 3 | M Field | Manufacturer code ZRI (LSB) | | 49h | | |
| 4 | M Field | Manufacturer code (MSB) | | 6Ah | | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | | |
| 6 | A Field | Ident No (BCD) | | 56h | | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | | |
| 9 | A Field | Version (or Generation number) | | 01h | | |
| 10 | A Field | Device type water meter | | 07h | | |
| 11 | CRC 1 | | | 14h | ELL | |
| 12 | CRC 1 | | | 64h | | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | | |
| 14 | CC Field | Communication Control (bidir.) | | 80h | | |
| 15 | Access No. | ELL-Access number of Meter | | 11h | | |
| 16 | M Field | Manufacturer code | | 3Ah | | |
| 17 | M Field | Manufacturer code | | 63h | | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | | |
| 19 | A Field | Ident No (BCD) | | 55h | | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | AFL | |
| 22 | A Field | Version (or Generation number) | | 0Ah | | |
| 23 | A Field | Device type (Communication controller) | | 31h | | |
| 24 | CI Field | Authentication & Fragmentation Layer (AFL) | | 90h | | |
| 25 | AFL | AFL Length Field | | 09h | | |
| 26 | FCL | FID, Fragment-ID | | 01h | AFL | |
| 27 | FCL | MF=1, MCLP=1, MLP=1, MCRP=1, MACP=0 | | 78h | | |
| 28 | MCL | MLMP=1, MCMP=1, AES128-CMAC, 8 bytes | | 65h | | |
| 29 | CRC 2 | | | D4h | DLL | |
| 30 | CRC 2 | | | 38h | | |
| 31 | MCR | Message Counter C (LSB) | | B3h | AFL | |
| 32 | MCR | Message Counter C (eg. 2739) | | 0Ah | | |
| 33 | MCR | Message Counter C | | 00h | | |
| 34 | MCR | Message Counter C (MSB) | | 00h | | |
| 35 | ML | Message Length (LSB) = 86 bytes | | 56h | | |
| 36 | ML | Message Length (MSB) | | 00h | | |
| 37 | CI Field | Short header | | 7Ah | TPL | |
| 38 | Access No. | TPL Access number of Meter | | 05h | | |
| 39 | Status | Status byte | | 00h | | |
| 40 | Config Field | NNNNPIIIb | | 50h | | |
| 41 | Config Field | CCZMMMMMb (encr. mode 7, no signature in APL) | | 07h | | |
| 42 | CFE | 0VDDKKKKb (dyn. Key) | | 10h | | |
| 43 | Decr. Verify | Decryption verification | 2Fh | 30h | | |
| 44 | Decr. Verify | Decryption verification | 2Fh | 53h | | |
| 45 | DR1 | DIF storage #0, 8 digit BCD | 0Ch | 9Ah | # | A |

| | | | | | | | |
|----|-------|---|-----|-----|-----|-----|--|
| 46 | DR1 | VIF volume liter | 13h | 7Ch | | | |
| 47 | CRC 3 | | | 63h | DLL | | |
| 48 | CRC 3 | | | ABh | | | |
| 49 | DR1 | Value current volume (LSB) | 79h | DBh | | | |
| 50 | DR1 | Value current volume | 19h | 1Ch | # 1 | APL | |
| 51 | DR1 | Value current volume | 41h | BCh | | | |
| 52 | DR1 | Value current volume (MSB) | 00h | A6h | | | |
| 53 | DR2 | DIF storage #0, 16bit | 02h | D4h | | | |
| 54 | DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 3Ch | | | |
| 55 | DR2 | Value current date (LSB) | B2h | B0h | | | |
| 56 | DR2 | Value current date (MSB) | 18h | 2Dh | | | |
| 57 | DR3 | DIF Storage #1, 8 digit BCD | 4Ch | 76h | | | |
| 58 | DR3 | VIF volume liter | 13h | 2Ah | | | |
| 59 | DR3 | Value due date volume (LSB) | 94h | 1Eh | | | |
| 60 | DR3 | Value due date volume | 32h | 16h | | | |
| 61 | DR3 | Value due date volume | 38h | 26h | | | |
| 62 | DR3 | Value due date volume (MSB) | 00h | FEh | | | |
| 63 | DR4 | DIF base time, 16 bit | 82h | EFh | # 2 | | |
| 64 | DR4 | DIFE storage #8, acc. to EN13757-3, Annex I | 04h | 0Eh | | | |
| 65 | CRC 4 | | | 8Eh | DLL | | |
| 66 | CRC 4 | | | 95h | | | |

N.3.4 Second fragment

REQ-UD2 (wM-Bus - Fragment 2)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (20 bytes) | 14h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 5Bh | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 47h | ELL |
| 12 | CRC 1 | | 39h | |
| 13 | CI Field | Extended Link Layer (long) | 8Eh | |
| 14 | CC Field | Communication Control | 84h | |
| 15 | Access No. | ELL-Access number of GW | 12h | |
| 16 | M Field | Manufacturer code | 49h | |
| 17 | M Field | Manufacturer code | 6Ah | |
| 18 | A Field | Ident No LSB (BCD) | 78h | |
| 19 | A Field | Ident No (BCD) | 56h | |
| 20 | A Field | Ident No (BCD) (= 12345678) | 34h | |
| 21 | A Field | Ident No MSB (BCD) | 12h | DLL |
| 22 | A Field | Version | 01h | |
| 23 | A Field | Device type water meter | 07h | |
| 24 | CRC 2 | | 53h | |
| 25 | CRC 2 | | CFh | |

RSP-UD (wM-Bus - Fragment2)

| Byte No | | OMS wM-Bus frame (intermediate fragment) | MTR->GW | | Layer | | |
|---------|------------|---|-------------|-------------|-------|-----|--|
| | | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | | |
| | | | plain | AES coded | | | |
| 1 | L Field | Length of data (57 bytes) | | 39h | DLL | | |
| 2 | C Field | Respond user data | | 08h | | | |
| 3 | M Field | Manufacturer code ZRI (LSB) | | 49h | | | |
| 4 | M Field | Manufacturer code (MSB) | | 6Ah | | | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | | | |
| 6 | A Field | Ident No (BCD) | | 56h | | | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | | | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | | | |
| 9 | A Field | Version (or Generation number) | | 01h | | | |
| 10 | A Field | Device type water meter | | 07h | | | |
| 11 | CRC 1 | | | 14h | | | |
| 12 | CRC 1 | | | 64h | | | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | ELL | | |
| 14 | CC Field | Communication Control (bidir.) | | 80h | | | |
| 15 | Access No. | ELL-Access number of Meter | | 12h | | | |
| 16 | M Field | Manufacturer code | | 3Ah | | | |
| 17 | M Field | Manufacturer code | | 63h | | | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | | | |
| 19 | A Field | Ident No (BCD) | | 55h | | | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | | | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | | | |
| 22 | A Field | Version (or Generation number) | | 0Ah | | | |
| 23 | A Field | Device type (Communication controller) | | 31h | | | |
| 24 | CI Field | AFL | | 90h | AFL | | |
| 25 | AFL | AFL Length Field | | 02h | | | |
| 26 | FCL | FID, Fragment-ID | | 02h | | | |
| 27 | FCL | MF=1, MCLP=0, MLP=0, MCRP=0, MACP=0 | | 40h | | | |
| 28 | DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | C4h | | | |
| 29 | CRC 2 | | | E9h | DLL | | |
| 30 | CRC 2 | | | B3h | | | |
| 31 | DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 90h | # 2 | APL | |
| 32 | DR4 | Value base date (MSB) | 11h | 27h | | | |
| 33 | DR5 | DIF base value, 8 digit BCD | 8Ch | 8Eh | | | |
| 34 | DR5 | DIFE storage #8 | 04h | 41h | | | |
| 35 | DR5 | VIF volume liter | 13h | A4h | | | |
| 36 | DR5 | Value (LSB) | 90h | 8Bh | | | |
| 37 | DR5 | Value | 52h | ADh | | | |
| 38 | DR5 | Value | 34h | 14h | | | |
| 39 | DR5 | Value (MSB) | 00h | 38h | | | |
| 40 | DR6 | DIF variable length | 8Dh | BDh | | | |
| 41 | DR6 | DIFE storage #8 | 04h | E3h | | | |
| 42 | DR6 | VIF volume liter | 93h | 8Dh | | | |
| 43 | DR6 | orth. VIFE, compact profile without registers | 1Fh | 4Dh | # 3 | | |
| 44 | DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 11h | | | |
| 45 | DR6 | Spacing control: signed diff., month, 6 digit BCD | FBh | 66h | | | |

| | | | | | | |
|----|-------|---|-----|-----|-----|-----|
| 46 | DR6 | Spacing value: month, acc. to Annex I table I.9 | FEh | 30h | | |
| 47 | CRC 3 | | | 21h | DLL | |
| 48 | CRC 3 | | | 5Fh | | |
| 49 | DR6 | Value (LSB) | 60h | 5Dh | | |
| 50 | DR6 | Value n-11 (February) | 26h | EFh | # 3 | APL |
| 51 | DR6 | Value (MSB) | 00h | F6h | | |
| 52 | DR6 | Value (LSB) | 39h | 39h | | |
| 53 | DR6 | Value n-10 (March) | 39h | 2Bh | | |
| 54 | DR6 | Value (MSB) | 00h | 6Bh | | |
| 55 | DR6 | Value (LSB) | 34h | E3h | | |
| 56 | DR6 | Value n-9 (April) | 31h | 1Ah | | |
| 57 | DR6 | Value (MSB) | 00h | 9Fh | | |
| 58 | DR6 | Value (LSB) | 68h | C8h | | |
| 59 | DR6 | Value n-8 (May) | 34h | 12h | | |
| 60 | DR6 | Value (MSB) | 00h | 75h | # 4 | |
| 61 | DR6 | Value (LSB) | 10h | 7Bh | | |
| 62 | DR6 | Value n-7 (June) | 42h | E8h | | |
| 63 | DR6 | Value (MSB) | 00h | 05h | | |
| 64 | DR6 | Value (LSB) | 78h | B4h | | |
| 65 | CRC 4 | | | B1h | DLL | |
| 66 | CRC 4 | | | 86h | | |

N.3.5 Last fragment

The clear More Fragment Bit indicates the last Fragment. This datagram contains also the CMAC of the message.

REQ-UD2 (wM-Bus - Fragment 3)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (20 bytes) | 14h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 7Bh | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | B6h | ELL |
| 12 | CRC 1 | | 0Ch | |
| 13 | CI Field | Extended Link Layer (long) | 8Eh | |
| 14 | CC Field | Communication Control | 84h | |
| 15 | Access No. | ELL-Access number of GW | 13h | |
| 16 | M Field | Manufacturer code | 49h | |
| 17 | M Field | Manufacturer code | 6Ah | |
| 18 | A Field | Ident No LSB (BCD) | 78h | |
| 19 | A Field | Ident No (BCD) | 56h | |
| 20 | A Field | Ident No (BCD) (= 12345678) | 34h | |
| 21 | A Field | Ident No MSB (BCD) | 12h | DLL |
| 22 | A Field | Version | 01h | |
| 23 | A Field | Device type water meter | 07h | |
| 24 | CRC 2 | | C3h | |
| 25 | CRC 2 | | 1Fh | |

RSP-UD (wM-Bus - Fragment3)

| Byte No | OMS wM-Bus frame (last fragment) | | MTR->GW | | Layer |
|---------|----------------------------------|--|-------------|-------------|------------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (59 bytes) | | 3Bh | DLL |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code ZRI (LSB) | | 49h | |
| 4 | M Field | Manufacturer code (MSB) | | 6Ah | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 01h | |
| 10 | A Field | Device type water meter | | 07h | |
| 11 | CRC 1 | | | 63h | ELL |
| 12 | CRC 1 | | | 42h | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | |
| 14 | CC Field | Communication Control (bidir.) | | 80h | |
| 15 | Access No. | ELL-Access number of Meter | | 13h | |
| 16 | M Field | Manufacturer code | | 3Ah | |
| 17 | M Field | Manufacturer code | | 63h | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | |
| 19 | A Field | Ident No (BCD) | | 55h | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | AFL |
| 22 | A Field | Version (or Generation number) | | 0Ah | |
| 23 | A Field | Device type (Communication controller) | | 31h | |
| 24 | CI Field | AFL | | 90h | |
| 25 | AFL | AFL Length Field | | 0Ah | |
| 26 | FCL | FID, Fragment-ID | | 03h | |
| 27 | FCL | MF=0, MCLP=0, MLP=0, MCRP=0, MACP=1 | | 04h | |
| 28 | MAC | MAC (MSB) | | BEh | |
| 29 | CRC 2 | | | 41h | |
| 30 | CRC 2 | | | AFh | DLL |
| 31 | MAC | MAC | | 47h | AFL |
| 32 | MAC | MAC | | EDh | |
| 33 | MAC | MAC | | 4Ch | |
| 34 | MAC | MAC | | 9Ch | |
| 35 | MAC | MAC | | C1h | |
| 36 | MAC | MAC | | 1Ah | |
| 37 | MAC | MAC (LSB) | | 78h | |
| 38 | DR6 | Value n-6 (July) | 31h | 06h | # 4 APL |
| 39 | DR6 | Value (MSB) | 00h | CCh | |
| 40 | DR6 | Value (LSB) | 10h | 3Eh | |
| 41 | DR6 | Value n-5 (August) | 54h | 04h | |
| 42 | DR6 | Value (MSB) | 00h | 57h | |
| 43 | DR6 | Value (LSB) | 30h | C7h | |
| 44 | DR6 | Value n-4 (September) | 18h | 25h | |
| 45 | DR6 | Value (MSB) | 00h | B4h | |
| 46 | DR6 | Value (LSB) | 86h | B2h | |

| | | | | | | |
|----|-------|-----------------------------------|-----|-----|-----|-----|
| 47 | CRC 3 | | | CDh | DLL | |
| 48 | CRC 3 | | | 8Ch | | |
| 49 | DR6 | Value n-3 (October) | 19h | 9Bh | # 4 | |
| 50 | DR6 | Value (MSB) | 00h | E7h | | |
| 51 | DR6 | Value (LSB) | 64h | FEh | # 5 | APL |
| 52 | DR6 | Value n-2 (November) | 24h | F0h | | |
| 53 | DR6 | Value (MSB) | 00h | 78h | | |
| 54 | DR6 | Value (LSB) | 03h | 77h | | |
| 55 | DR6 | Value n-1 (December) | 41h | 71h | | |
| 56 | DR6 | Value (MSB) | 00h | 87h | | |
| 57 | DR7 | DIF 16bit | 02h | CCh | | |
| 58 | DR7 | VIF from FD table | FDh | EFh | | |
| 59 | DR7 | VIFE error flags, device specific | 17h | 8Eh | | |
| 60 | DR7 | Value error flags byte A | 00h | 2Ah | | |
| 61 | DR7 | Value error flags byte B | 00h | F5h | | |
| 62 | Dummy | Idle filler | 2Fh | 1Ch | # 5 | APL |
| 63 | Dummy | Idle filler | 2Fh | C7h | | |
| 64 | Dummy | Idle filler | 2Fh | 29h | | |
| 65 | CRC 4 | | | 95h | DLL | |
| 66 | CRC 4 | | | 83h | | |
| 67 | Dummy | Idle filler | 2Fh | EFh | # 5 | APL |
| 68 | Dummy | Idle filler | 2Fh | 7Ah | | |
| 69 | CRC 5 | | | C7h | DLL | |
| 70 | CRC 5 | | | F2h | | |

N.4 M-Bus Water Meter with a fragmented message and Security Profile A

5 This example shows a wired M-Bus water meter, which responds a Compact Load Profile within three fragments to a special request of the GW (e.g. Application select). Data are secured by Security profile A.

N.4.1 Input parameters

| Water meter example | |
|----------------------------|-------------|
| Primary address | 3 |
| Medium | water |
| Manufacturer | QDS |
| Ident number | 12345678 |
| Version | 16 |
| Current volume counter | 411,979 m3 |
| Current date | 18-Aug-2013 |
| Volume counter at due date | 383,294 m3 |
| Counter January 2012 | 345,290 m3 |
| Counter February 2012 | 347,950 m3 |
| Counter March 2012 | 351,889 m3 |
| Counter April 2012 | 355,023 m3 |
| Counter May 2012 | 358,491 m3 |
| Counter June 2012 | 362,701 m3 |
| Counter July 2012 | 365,879 m3 |
| Counter August 2012 | 371,289 m3 |
| Counter September 2012 | 373,119 m3 |
| Counter October 2012 | 375,105 m3 |
| Counter November 2012 | 377,569 m3 |
| Counter December 2012 | 381,672 m3 |

| SM-GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 33445566 |
| Version | 10 (e.g. V 1.0) |

| AES Key according to FIPS 197 (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| AES CBC Initial Vector according to FIPS 197 (LSB first): |
|---|
| = M Field + A Field + 8 bytes Acces No |
| = 93 44 78 56 34 12 10 07 05 05 05 05 05 05 05 05 |

| Notes |
|-------|
|-------|

The selected fragment sizes have been chosen disproportionately short to obtain the clarity of example. To avoid inefficient channel use a larger fragments size should be selected.

N.4.2 Calculate Message

To build a message following order has to be applied.

1. Separate message in several fragments
2. Add lower layers (AFL, DLL)
3. Calculate length and CRC

5

Encryption over the Message

| unfragmented message | | Water meter example | |
|----------------------|--|---------------------|-------------|
| Field Name | Content | Bytes [hex] | Bytes [hex] |
| | | plain | AES coded |
| MCL | MLMP=1, MCMP=0, AT=00; ATO=00 | 40h | 40h |
| ML | Message Length (LSB) = 93 bytes | 5Dh | 5Dh |
| ML | Message Length (MSB) | 00h | 00h |
| CI Field | 72h (long header) | 72h | 72h |
| Ident.Nr. | Ident No LSB (BCD) | 78h | 78h |
| Ident.Nr. | Ident No (BCD) | 56h | 56h |
| Ident.Nr. | Ident No (BCD) | 34h | 34h |
| Ident.Nr. | Ident No MSB (BCD) of meter | 12h | 12h |
| Manufr | Manufacturer code | 93h | 93h |
| Manufr | Manufacturer code | 44h | 44h |
| Version | Version (or Generation number) | 10h | 10h |
| Device type | Device type (Medium = Water) | 07h | 07h |
| ACC | Access Counter | 05h | 05h |
| Status | Status byte | 00h | 00h |
| Config Field | NNNNCCRhb (5 blocks) | 00h | 50h |
| Config Field | BASMMMMMb (Enc. mode 5, no signature in APL) | 00h | 05h |
| Decr. Verify | Decryption verification | 2Fh | 28h |
| Decr. Verify | Decryption verification | 2Fh | FCb |
| DR1 | DIF storage #0, 8 digit BCD | 0Ch | B7h |
| DR1 | VIF volume liter | 13h | 63h |
| DR1 | Value current volume (LSB) | 79h | E5h |
| DR1 | Value current volume | 19h | 1Bh |
| DR1 | Value current volume | 41h | 4Ah |
| DR1 | Value current volume (MSB) | 00h | 6Dh |
| DR2 | DIF storage #0, 16bit | 02h | 4Fh |
| DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | DDh |
| DR2 | Value current date (LSB) | B2h | F2h |
| DR2 | Value current date (MSB) | 18h | EEh |
| DR3 | DIF Storage #1, 8 digit BCD | 4Ch | A9h |
| DR3 | VIF volume liter | 13h | 06h |
| DR3 | Value due date volume (LSB) | 94h | F6h |
| DR3 | Value due date volume | 32h | 1Eh |
| DR3 | Value due date volume | 38h | D0h |
| DR3 | Value due date volume (MSB) | 00h | DAh |
| DR4 | DIF base time, 16 bit | 82h | 7Ah |

Total Message

Fragment 1 (length = 36 bytes)

1

1

2

Total Message

| | | | | | | |
|-----|--|-----|-----|-----|---------------|--------------------------------|
| DR4 | DIFE storage #8, as required by EN13757-3, Annex I | 04h | B2h | # 3 | Total Message | Fragment 2 (length = 33 bytes) |
| DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 97h | | | |
| DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 87h | | | |
| DR4 | Value base date (MSB) | 11h | E1h | | | |
| DR5 | DIF base value, 8 digit BCD | 8Ch | B2h | | | |
| DR5 | DIFE storage #8 | 04h | B5h | | | |
| DR5 | VIF volume liter | 13h | E3h | | | |
| DR5 | Value (LSB) | 90h | 4Eh | | | |
| DR5 | Value | 52h | F3h | | | |
| DR5 | Value | 34h | C5h | | | |
| DR5 | Value (MSB) | 00h | 90h | | | |
| DR6 | DIF variable length | 8Dh | 3Eh | | | |
| DR6 | DIFE storage #8 | 04h | 3Ah | | | |
| DR6 | VIF volume liter | 93h | E4h | | | |
| DR6 | orthogonal VIFE, compact profile without registers | 1Fh | 24h | | | |
| DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 27h | | | |
| DR6 | Spacing control: signed difference, month, 6 digit BCD | FBh | CDh | | | |
| DR6 | Spacing value: month, acc. to Annex I table I.9 | FEh | A9h | | | |
| DR6 | Value (LSB) | 60h | DBh | | | |
| DR6 | Value n-11 (February) | 26h | 24h | | | |
| DR6 | Value (MSB) | 00h | 07h | | | |
| DR6 | Value (LSB) | 39h | FAh | | | |
| DR6 | Value n-10 (March) | 39h | 81h | | | |
| DR6 | Value (MSB) | 00h | 31h | | | |
| DR6 | Value (LSB) | 34h | EFh | | | |
| DR6 | Value n-9 (April) | 31h | B2h | | | |
| DR6 | Value (MSB) | 00h | 25h | | | |
| DR6 | Value (LSB) | 68h | 97h | | | |
| DR6 | Value n-8 (May) | 34h | 98h | | | |
| DR6 | Value (MSB) | 00h | E2h | | | |
| DR6 | Value (LSB) | 10h | B7h | | | |
| DR6 | Value n-7 (June) | 42h | 9Bh | | | |
| DR6 | Value (MSB) | 00h | AAh | | | |
| DR6 | Value (LSB) | 78h | D1h | | | |
| DR6 | Value n-6 (July) | 31h | AFh | | | |
| DR6 | Value (MSB) | 00h | 89h | | | |
| DR6 | Value (LSB) | 10h | B7h | | | |
| DR6 | Value n-5 (August) | 54h | 50h | | | |
| DR6 | Value (MSB) | 00h | 6Fh | | | |
| DR6 | Value (LSB) | 30h | EBh | | | |
| DR6 | Value n-4 (September) | 18h | 16h | | | |
| DR6 | Value (MSB) | 00h | C2h | | | |
| DR6 | Value (LSB) | 86h | 2Bh | | | |
| DR6 | Value n-3 (October) | 19h | 15h | | | |
| DR6 | Value (MSB) | 00h | 1Bh | | | |
| DR6 | Value (LSB) | 64h | 35h | | | |
| DR6 | Value n-2 (November) | 24h | 37h | | | |
| DR6 | Value (MSB) | 00h | FAh | | | |
| DR6 | Value (LSB) | 03h | 27h | | | |
| DR6 | Value n-1 (December) | 41h | 2Dh | | | |
| DR6 | Value (MSB) | 00h | 55h | | | |

| | | | | | | |
|-------|-----------------------------------|-----|-----|--|--|--|
| DR7 | DIF 16bit | 02h | 22h | | | |
| DR7 | VIF from FD table | FDh | 75h | | | |
| DR7 | VIFE error flags, device specific | 17h | 62h | | | |
| DR7 | Value error flags byte A | 00h | C6h | | | |
| DR7 | Value error flags byte B | 00h | 3Fh | | | |
| Dummy | Idle filler | 2Fh | 6Ch | | | |
| Dummy | Idle filler | 2Fh | 40h | | | |
| Dummy | Idle filler | 2Fh | 83h | | | |
| Dummy | Idle filler | 2Fh | 83h | | | |
| Dummy | Idle filler | 2Fh | EBh | | | |

N.4.3 First fragment

After the REQ-UD2 the first fragment is responded. The Message length indicates to total length of the unfragmented message. The More Fragment Bit in the AFL informs the GW that more fragments has to be requested.

5

REQ-UD2 (M-Bus - Fragment 1)

| Byte No | OMS M-Bus frame | | GW -> MTR | Layer |
|---------|-----------------|---------------------------------|-------------|-------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | Start | Start byte | 10h | DLL |
| 2 | C Field | Respond user data | 7Bh | |
| 3 | A Field | Addressing by secondary address | FDh | |
| 4 | Checksum | | 78h | |
| 5 | Stop | Stop byte | 16h | |

RSP-UD (M-Bus - Fragment1)

| Byte No | OMS M-Bus frame (first fragment) | | MTR->GW | | Layer |
|---------|----------------------------------|---|-------------|-------------|-------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| | | | | | |
| 1 | Start | Start byte | | 68h | DLL |
| 2 | L Field | Length of data (42 bytes) | | 2Ah | |
| 3 | L Field | Length of data (42 bytes) | | 2Ah | |
| 4 | Start | Start byte | | 68h | |
| 5 | C Field | Respond user data | | 08h | |
| 6 | A Field | Addressing by secondary address | | 03h | |
| 7 | CI Field | Authentification & Fragmentation Layer (AFL) | | 90h | AFL |
| 8 | AFL | AFL Length Field | | 05h | |
| 9 | FCL | FID, Fragment-ID | | 01h | |
| 10 | FCL | MF=1, MCLP=1, MLP=1, MCRP=0, MACP=0 | | 70h | |
| 11 | MCL | MLMP=1, MCMP=0, AT=00; ATO=00 | | 40h | |
| 12 | ML | Message Length (LSB) = 93 bytes | | 5Dh | |
| 13 | ML | Message Length (MSB) | | 00h | |
| 14 | CI Field | 72h (long header) | | 72h | TPL |
| 15 | Ident.Nr. | Ident No LSB (BCD) | | 78h | |
| 16 | Ident.Nr. | Ident No (BCD) | | 56h | |
| 17 | Ident.Nr. | Ident No (BCD) | | 34h | |
| 18 | Ident.Nr. | Ident No MSB (BCD) of meter | | 12h | |
| 19 | Manufr | Manufacturer code | | 93h | |
| 20 | Manufr | Manufacturer code | | 44h | |
| 21 | Version | Version (or Generation number) | | 10h | |
| 22 | Device type | Device type (Medium = Water) | | 07h | |
| 23 | Access No. | TPL Access number of Meter | | 05h | |
| 24 | Status | Status byte | | 00h | |
| 25 | Config Field | NNNNCCRHb (5 blocks) | | 50h | |
| 26 | Config Field | BASMMMMMb (encr. mode 5, no signature in APL) | | 05h | |
| 27 | Decr. Verify | Decryption verification | 2Fh | 28h | |
| 28 | Decr. Verify | Decryption verification | 2Fh | FC | |

| | | | | | | |
|----|----------|---|-----|-----|-----|-----|
| 29 | DR1 | DIF storage #0, 8 digit BCD | 0Ch | B7h | # 1 | APL |
| 30 | DR1 | VIF volume liter | 13h | 63h | | |
| 31 | DR1 | Value current volume (LSB) | 79h | E5h | | |
| 32 | DR1 | Value current volume | 19h | 1Bh | | |
| 33 | DR1 | Value current volume | 41h | 4Ah | | |
| 34 | DR1 | Value current volume (MSB) | 00h | 6Dh | | |
| 35 | DR2 | DIF storage #0, 16bit | 02h | 4Fh | | |
| 36 | DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | DDh | | |
| 37 | DR2 | Value current date (LSB) | B2h | F2h | | |
| 38 | DR2 | Value current date (MSB) | 18h | EEh | | |
| 39 | DR3 | DIF Storage #1, 8 digit BCD | 4Ch | A9h | | |
| 40 | DR3 | VIF volume liter | 13h | 06h | | |
| 41 | DR3 | Value due date volume (LSB) | 94h | F6h | | |
| 42 | DR3 | Value due date volume | 32h | 1Eh | | |
| 43 | DR3 | Value due date volume | 38h | D0h | # 2 | |
| 44 | DR3 | Value due date volume (MSB) | 00h | DAh | | |
| 45 | DR4 | DIF base time, 16 bit | 82h | 7Ah | | |
| 46 | DR4 | DIFE storage #8, acc. to EN13757-3, Annex I | 04h | B2h | | |
| 47 | Checksum | | | 16h | DLL | |
| 48 | Stop | Stop byte | | 16h | | |

N.4.4 Second fragment

REQ-UD2 (wM-Bus - Fragment 2)

| Byte No | OMS M-Bus frame | | GW -> MTR | Layer |
|---------|-----------------|---------------------------------|-------------|-------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | Start | Start byte | 10h | DLL |
| 2 | C Field | Respond user data | 5Bh | |
| 3 | A Field | Addressing by secondary address | FDh | |
| 4 | Checksum | | 58h | |
| 5 | Stop | Stop byte | 16h | |

RSP-UD (M-Bus - Fragment2)

| Byte No | | OMS M-Bus frame (intermediate fragment) | MTR->GW | | Layer | |
|---------|------------|---|-------------|-------------|-------|-----|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | |
| | | | plain | AES coded | | |
| 1 | Start | Start byte | | 68h | DLL | |
| 2 | L Field | Length of data (39 bytes) | | 27h | | |
| 3 | L Field | Length of data (39 bytes) | | 27h | | |
| 4 | Start | Start byte | | 68h | | |
| 5 | C Field | Respond user data | | 08h | | |
| 6 | A Field | Addressing by secondary adress | | 03h | | |
| 7 | CI Field | AFL | | 90h | AFL | |
| 8 | AFL | AFL Length Field | | 02h | | |
| 9 | FCL | FID, Fragment-ID | | 02h | | |
| 10 | FCL | MF=1, MCLP=0, MLP=0, MCRP=0, MACP=0 | | 40h | | |
| 11 | DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 97h | # 2 | APL |
| 12 | DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 87h | | |
| 13 | DR4 | Value base date (MSB) | 11h | E1h | | |
| 14 | DR5 | DIF base value, 8 digit BCD | 8Ch | B2h | | |
| 15 | DR5 | DIFE storage #8 | 04h | B5h | | |
| 16 | DR5 | VIF volume liter | 13h | E3h | | |
| 17 | DR5 | Value (LSB) | 90h | 4Eh | | |
| 18 | DR5 | Value | 52h | F3h | | |
| 19 | DR5 | Value | 34h | C5h | | |
| 20 | DR5 | Value (MSB) | 00h | 90h | | |
| 21 | DR6 | DIF variable length | 8Dh | 3Eh | # 3 | |
| 22 | DR6 | DIFE storage #8 | 04h | 3Ah | | |
| 23 | DR6 | VIF volume liter | 93h | E4h | | |
| 24 | DR6 | orth. VIFE, compact profile without registers | 1Fh | 24h | | |
| 25 | DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 27h | | |
| 26 | DR6 | Spacing control: signed diff., month, 6 digit BCD | FBh | CDh | | |
| 27 | DR6 | Spacing value: month, acc. to Annex I table I.9 | FEh | A9h | | |
| 28 | DR6 | Value (LSB) | 60h | DBh | | |
| 29 | DR6 | Value n-11 (February) | 26h | 24h | | |
| 30 | DR6 | Value (MSB) | 00h | 07h | | |
| 31 | DR6 | Value (LSB) | 39h | FAh | | |
| 32 | DR6 | Value n-10 (March) | 39h | 81h | | |

| | | | | | | |
|----|----------|-------------------|-----|-----|-----|--|
| 33 | DR6 | Value (MSB) | 00h | 31h | | |
| 34 | DR6 | Value (LSB) | 34h | EFh | | |
| 35 | DR6 | Value n-9 (April) | 31h | B2h | | |
| 36 | DR6 | Value (MSB) | 00h | 25h | | |
| 37 | DR6 | Value (LSB) | 68h | 97h | | |
| 38 | DR6 | Value n-8 (May) | 34h | 98h | | |
| 39 | DR6 | Value (MSB) | 00h | E2h | # 4 | |
| 40 | DR6 | Value (LSB) | 10h | B7h | | |
| 41 | DR6 | Value n-7 (June) | 42h | 9Bh | | |
| 42 | DR6 | Value (MSB) | 00h | AAh | | |
| 43 | DR6 | Value (LSB) | 78h | D1h | | |
| 44 | Checksum | | | 31 | DLL | |
| 45 | Stop | Stop byte | | 16h | | |

N.4.5 Last fragment

The clear More Fragment Bit indicates the last Fragment.

REQ-UD2 (wM-Bus - Fragment 3)

| Byte No | OMS M-Bus frame | | GW -> MTR | Layer |
|---------|-----------------|---------------------------------|-------------|-------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | Start | Start byte | 10h | DLL |
| 2 | C Field | Respond user data | 7Bh | |
| 3 | A Field | Addressing by secondary address | FDh | |
| 4 | Checksum | | 78h | |
| 5 | Stop | Stop byte | 16h | |

RSP-UD (M-Bus - Fragment3)

| Byte No | | OMS M-Bus frame (last fragment) | MTR->GW | | Layer |
|---------|------------|-------------------------------------|-------------|-------------|-------|
| | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | Start | Start byte | | 68h | DLL |
| 2 | L Field | Length of data (33 bytes) | | 21h | |
| 3 | L Field | Length of data (33 bytes) | | 21h | |
| 4 | Start | Start byte | | 68h | |
| 5 | C Field | Respond user data | | 08h | |
| 6 | A Field | Addressing by secondary address | | 03h | |
| 7 | CI Field | AFL | | 90h | AFL |
| 8 | AFL L | AFL Length Field | | 02h | |
| 9 | FCL | FID, Fragment-ID | | 03h | |
| 10 | FCL | MF=0, MCLP=0, MLP=0, MCRP=0, MACP=0 | | 00h | |
| 11 | DR6 | Value n-6 (July) | 31h | AFh | APL |
| 12 | DR6 | Value (MSB) | 00h | 89h | |
| 13 | DR6 | Value (LSB) | 10h | B7h | |
| 14 | DR6 | Value n-5 (August) | 54h | 50h | |
| 15 | DR6 | Value (MSB) | 00h | 6Fh | |
| 16 | DR6 | Value (LSB) | 30h | EBh | |
| 17 | DR6 | Value n-4 (September) | 18h | 16h | |
| 18 | DR6 | Value (MSB) | 00h | C2h | |
| 19 | DR6 | Value (LSB) | 86h | 2Bh | |
| 20 | DR6 | Value n-3 (October) | 19h | 15h | |
| 21 | DR6 | Value (MSB) | 00h | 1Bh | |
| 22 | DR6 | Value (LSB) | 64h | 35h | |
| 23 | DR6 | Value n-2 (November) | 24h | 37h | |
| 24 | DR6 | Value (MSB) | 00h | FAh | |
| 25 | DR6 | Value (LSB) | 03h | 27h | |
| 26 | DR6 | Value n-1 (December) | 41h | 2Dh | |
| 27 | DR6 | Value (MSB) | 00h | 55h | |
| 28 | DR7 | DIF 16bit | 02h | 22h | |

| | | | | | | |
|----|----------|-----------------------------------|-----|-----|-----|-----|
| 29 | DR7 | VIF from FD table | FDh | 75h | #5 | APL |
| 30 | DR7 | VIFE error flags, device specific | 17h | 62h | | |
| 31 | DR7 | Value error flags byte A | 00h | C6h | | |
| 32 | DR7 | Value error flags byte B | 00h | 3Fh | | |
| 33 | Dummy | Idle filler | 2Fh | 6Ch | | |
| 34 | Dummy | Idle filler | 2Fh | 40h | | |
| 35 | Dummy | Idle filler | 2Fh | 83h | | |
| 36 | Dummy | Idle filler | 2Fh | 83h | | |
| 37 | Dummy | Idle filler | 2Fh | EBh | | |
| 38 | Checksum | | | 16h | DLL | |
| 39 | Stop | Stop byte | | 16h | | |

N.5 wM-Bus Water Meter with a fragmented message and Security Profile D

5 This example shows a bidirectional water meter, which responds a Compact Load Profile within three fragments to a special request of the GW (e.g. Application select). Data are secured by Security profile D.

N.5.1 Input parameters

| Water meter example | |
|----------------------------|-------------|
| Medium | water |
| Manufacturer | OMG (3DA7h) |
| Ident number | 12345678 |
| Version | 1 |
| Current volume counter | 411,979 m3 |
| Current date | 18-Aug-2013 |
| Volume counter at due date | 383,294 m3 |
| Counter January 2012 | 345,290 m3 |
| Counter February 2012 | 347,950 m3 |
| Counter March 2012 | 351,889 m3 |
| Counter April 2012 | 355,023 m3 |
| Counter May 2012 | 358,491 m3 |
| Counter June 2012 | 362,701 m3 |
| Counter July 2012 | 365,879 m3 |
| Counter August 2012 | 371,289 m3 |
| Counter September 2012 | 373,119 m3 |
| Counter October 2012 | 375,105 m3 |
| Counter November 2012 | 377,569 m3 |
| Counter December 2012 | 381,672 m3 |

| SM-GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633Ah) |
| Ident number | 33445566 |
| Version | 10 (e.g. V 1.0) |

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |

= EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F

| Nonce |
|--|
| = A7 3D 78 56 34 12 01 07 00 00 00 0A B3 |

| Associated data (7 bytes) |
|---------------------------|
| = 7A 05 00 49 2A 10 01 |

N.5.2 Calculate Message

To build a message following order has to be applied.

1. Derive Kenc and Kmac
- 5 2. Encrypt the message with Kenc
3. Calculate a 16 Byte CMAC with Kmac
(Note for a truncated CMAC the first 8 bytes are used only)
4. Separate message in several fragments
5. Add lower layers (AFL, ELL, DLL)
- 10 6. Calculate length and CRC

Encryption and Authentication over the Message

| | unfragmented message | Water meter example | | |
|--------------|---|---------------------|-------------|----------------------------|
| | | Bytes [hex] | Bytes [hex] | |
| Field Name | Content | plain | AES coded | |
| MCL | MLMP=1 | | 40h | |
| ML | Message Length (LSB) = 92 bytes | | 5Ch | |
| ML | Message Length (MSB) | | 00h | |
| CI Field | Short header | | 7Ah | Fields to be |
| ACC | Access Counter | | 05h | |
| Status | Status byte | | 00h | |
| Config Field | NNNNNNNNb 73 Bytes | | 49h | |
| Config Field | CCZMMMMMb | | 2Ah | |
| CFE | 0VDDKKKKb | | 10h | |
| CFE | 00IIIIIOOb | | 01h | |
| MCR | Message Counter C (LSB) | | B3h | |
| MCR | Message Counter C | | 0Ah | |
| MCR | Message Counter C (e.g. = 2739) | | 00h | |
| MCR | Message Counter C (MSB) | | 00h | |
| DR1 | DIF storage #0, 8 digit BCD | 0Ch | 02h | Fields to be considered by |
| DR1 | VIF volume liter | 13h | B1h | |
| DR1 | Value current volume (LSB) | 79h | 2Bh | |
| DR1 | Value current volume | 19h | 47h | |
| DR1 | Value current volume | 41h | A6h | |
| DR1 | Value current volume (MSB) | 00h | B8h | |
| DR2 | DIF storage #0, 16bit | 02h | 9Ch | |
| DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | F8h | |
| DR2 | Value current date (LSB) | B2h | F5h | |

Fragment 1 (length = 29 bytes)

| | | | | |
|-----|--|-----|-----|--------------------------------|
| DR2 | Value current date (MSB) | 18h | 4Dh | Fragment 2 (length = 33 bytes) |
| DR3 | DIF Storage #1, 8 digit BCD | 4Ch | E4h | |
| DR3 | VIF volume liter | 13h | BFh | |
| DR3 | Value due date volume (LSB) | 94h | C8h | |
| DR3 | Value due date volume | 32h | 9Ch | |
| DR3 | Value due date volume | 38h | F8h | |
| DR3 | Value due date volume (MSB) | 00h | 36h | |
| DR4 | DIF base time, 16 bit | 82h | 12h | |
| DR4 | DIFE storage #8, as required by EN13757-3, Annex F | 04h | 08h | |
| DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 85h | |
| DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 29h | |
| DR4 | Value base date (MSB) | 11h | 0Bh | |
| DR5 | DIF base value, 8 digit BCD | 8Ch | 67h | |
| DR5 | DIFE storage #8 | 04h | 5Fh | |
| DR5 | VIF volume liter | 13h | E6h | |
| DR5 | Value (LSB) | 90h | DBh | |
| DR5 | Value | 52h | 08h | |
| DR5 | Value | 34h | EEh | |
| DR5 | Value (MSB) | 00h | 8Bh | |
| DR6 | DIF variable length | 8Dh | 55h | |
| DR6 | DIFE storage #8 | 04h | 81h | |
| DR6 | VIF volume liter | 93h | 29h | |
| DR6 | orthogonal VIFE, compact profile without registers | 1Fh | 89h | |
| DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 10h | |
| DR6 | Spacing control: signed difference, month, 6 digit BCD | FBh | 8Bh | |
| DR6 | Spacing value: month, see EN13757-3, Annex F, Tab.F.8 | FEh | 08h | |
| DR6 | Value (LSB) | 60h | 13h | |
| DR6 | Value n-11 (February) | 26h | 1Ch | |
| DR6 | Value (MSB) | 00h | EFh | |
| DR6 | Value (LSB) | 39h | 21h | |
| DR6 | Value n-10 (March) | 39h | 45h | |
| DR6 | Value (MSB) | 00h | ACh | |
| DR6 | Value (LSB) | 34h | 23h | |
| DR6 | Value n-9 (April) | 31h | 2Ch | |
| DR6 | Value (MSB) | 00h | 9Ch | |
| DR6 | Value (LSB) | 68h | E2h | |
| DR6 | Value n-8 (May) | 34h | 43h | |
| DR6 | Value (MSB) | 00h | 50h | |
| DR6 | Value (LSB) | 10h | 51h | |
| DR6 | Value n-7 (June) | 42h | 81h | |
| DR6 | Value (MSB) | 00h | F0h | |
| DR6 | Value (LSB) | 78h | 12h | |

| | | | | |
|-----|-----------------------------------|-----|-----|-------------------------------|
| DR6 | Value n-6 (July) | 31h | 94h | Fragment 3 (length =30 bytes) |
| DR6 | Value (MSB) | 00h | C5h | |
| DR6 | Value (LSB) | 10h | 2Ah | |
| DR6 | Value n-5 (August) | 54h | B9h | |
| DR6 | Value (MSB) | 00h | 8Ah | |
| DR6 | Value (LSB) | 30h | 7Eh | |
| DR6 | Value n-4 (September) | 18h | C5h | |
| DR6 | Value (MSB) | 00h | 1Dh | |
| DR6 | Value (LSB) | 86h | B7h | |
| DR6 | Value n-3 (October) | 19h | CDh | |
| DR6 | Value (MSB) | 00h | C0h | |
| DR6 | Value (LSB) | 64h | 2Fh | |
| DR6 | Value n-2 (November) | 24h | 51h | |
| DR6 | Value (MSB) | 00h | E1h | |
| DR6 | Value (LSB) | 03h | 7Ah | |
| DR6 | Value n-1 (December) | 41h | ABh | |
| DR6 | Value (MSB) | 00h | 87h | |
| DR7 | DIF 16bit | 02h | C6h | |
| DR7 | VIF from FD table | FDh | B2h | |
| DR7 | VIFE error flags, device specific | 17h | 59h | |
| DR7 | Value error flags byte (LSB) | 00h | D2h | |
| DR7 | Value error flags byte (MSB) | 00h | 8Bh | |
| MAC | Authentication tag (MSB)) | | E4h | |
| MAC | Authentication tag | | 13h | |
| MAC | Authentication tag | | 70h | |
| MAC | Authentication tag | | F8h | |
| MAC | Authentication tag | | 74h | |
| MAC | Authentication tag | | 1Bh | |
| MAC | Authentication tag | | 9Dh | |
| MAC | Authentication tag (LSB) | | 99h | |

N.5.3 First fragment

After the REQ-UD2 the first fragment is responded. The Message length indicates the total length of the unfragmented message. The More Fragment Bit (MF=1) in the AFL informs the GW that more fragments has to be requested.

5

REQ-UD2 (wM-Bus - Fragment 1)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 7Bh | |
| 3 | M Field | Manufacturer code XYZ (LSB) | 3Ah | |
| 4 | M Field | Manufacturer code (MSB) | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 82h | ELL |
| 12 | CRC 1 | | 2Eh | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control | 84h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | 11h | |
| 16 | CI Field | GW -> Meter | 80h | |
| 17 | Ident.Nr. | Meter-ID | 78h | |
| 18 | Ident.Nr. | Meter-ID | 56h | |
| 19 | Ident.Nr. | Meter-ID | 34h | |
| 20 | Ident.Nr. | Meter-ID | 12h | |
| 21 | Manufr | Meter-Manufacturer-ID | A7h | |
| 22 | Manufr | Meter-Manufacturer-ID | 3Dh | |
| 23 | Version | Meter-Version | 01h | |
| 24 | Device type | Meter-Device-Type | 07h | |
| 25 | Access No. | Access Number of GW | 05h | |
| 26 | Status | GW State RSSI level (-84dBm) | 17h | |
| 27 | Config Field | 0000CCRhb | 00h | DLL |
| 28 | Config Field | BASMMMMMb (no encr.) | 00h | |
| 29 | CRC 2 | | 84h | |
| 30 | CRC 2 | | 49h | |

RSP-UD (wM-Bus - Fragment1)

| Byte No | OMS wM-Bus frame (first fragment) | | MTR->GW | | Layer |
|---------|-----------------------------------|--|-------------|-------------|-------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| | | | | | |
| 1 | L Field | Length of data (56 bytes) | | 38h | DLL |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code OMG (LSB) | | A7h | |
| 4 | M Field | Manufacturer code (MSB) | | 3Dh | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 01h | |
| 10 | A Field | Device type water meter | | 07h | |
| 11 | CRC 1 | | | 60h | |
| 12 | CRC 1 | | | 9Eh | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | ELL |
| 14 | CC Field | Communication Control (bidir.) | | 80h | |
| 15 | Access No. | ELL-Access number of Meter | | 11h | |
| 16 | M Field | Manufacturer code | | 3Ah | |
| 17 | M Field | Manufacturer code | | 63h | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | |
| 19 | A Field | Ident No (BCD) | | 55h | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | |
| 22 | A Field | Version (or Generation number) | | 0Ah | |
| 23 | A Field | Device type (Communication controller) | | 31h | |
| 24 | CI Field | Authentication & Fragmentation Layer (AFL) | | 90h | AFL |
| 25 | AFL | AFL Length Field | | 05h | |
| 26 | FCL | FID, Fragment-ID | | 01h | |
| 27 | FCL | MF=1, MCLP=1, MLP=1, MCRP=0, MACP=0 | | 70h | |
| 28 | MCL | MLMP=1 | | 40h | DLL |
| 29 | CRC 2 | | | 1Eh | |
| 30 | CRC 2 | | | 8Ch | AFL |
| 31 | ML | Message Length (LSB) = 92 bytes | | 5Ch | |
| 32 | ML | Message Length (MSB) | | 00h | TPL |
| 33 | CI Field | Short header | | 7Ah | |
| 34 | Access No. | TPL Access number of Meter | | 05h | |
| 35 | Status | Status byte | | 00h | |
| 36 | Config Field | NNNNNNNNb 73 Bytes | | 49h | |
| 37 | Config Field | CCZMMMMMMb (encr. mode 10) | | 2Ah | |
| 38 | CFE | 0VDDKKKKb (dyn. Key) | | 10h | |
| 39 | CFE | 00IIIIIOOb | | 01h | |
| 40 | MCR | Message Counter C (LSB) | | B3h | |
| 41 | MCR | Message Counter C | | 0Ah | |
| 42 | MCR | Message Counter C (e.g. = 2739) | | 00h | |

| | | | | | |
|----|-------|---|-----|-----|-----|
| 43 | MCR | Message Counter C (MSB) | | 00h | |
| 44 | DR1 | DIF storage #0, 8 digit BCD | 0Ch | 02h | APL |
| 45 | DR1 | VIF volume liter | 13h | B1h | |
| 46 | DR1 | Value current volume (LSB) | 79h | 2Bh | |
| 47 | CRC 3 | | | DDh | DLL |
| 48 | CRC 3 | | | B9h | |
| 49 | DR1 | Value current volume | 19h | 47h | APL |
| 50 | DR1 | Value current volume | 41h | A6h | |
| 51 | DR1 | Value current volume (MSB) | 00h | B8h | |
| 52 | DR2 | DIF storage #0, 16bit | 02h | 9Ch | |
| 53 | DR2 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | F8h | |
| 54 | DR2 | Value current date (LSB) | B2h | F5h | |
| 55 | DR2 | Value current date (MSB) | 18h | 4Dh | |
| 56 | DR3 | DIF Storage #1, 8 digit BCD | 4Ch | E4h | |
| 57 | DR3 | VIF volume liter | 13h | BFh | |
| 58 | DR3 | Value due date volume (LSB) | 94h | C8h | |
| 59 | DR3 | Value due date volume | 32h | 9Ch | |
| 60 | DR3 | Value due date volume | 38h | F8h | |
| 61 | DR3 | Value due date volume (MSB) | 00h | 36h | |
| 62 | DR4 | DIF base time, 16 bit | 82h | 12h | |
| 63 | DR4 | DIFE storage #8, acc. to EN13757-3, Annex F | 04h | 08h | |
| 64 | CRC 4 | | | 20h | DLL |
| 65 | CRC 4 | | | 60h | |

N.5.4 Second fragment

REQ-UD2 (wM-Bus - Fragment 2)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (20 bytes) | 14h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 5Bh | |
| 3 | M Field | Manufacturer code XYZ (LSB) | 3Ah | |
| 4 | M Field | Manufacturer code (MSB) | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 47h | |
| 12 | CRC 1 | | 39h | |
| 13 | CI Field | Extended Link Layer (long) | 8Eh | ELL |
| 14 | CC Field | Communication Control | 84h | |
| 15 | Access No. | ELL-Access number of GW | 12h | |
| 16 | M Field | Manufacturer code | A7h | |
| 17 | M Field | Manufacturer code | 3Dh | |
| 18 | A Field | Ident No LSB (BCD) | 78h | |
| 19 | A Field | Ident No (BCD) | 56h | |
| 20 | A Field | Ident No (BCD) (= 12345678) | 34h | |
| 21 | A Field | Ident No MSB (BCD) | 12h | |
| 22 | A Field | Version | 01h | |
| 23 | A Field | Device type water meter | 07h | |
| 24 | CRC 2 | | 1Ch | DLL |
| 25 | CRC 2 | | A6h | |

RSP-UD (wM-Bus - Fragment2)

| Byte No | OMS wM-Bus frame (intermediate fragment) | | MTR->GW | | Layer |
|---------|--|---|-------------|-------------|-------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (57 bytes) | | 39h | DLL |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code OMG (LSB) | | A7h | |
| 4 | M Field | Manufacturer code (MSB) | | 3Dh | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 01h | |
| 10 | A Field | Device type water meter | | 07h | |
| 11 | CRC 1 | | | 5Bh | ELL |
| 12 | CRC 1 | | | 0Dh | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | |
| 14 | CC Field | Communication Control (bidir.) | | 80h | |
| 15 | Access No. | ELL-Access number of Meter | | 12h | |
| 16 | M Field | Manufacturer code | | 3Ah | |
| 17 | M Field | Manufacturer code | | 63h | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | |
| 19 | A Field | Ident No (BCD) | | 55h | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | AFL |
| 22 | A Field | Version (or Generation number) | | 0Ah | |
| 23 | A Field | Device type (Communication controller) | | 31h | |
| 24 | CI Field | AFL | | 90h | AFL |
| 25 | AFL | AFL Length Field | | 02h | |
| 26 | FCL | FID, Fragment-ID | | 02h | |
| 27 | FCL | MF=1, MCLP=0, MLP=0, MCRP=0, MACP=0 | | 40h | APL |
| 28 | DR4 | VIF date type G, acc. to EN13757-3, Annex A | 6Ch | 85h | |
| 29 | CRC 2 | | | E9h | |
| 30 | CRC 2 | | | E0h | APL |
| 31 | DR4 | Value base date (LSB) 1-Jan-2012 | 81h | 29h | |
| 32 | DR4 | Value base date (MSB) | 11h | 0Bh | |
| 33 | DR5 | DIF base value, 8 digit BCD | 8Ch | 67h | |
| 34 | DR5 | DIFE storage #8 | 04h | 5Fh | |
| 35 | DR5 | VIF volume liter | 13h | E6h | |
| 36 | DR5 | Value (LSB) | 90h | DBh | |
| 37 | DR5 | Value | 52h | 08h | |
| 38 | DR5 | Value | 34h | EEh | |
| 39 | DR5 | Value (MSB) | 00h | 8Bh | |
| 40 | DR6 | DIF variable length | 8Dh | 55h | |
| 41 | DR6 | DIFE storage #8 | 04h | 81h | |
| 42 | DR6 | VIF volume liter | 93h | 29h | |
| 43 | DR6 | orth. VIFE, compact profile without registers | 1Fh | 89h | |
| 44 | DR6 | LVAR length of profile (2+11*3 = 35 Bytes) | 23h | 10h | |
| 45 | DR6 | Spacing control: signed diff., month, 6 digit BCD | FBh | 8Bh | |

| | | | | | |
|----|-------|---|-----|-----|-----|
| 46 | DR6 | Spacing value: month, acc. to Annex I table I.9 | FEh | 08h | DLL |
| 47 | CRC 3 | | | 87h | |
| 48 | CRC 3 | | | 6Bh | |
| 49 | DR6 | Value (LSB) | 60h | 13h | APL |
| 50 | DR6 | Value n-11 (February) | 26h | 1Ch | |
| 51 | DR6 | Value (MSB) | 00h | EFh | |
| 52 | DR6 | Value (LSB) | 39h | 21h | |
| 53 | DR6 | Value n-10 (March) | 39h | 45h | |
| 54 | DR6 | Value (MSB) | 00h | ACh | |
| 55 | DR6 | Value (LSB) | 34h | 23h | |
| 56 | DR6 | Value n-9 (April) | 31h | 2Ch | |
| 57 | DR6 | Value (MSB) | 00h | 9Ch | |
| 58 | DR6 | Value (LSB) | 68h | E2h | |
| 59 | DR6 | Value n-8 (May) | 34h | 43h | |
| 60 | DR6 | Value (MSB) | 00h | 50h | |
| 61 | DR6 | Value (LSB) | 10h | 51h | |
| 62 | DR6 | Value n-7 (June) | 42h | 81h | |
| 63 | DR6 | Value (MSB) | 00h | F0h | |
| 64 | DR6 | Value (LSB) | 78h | 12h | |
| 65 | CRC 4 | | | DEh | DLL |
| 66 | CRC 4 | | | BEh | |

N.5.5 Last fragment

The clear More Fragment Bit indicates the last Fragment. This datagram contains also the CMAC of the message.

REQ-UD2 (wM-Bus - Fragment 3)

| Byte No | OMS wM-Bus frame | | GW -> MTR | Layer |
|---------|------------------|--------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (20 bytes) | 14h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 | 7Bh | |
| 3 | M Field | Manufacturer code XYZ (LSB) | 3Ah | |
| 4 | M Field | Manufacturer code (MSB) | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | B6h | |
| 12 | CRC 1 | | 0Ch | |
| 13 | CI Field | Extended Link Layer (long) | 8Eh | ELL |
| 14 | CC Field | Communication Control | 84h | |
| 15 | Access No. | ELL-Access number of GW | 13h | |
| 16 | M Field | Manufacturer code | A7h | |
| 17 | M Field | Manufacturer code | 3Dh | |
| 18 | A Field | Ident No LSB (BCD) | 78h | |
| 19 | A Field | Ident No (BCD) | 56h | |
| 20 | A Field | Ident No (BCD) (= 12345678) | 34h | |
| 21 | A Field | Ident No MSB (BCD) | 12h | |
| 22 | A Field | Version | 01h | |
| 23 | A Field | Device type water meter | 07h | |
| 24 | CRC 2 | | 8Ch | DLL |
| 25 | CRC 2 | | 76h | |

RSP-UD (wM-Bus - Fragment3)

| Byte No | | OVS wM-Bus frame (last fragment) | MTR->GW | | Layer |
|---------|------------|--|-------------|-------------|-------|
| | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (54 bytes) | | 36h | DLL |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code OMS (LSB) | | A7h | |
| 4 | M Field | Manufacturer code (MSB) | | 3Dh | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 01h | |
| 10 | A Field | Device type water meter | | 07h | |
| 11 | CRC 1 | | | 18h | ELL |
| 12 | CRC 1 | | | 09h | |
| 13 | CI Field | Extended LinkLayer | | 8Eh | |
| 14 | CC Field | Communication Control (bidir.) | | 80h | |
| 15 | Access No. | ELL-Access number of Meter | | 13h | |
| 16 | M Field | Manufacturer code | | 3Ah | |
| 17 | M Field | Manufacturer code | | 63h | |
| 18 | A Field | Ident No LSB (BCD) | | 66h | |
| 19 | A Field | Ident No (BCD) | | 55h | |
| 20 | A Field | Ident No (BCD) (= 33445566) | | 44h | |
| 21 | A Field | Ident No MSB (BCD) | | 33h | AFL |
| 22 | A Field | Version (or Generation number) | | 0Ah | |
| 23 | A Field | Device type (Communication controller) | | 31h | |
| 24 | CI Field | AFL | | 90h | |
| 25 | AFL | AFL Length Field | | 02h | APL |
| 26 | FCL | FID, Fragment-ID | | 03h | |
| 27 | FCL | MF=0, MCLP=0, MLP=0, MCRP=0, MACP=0 | | 00h | |
| 28 | DR6 | Value n-6 (July) | 31h | 94h | |
| 29 | CRC 2 | | | 83h | DLL |
| 30 | CRC 2 | | | 99h | |
| 31 | DR6 | Value (MSB) | 00h | C5h | APL |
| 32 | DR6 | Value (LSB) | 10h | 2Ah | |
| 33 | DR6 | Value n-5 (August) | 54h | B9h | |
| 34 | DR6 | Value (MSB) | 00h | 8Ah | |
| 35 | DR6 | Value (LSB) | 30h | 7Eh | |
| 36 | DR6 | Value n-4 (September) | 18h | C5h | |
| 37 | DR6 | Value (MSB) | 00h | 1Dh | |
| 38 | DR6 | Value (LSB) | 86h | B7h | |
| 39 | DR6 | Value n-3 (October) | 19h | CDh | |
| 40 | DR6 | Value (MSB) | 00h | C0h | |
| 41 | DR6 | Value (LSB) | 64h | 2Fh | |
| 42 | DR6 | Value n-2 (November) | 24h | 51h | |
| 43 | DR6 | Value (MSB) | 00h | E1h | |
| 44 | DR6 | Value (LSB) | 03h | 7Ah | |
| 45 | DR6 | Value n-1 (December) | 41h | ABh | |
| 46 | DR6 | Value (MSB) | 00h | 87h | |

| | | | | | |
|----|-------|-----------------------------------|-----|-----|-----|
| 47 | CRC 3 | | | D9h | DLL |
| 48 | CRC 3 | | | 9Eh | |
| 49 | DR7 | DIF 16bit | 02h | C6h | APL |
| 50 | DR7 | VIF from FD table | FDh | B2h | |
| 51 | DR7 | VIFE error flags, device specific | 17h | 59h | |
| 52 | DR7 | Value error flags byte (LSB) | 00h | D2h | |
| 53 | DR7 | Value error flags byte (MSB) | 00h | 8Bh | TPL |
| 54 | MAC | Authentication tag (MSB) | | E4h | |
| 55 | MAC | Authentication tag | | 13h | |
| 56 | MAC | Authentication tag | | 70h | |
| 57 | MAC | Authentication tag | | F8h | |
| 58 | MAC | Authentication tag | | 74h | |
| 59 | MAC | Authentication tag | | 1Bh | |
| 60 | MAC | Authentication tag | | 9Dh | |
| 61 | MAC | Authentication tag (LSB) | | 99h | |
| 62 | CRC 5 | | | 27h | DLL |
| 63 | CRC 5 | | | 4Eh | |

N.6 Heat Cost Allocator

N.6.1 Input parameters

- 5 This example shows an asynchronous transmission of a heat cost allocator with an external unidirectional radio adapter. A presence transmission is done using ACC-NR. In the following SND-NR the application layer is partially encrypted only using Security profile A. This device signals an Low Power alert by the Status-Field.

| Example for Heat cost allocator with RF-Adapter | |
|---|----------------------|
| Medium | Heat cost allocation |
| Manufacturer | QDS |
| Ident number of Meter (HCA) | 55667788 |
| Version | 85 |
| Status (Low Power/Battery low) | 4 |
| Current consumption value | 1234 HCA units |
| Due date | 30.04.2007 |
| Consumption at due date | 23456 HCA units |
| Customer Location | 12345678 |

| RF adapter | |
|----------------------------|----------|
| Medium/device type | 55 |
| Manufacturer | QDS |
| Ident number of RF-Adapter | 11223344 |
| Version | 85 |

| AES Key according to FIPS 197 (see 9.1): | |
|--|--|
| = manu. spec. at least 8 bytes unique for each meter | |
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F | |

| AES CBC Initial Vector according to FIPS 197 (LSB first): | |
|---|--|
| = M Field + A Field + 8 bytes Acces No | |
| = 93 44 88 77 66 55 55 08 00 00 00 00 00 00 00 00 | |

N.6.2 wM-Bus Example with ACC-NR

| Example for Heat cost allocator with RF-Adapter | |
|---|----------------------|
| Medium | Heat cost allocation |
| Manufacturer | QDS |
| Ident number of Meter (HCA) | 55667788 |
| Version | 85 |
| Status (Low Power/Battery low) | 4 |

| RF adapter | |
|----------------------------|----------|
| Medium/device type | 55 |
| Manufacturer | QDS |
| Ident number of RF-Adapter | 11223344 |
| Version | 85 |

ACC-NR (wM-Bus)

| Byte No | OMS wM-Bus frame | | HCA -> GW | Layer |
|---------|------------------|---------------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Access - No Reply | 47h | |
| 3 | M Field | Manufacturer code | 93h | |
| 4 | M Field | Manufacturer code | 44h | |
| 5 | A Field | Ident No LSB (BCD) | 44h | |
| 6 | A Field | Ident No (BCD) | 33h | |
| 7 | A Field | Ident No (BCD) (= 11223344) | 22h | |
| 8 | A Field | Ident No MSB (BCD) | 11h | |
| 9 | A Field | Version (or Generation number) | 55h | |
| 10 | A Field | Device type (RF-Adapter) | 37h | |
| 11 | CRC 1 | | 35h | ELL |
| 12 | CRC 1 | | 72h | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (unidir. sync.) | 20h | Transport Layer (TPL) |
| 15 | Access No. | ELL-Access Counter of Meter | 75h | |
| 16 | CI Field | 8Bh (long header) | 8Bh | |
| 17 | Meter-ID | Ident No LSB (BCD) | 88h | |
| 18 | Meter-ID | Ident No (BCD) | 77h | |
| 19 | Meter-ID | Ident No (BCD) (= 55667788) | 66h | |
| 20 | Meter-ID | Ident No MSB (BCD) | 55h | |
| 21 | Meter-Man. | Meter Manufacturer code | 93h | |
| 22 | Meter-Man. | Meter Manufacturer code | 44h | |
| 23 | Meter-Vers. | Version (or Generation number) | 55h | |
| 24 | Meter-Med. | Device type (Medium=HCA) | 08h | DLL |
| 25 | Access No. | Access Number of Meter | FFh | |
| 26 | Status | Meter state (Low power) | 04h | |
| 27 | Config Field | 0000CCRhb (no encryption) | 00h | |
| 28 | Config Field | BASMMMMMb | 00h | |
| 29 | CRC 2 | | 13h | |
| 30 | CRC 2 | | 93h | |

N.6.3 wM-Bus Example with partial encryption

SND-NR (wM-Bus)

| Byte No | OMS wM-Bus frame | | Heat cost allocator example | | Layer |
|---------|------------------|--|-----------------------------|-------------|--------------------------------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (48 bytes) | | 30h | Data Link Layer (DLL) |
| 2 | C Field | Send - No Reply | | 44h | |
| 3 | M Field | Manufacturer code | | 93h | |
| 4 | M Field | Manufacturer code | | 44h | |
| 5 | A Field | Ident No LSB (BCD) | | 44h | |
| 6 | A Field | Ident No (BCD) | | 33h | |
| 7 | A Field | Ident No (BCD) (= 11223344) | | 22h | |
| 8 | A Field | Ident No MSB (BCD) | | 11h | |
| 9 | A Field | Version (or Generation number) | | 55h | |
| 10 | A Field | Device type (RF-Adapter) | | 37h | |
| 11 | CRC 1 | | | A3h | ELL |
| 12 | CRC 1 | | | 52h | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (unidir. async.) | | 00h | Transport Layer (TPL) |
| 15 | Access No. | ELL-Access Counter of Meter | | 75h | |
| 16 | CI Field | 72h (long header) | | 72h | |
| 17 | Meter-ID | Ident No LSB (BCD) | | 88h | |
| 18 | Meter-ID | Ident No (BCD) | | 77h | |
| 19 | Meter-ID | Ident No (BCD) (= 55667788) | | 66h | |
| 20 | Meter-ID | Ident No MSB (BCD) | | 55h | |
| 21 | Meter-Man. | Meter Manufacturer code | | 93h | |
| 22 | Meter-Man. | Meter Manufacturer code | | 44h | |
| 23 | Meter-Vers. | Version (or Generation number) | | 55h | |
| 24 | Meter-Med. | Device type (Medium=HCA) | | 08h | DLL |
| 25 | Access No. | Access Number of Meter | | 00h | |
| 26 | Status | Meter state (Low power) | | 04h | # 1 Application Layer (APL) |
| 27 | Config Field | NNNNCCRhb (1 encr. block) | | 10h | |
| 28 | Config Field | BASMMMMMb (AES) | | 05h | |
| 29 | CRC 2 | | | 1Bh | |
| 30 | CRC 2 | | | 2Fh | |
| 31 | AES-Verify | Encryption verification | 2Fh | 00h | |
| 32 | AES-Verify | Encryption verification | 2Fh | DFh | |
| 33 | DR1 | DIF (6 digit BCD) | 0Bh | E2h | |
| 34 | DR1 | VIF (HCA-units) | 6Eh | A7h | |
| 35 | DR1 | Value LSB | 34h | 82h | |
| 36 | DR1 | Value (= 001234 HCA-Units) | 12h | 14h | |
| 37 | DR1 | Value MSB | 00h | 6Dh | |
| 38 | DR2 | DIF (Data type G, StorageNo 1) | 42h | 15h | |
| 39 | DR2 | VIF (Date) | 6Ch | 13h | |
| 40 | DR2 | Value LSB | FEh | 58h | |
| 41 | DR2 | Value MSB (= 30.04.2007) | 04h | 1Ch | |
| 42 | DR3 | DIF (6 digit BCD, StorageNo 1) | 4Bh | D2h | |
| 43 | DR3 | VIF (HCA-units) | 6Eh | F8h | |
| 44 | DR3 | Value LSB | 56h | 3Fh | |

| | | | | | | |
|----|-------|-----------------------------|-----|-----|-----|-----|
| 45 | DR3 | Value (= 023456 HCA-Units) | 34h | 39h | #1 | APL |
| 46 | DR3 | Value MSB | 02h | 04h | | |
| 47 | CRC 3 | | | D7h | DLL | |
| 48 | CRC 3 | | | 57h | | |
| 49 | DR4 | DIF (8 digit BCD) | 0Ch | 0Ch | APL | |
| 50 | DR4 | VIF (Extension Table FDh) | FDh | FDh | | |
| 51 | DR4 | VIFE (Customer Location) | 10h | 10h | | |
| 52 | DR4 | Value LSB | 78h | 78h | | |
| 53 | DR4 | Value (Location ID) | 56h | 56h | | |
| 54 | DR4 | Value | 34h | 34h | | |
| 55 | DR4 | Value MSB | 12h | 12h | | |
| 56 | CRC 4 | | | FBh | DLL | |
| 57 | CRC 4 | | | 35h | | |

SND-NR (wM-Bus)

| Byte No | | OMS wM-Bus frame | Heat cost allocator example | | Layer | |
|---------|--------------|--|-----------------------------|-------------|-----------------------|--|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | |
| | | | plain | AES coded | | |
| 1 | L Field | Length of data (48 bytes) | | 30h | Data Link Layer (DLL) | |
| 2 | C Field | Send - No Reply | | 44h | | |
| 3 | M Field | Manufacturer code | | 93h | | |
| 4 | M Field | Manufacturer code | | 44h | | |
| 5 | A Field | Ident No LSB (BCD) | | 44h | | |
| 6 | A Field | Ident No (BCD) | | 33h | | |
| 7 | A Field | Ident No (BCD) (= 11223344) | | 22h | | |
| 8 | A Field | Ident No MSB (BCD) | | 11h | | |
| 9 | A Field | Version (or Generation number) | | 55h | | |
| 10 | A Field | Device type (RF-Adapter) | | 37h | | |
| 11 | CRC 1 | | | A3h | ELL | |
| 12 | CRC 1 | | | 52h | | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | | |
| 14 | CC Field | Communication Control (unidir. async.) | | 00h | Transport Layer (TPL) | |
| 15 | Access No. | ELL-Access Counter of Meter | | 75h | | |
| 16 | CI Field | 72h (long header) | | 72h | | |
| 17 | Meter-ID | Ident No LSB (BCD) | | 88h | | |
| 18 | Meter-ID | Ident No (BCD) | | 77h | | |
| 19 | Meter-ID | Ident No (BCD) (= 55667788) | | 66h | | |
| 20 | Meter-ID | Ident No MSB (BCD) | | 55h | | |
| 21 | Meter-Man. | Meter Manufacturer code | | 93h | | |
| 22 | Meter-Man. | Meter Manufacturer code | | 44h | | |
| 23 | Meter-Vers. | Version (or Generation number) | | 55h | | |
| 24 | Meter-Med. | Device type (Medium=HCA) | | 08h | | |
| 25 | Access No. | Access Number of Meter | | 00h | | |
| 26 | Status | Meter state (Low power) | | 04h | | |
| 27 | Config Field | NNNNCCRhb (1 encr. block) | | 10h | DLL | |
| 28 | Config Field | BASMMMMMb (AES) | | 05h | | |
| 29 | CRC 2 | | | 1Bh | # 1 | |
| 30 | CRC 2 | | | 2Fh | | |
| 31 | AES-Verify | Encryption verification | 2Fh | 00h | # 1 | |
| 32 | AES-Verify | Encryption verification | 2Fh | DFh | | |

| | | | | | | |
|----|-------|--------------------------------|-----|-----|-----|-------------------------|
| 33 | DR1 | DIF (6 digit BCD) | 0Bh | E2h | # 1 | Application Layer (APL) |
| 34 | DR1 | VIF (HCA-units) | 6Eh | A7h | | |
| 35 | DR1 | Value LSB | 34h | 82h | | |
| 36 | DR1 | Value (= 001234 HCA-Units) | 12h | 14h | | |
| 37 | DR1 | Value MSB | 00h | 6Dh | | |
| 38 | DR2 | DIF (Data type G, StorageNo 1) | 42h | 15h | | |
| 39 | DR2 | VIF (Date) | 6Ch | 13h | | |
| 40 | DR2 | Value LSB | FEh | 58h | | |
| 41 | DR2 | Value MSB (= 30.04.2007) | 04h | 1Ch | | |
| 42 | DR3 | DIF (6 digit BCD, StorageNo 1) | 4Bh | D2h | | |
| 43 | DR3 | VIF (HCA-units) | 6Eh | F8h | #1 | APL |
| 44 | DR3 | Value LSB | 56h | 3Fh | | |
| 45 | DR3 | Value (= 023456 HCA-Units) | 34h | 39h | | |
| 46 | DR3 | Value MSB | 02h | 04h | | |
| 47 | CRC 3 | | | D7h | DLL | |
| 48 | CRC 3 | | | 57h | | |
| 49 | DR4 | DIF (8 digit BCD) | 0Ch | 0Ch | | APL |
| 50 | DR4 | VIF (Extension Table FDh) | FDh | FDh | | |
| 51 | DR4 | VIFE (Customer Location) | 10h | 10h | | |
| 52 | DR4 | Value LSB | 78h | 78h | | |
| 53 | DR4 | Value (Location ID) | 56h | 56h | | |
| 54 | DR4 | Value | 34h | 34h | | |

N.6.4 M-Bus Example with partial encryption

RSP-UD (M-Bus with Encryption)

| Byte No | OMS M-Bus frame | | HCA example | | Layer |
|---------|-----------------|--------------------------------|-------------|-------------|--------------------------------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | Start | Start byte | | 68h | Data Link Layer (DLL) |
| 2 | L Field | Length of data (44bytes) | | 2Ch | |
| 3 | L Field | Length of data (44 bytes) | | 2Ch | |
| 4 | Start | Start byte | | 68h | |
| 5 | C Field | Respond user data | | 08h | |
| 6 | A-Field | Secondary addressing mode | | FDh | |
| 7 | CI Field | 72h (long header) | | 72h | Transport Layer (TPL) |
| 8 | Ident.Nr. | Ident No LSB (BCD) | | 88h | |
| 9 | Ident.Nr. | Ident No (BCD) | | 77h | |
| 10 | Ident.Nr. | Ident No (BCD) (=55667788) | | 66h | |
| 11 | Ident.Nr. | Ident No MSB (BCD) | | 55h | |
| 12 | Manufr | Manufacturer code | | 93h | |
| 13 | Manufr | Manufacturer code | | 44h | |
| 14 | Version | Version (or Generation number) | | 55h | |
| 15 | Device type | Device type (Medium=HCA) | | 08h | |
| 16 | Access No. | Access Number of Meter | | 00h | |
| 17 | Status | Meter state (Low power) | | 04h | |
| 18 | Config Field | NNNNCCRHb (1 encr. block) | | 10h | |
| 19 | Config Field | BASMMMMMb (AES) | | 05h | |
| 20 | AES-Verify | Encryption verification | 2Fh | 00h | # 1 Application Layer (APL) |
| 21 | AES-Verify | Encryption verification | 2Fh | DFh | |
| 22 | DR1 | DIF (6 digit BCD) | 0Bh | E2h | |
| 23 | DR1 | VIF (HCA-units) | 6Eh | A7h | |
| 24 | DR1 | Value LSB | 34h | 82h | |
| 25 | DR1 | Value (= 001234 HCA-Units) | 12h | 14h | |
| 26 | DR1 | Value MSB | 00h | 6Dh | |
| 27 | DR2 | DIF (Data type G, StorageNo 1) | 42h | 15h | |
| 28 | DR2 | VIF (Date) | 6Ch | 13h | |
| 29 | DR2 | Value LSB | FEh | 58h | |
| 30 | DR2 | Value MSB (= 30.04.2007) | 04h | 1Ch | |
| 31 | DR3 | DIF (6 digit BCD, StorageNo 1) | 4Bh | D2h | |
| 32 | DR3 | VIF (HCA-units) | 6Eh | F8h | |
| 33 | DR3 | Value LSB | 56h | 3Fh | |
| 34 | DR3 | Value (= 023456 HCA-Units) | 34h | 39h | |
| 35 | DR3 | Value MSB | 02h | 04h | |
| 36 | DR4 | DIF (8 digit BCD) | 0Ch | 0Ch | |
| 37 | DR4 | VIF (Extension Table FDh) | FDh | FDh | |
| 38 | DR4 | VIFE (Customer Location) | 10h | 10h | |
| 39 | DR4 | Value LSB | 78h | 78h | |
| 40 | DR4 | Value (Location ID) | 56h | 56h | |
| 41 | DR4 | Value | 34h | 34h | |
| 42 | DR4 | Value MSB | 12h | 12h | |
| 43 | DR5 | DIF (8 digit BCD) | 0Ch | 0Ch | |

| | | | | | |
|----|----------|-----------------------------|-----|-----|-----|
| 44 | DR5 | VIF (Fabrication number) | 78h | 78h | APL |
| 45 | DR5 | Value LSB | 44h | 44h | |
| 46 | DR5 | Value (Ident-Nr of Adapter) | 33h | 33h | |
| 47 | DR5 | Value | 22h | 22h | |
| 48 | DR5 | Value MSB | 11h | 11h | |
| 49 | Checksum | | | 26h | DLL |
| 50 | Stop | Stop byte | | 16h | |

N.7 Installation Procedure with a Special Installation Datagram

This example shows a special transmission of a Gas meter with Request for installation. The Gateway confirms this request. Note that the GW sends however an additional SND-NKE a few seconds after the CNF-IR.

5

| GW example | |
|--------------|--------------------------|
| Medium | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 33445566 |
| Version | 10 (e.g. V 1.0) |

| Gas meter example | |
|----------------------------|----------------------|
| Medium | Gas |
| Manufacturer | ELS |
| Ident number | 12345678 |
| Version | 51 (e.g. V 5.1) |
| Model/Version | BKG4 |
| Hardware Version | 15 (e.g. V 1.5) |
| Metrology Firmware Version | 11 (e.g. V 1.1) |
| Other Software Version | 10 (e.g. V 1.0) |
| Metering Point ID | DE 123456 49074 |
| | 00000000000012345678 |

| AES Key According to FIPS 197 (see 9.1): |
|--|
| = manu. spec. at least 8 bytes unique for each meter |
| = 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 11 |

| AES CBC Initial Vector according to FIPS 197 (LSB first): |
|---|
| = M Field + A Field + 8 bytes Acces No |
| = 93 15 78 56 34 12 33 03 01 01 01 01 01 01 01 01 |

SND-IR (wM-Bus)

| Byte No | | OMS wM-Bus frame | Gas meter -> GW | | Layer | |
|---------|--------------|---|-----------------|-------------|-----------------------|-------------------------|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | | |
| | | | plain | AES coded | | |
| 1 | L Field | Length of data (81 bytes) | | 51h | Data Link Layer (DLL) | |
| 2 | C Field | Send - Installation Request | | 46h | | |
| 3 | M Field | Manufacturer code | | 93h | | |
| 4 | M Field | Manufacturer code | | 15h | | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | | |
| 6 | A Field | Ident No (BCD) | | 56h | | |
| 7 | A Field | Ident No (BCD) (=12345678) | | 34h | | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | | |
| 9 | A Field | Version (or Generation number) | | 33h | | |
| 10 | A Field | Device type (Medium=Gas) | | 03h | | |
| 11 | CRC 1 | | | EFh | ELL | |
| 12 | CRC 1 | | | B5h | | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | | |
| 14 | CC Field | Communication Control (bidir., RX off) | | 80h | Transport Layer (TPL) | |
| 15 | Access No. | Access Number of Meter | | 45h | | |
| 16 | CI Field | 7Ah (short header) | | 7Ah | | |
| 17 | Access No. | Access Number of Meter | | 01h | | |
| 18 | Status | Meter state | | 00h | | |
| 19 | Config Field | NNNNCCRhb (4 encl. blocks, static tlg.) | | 48h | | |
| 20 | Config Field | BASMMMMMb (AES) | | 05h | | |
| 21 | AES-Verify | Encryption verification | 2Fh | D2h | | |
| 22 | AES-Verify | Encryption verification | 2Fh | B7h | | |
| 23 | DR1 | DIF (Variable length) | 0Dh | 0Bh | # 1 | APL |
| 24 | DR1 | VIF (Extension) | FDh | 3Fh | | |
| 25 | DR1 | VIFE (Version) | 0Ch | BCh | | |
| 26 | DR1 | LVAR (= 4 byte text string) | 04h | 1Ah | | |
| 27 | DR1 | Value (LSB) | 34h | 15h | | |
| 28 | DR1 | Value (= BKG4) | 47h | 80h | | |
| 29 | CRC 2 | | | C8h | DLL | |
| 30 | CRC 2 | | | 5Eh | | |
| 31 | DR1 | Value | 4Bh | D7h | # 1 | Application Layer (APL) |
| 32 | DR1 | Value (MSB) | 42h | 9Bh | | |
| 33 | DR2 | DIF (4 digit BCD) | 0Ah | 92h | | |
| 34 | DR2 | VIF (Extension) | FDh | CAh | | |
| 35 | DR2 | VIFE (Hardware version) | 0Dh | A1h | | |
| 36 | DR2 | Value LSB (=1.5) | 05h | D9h | | |
| 37 | DR2 | Value MSB | 01h | 53h | | |
| 38 | DR3 | DIF (4 digit BCD) | 0Ah | 41h | | |
| 39 | DR3 | VIF (Extension) | FDh | B6h | | |
| 40 | DR3 | VIFE (Metrology Firmware version) | 0Eh | 09h | | |
| 41 | DR3 | Value LSB (= 1.1) | 01h | EFh | | |
| 42 | DR3 | Value MSB | 01h | 60h | | |
| 43 | DR4 | DIF (4 digit BCD) | 0Ah | 3Ah | | |
| 44 | DR4 | VIF (Extension) | FDh | D3h | | |
| 45 | DR4 | VIFE (Other firmware version) | 0Fh | 62h | | |

| | | | | | | |
|----|-------|---------------------------------|-----|-----|-----|-------------------------|
| 46 | DR4 | Value LSB (= 1.0) | 00h | 94h | DLL | |
| 47 | CRC 3 | | | 85h | | |
| 48 | CRC 3 | | | 3Ah | | |
| 49 | DR4 | Value MSB | 01h | 72h | # 2 | Application Layer (APL) |
| 50 | DR5 | DIF (Variable length) | 0Dh | B2h | | |
| 51 | DR5 | VIF (Extension) | FDh | 06h | | |
| 52 | DR5 | VIFE (customer location) | 10h | 7Dh | | |
| 53 | DR5 | LVAR (=33 byte text string) | 21h | 26h | | |
| 54 | DR5 | Value LSB | 38h | BDh | | |
| 55 | DR5 | Value (= 000000000000012345678) | 37h | 2Bh | | |
| 56 | DR5 | Value | 36h | 5Fh | | |
| 57 | DR5 | Value | 35h | DDh | | |
| 58 | DR5 | Value | 34h | C2h | | |
| 59 | DR5 | Value | 33h | 37h | # 3 | Application Layer (APL) |
| 60 | DR5 | Value | 32h | 4Dh | | |
| 61 | DR5 | Value | 31h | 29h | | |
| 62 | DR5 | Value | 30h | D0h | | |
| 63 | DR5 | Value | 30h | CDh | | |
| 64 | DR5 | Value | 30h | 08h | | |
| 65 | CRC 4 | | | ABh | DLL | |
| 66 | CRC 4 | | | 48h | | |
| 67 | DR5 | Value | 30h | 58h | # 3 | Application Layer (APL) |
| 68 | DR5 | Value | 30h | C5h | | |
| 69 | DR5 | Value | 30h | 61h | | |
| 70 | DR5 | Value | 30h | 4Eh | | |
| 71 | DR5 | Value | 30h | 8Bh | | |
| 72 | DR5 | Value | 30h | 56h | | |
| 73 | DR5 | Value | 30h | E6h | | |
| 74 | DR5 | Value | 30h | C2h | | |
| 75 | DR5 | Value | 30h | 17h | | |
| 76 | DR5 | Value (= 49074) | 34h | 59h | # 4 | Application Layer (APL) |
| 77 | DR5 | Value | 37h | 62h | | |
| 78 | DR5 | Value | 30h | DBh | | |
| 79 | DR5 | Value | 39h | 0Fh | | |
| 80 | DR5 | Value | 34h | 01h | | |
| 81 | DR5 | Value (= 123456) | 36h | AAh | | |
| 82 | DR5 | Value | 35h | 2Ah | | |
| 83 | CRC 5 | | | 62h | DLL | |
| 84 | CRC 5 | | | E1h | | |
| 85 | DR5 | Value | 34h | A7h | # 4 | APL |
| 86 | DR5 | Value | 33h | B1h | | |
| 87 | DR5 | Value | 32h | 2Eh | | |
| 88 | DR5 | Value | 31h | E4h | | |
| 89 | DR5 | Value (= DE) | 45h | B5h | | |
| 90 | DR5 | Value MSB | 44h | F6h | | |
| 91 | Dummy | Fill Byte due to AES | 2Fh | 3Fh | | |
| 92 | Dummy | Fill Byte due to AES | 2Fh | 44h | DLL | |
| 93 | CRC 6 | | | 05h | | |
| 94 | CRC 6 | | | 69h | | |

CNF-IR (wM-Bus)

| Byte No | OMS wM-Bus frame | | GW -> Gas meter | Layer |
|---------|------------------|---------------------------------------|-----------------|-----------------------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Confirm - Installation Request | 06h | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 66h | |
| 6 | A Field | Ident No (BCD) | 55h | |
| 7 | A Field | Ident No (BCD) (=33445566) | 44h | |
| 8 | A Field | Ident No MSB (BCD) | 33h | |
| 9 | A Field | Version (or Generation number) | 0Ah | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 90h | ELL |
| 12 | CRC 1 | | 72h | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (bidir., RX on) | 84h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of Meter | 45h | |
| 16 | CI Field | 80h means 12 byte header | 80h | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | 78h | |
| 18 | Ident.Nr. | Ident No (BCD) | 56h | |
| 19 | Ident.Nr. | Ident No (BCD) (=12345678) | 34h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) | 12h | |
| 21 | Manufr | Manufacturer code | 93h | |
| 22 | Manufr | Manufacturer code | 15h | |
| 23 | Version | Version (or Generation number) | 33h | |
| 24 | Device type | Device type (Medium=Gas) | 03h | |
| 25 | Access No. | Access Number of Meter | 01h | DLL |
| 26 | Status | GW state cont. recept. level (-80dBm) | 19h | |
| 27 | Config Field | 0000CCRHb | 00h | |
| 28 | Config Field | BASMMMMMb (no encr.) | 00h | |
| 29 | CRC 2 | | 93h | |
| 30 | CRC 2 | | FDh | |

N.8 Send a Command

N.8.1 Input parameters

- 5 A SND-UD is applied to transport a command to a meter or actuator. When C-Field 53h or 73h is applied the meter will acknowledge a successful reception of the command. The bit “application error” in the Status Byte of the acknowledge datagram indicates an application error during the command execution.

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | HYD |
| Ident number | 90123456 |
| Version | 8 |

| RF adapter example | |
|-------------------------|-----------------|
| Medium/device type | Radio converter |
| Manufacturer | HYD |
| Ident number RF adapter | 43886102 |
| Version | 41 |

| Example of mechanical water meter | |
|-----------------------------------|-------------|
| Medium/device type | Water meter |
| Manufacturer | QDS |
| Ident number water meter | 92752244 |
| Version | - |

| AES Key According to FIPS 197 (see 9.1): | |
|--|--|
| = manu. spec. at least 8 bytes unique for each meter | |
| = 82 B0 55 11 91 F5 1D 66 EF CD AB 89 67 45 23 01 | |

| AES CBC Initial Vector according to FIPS 197 (LSB first): | |
|---|--|
| = M Field + A Field + 8 bytes Acces No | |
| = 93 44 44 22 75 92 00 07 7D 7D 7D 7D 7D 7D 7D | |

N.8.2 Command Adjust Clock Time by Gateway with Security profile A

SND-UD Adjust Clock Time (wM-Bus)

| Byte No | OMS wM-Bus frame | | GW -> water meter | | Layer |
|---------|------------------|---------------------------------------|-------------------|-------------|--------------------------------|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (41 bytes) | | 29h | Data Link Layer (DLL) |
| 2 | C Field | Send user data | | 53h | |
| 3 | M Field | Manufacturer code | | 24h | |
| 4 | M Field | Manufacturer code | | 23h | |
| 5 | A Field | Ident No LSB (BCD) | | 56h | |
| 6 | A Field | Ident No (BCD) | | 34h | |
| 7 | A Field | Ident No (BCD) | | 12h | |
| 8 | A Field | Ident No MSB (BCD) of GW | | 90h | |
| 9 | A Field | Version (or Generation number) | | 08h | |
| 10 | A Field | Device type (Medium=COM) | | 31h | |
| 11 | CRC 1 | | | 88h | ELL |
| 12 | CRC 1 | | | 8Ah | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (bidir., RX on) | | 84h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | | 51h | |
| 16 | CI Field | Clock synchronisation protocol | | 6Ch | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | | 44h | |
| 18 | Ident.Nr. | Ident No (BCD) | | 22h | |
| 19 | Ident.Nr. | Ident No (BCD) | | 75h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) of meter | | 92h | |
| 21 | Manufr | Manufacturer code | | 93h | |
| 22 | Manufr | Manufacturer code | | 44h | |
| 23 | Version | Version (or Generation number) | | 00h | DLL |
| 24 | Device type | Device type (Medium = Water) | | 07h | |
| 25 | Access No. | Access Number of GW | | 7Dh | TPL |
| 26 | Status | GW state (no RSSI level available) | | 00h | |
| 27 | Config Field | NNNNCCRhb (1 encr. block) | | 10h | # 1 Application Layer (APL) |
| 28 | Config Field | BASMMMMMb (AES) | | 05h | |
| 29 | CRC 2 | | | 72h | |
| 30 | CRC 2 | | | 93h | |
| 31 | AES-Verify | Encryption verification | 2Fh | 9Eh | |
| 32 | AES-Verify | Encryption verification | 2Fh | D8h | |
| 33 | TC-Field | Add time difference | 01h | 2Ah | |
| 34 | Time | Value format J, LSB | 32h | B2h | |
| 35 | Time | Value (add 1 minute, 50 seconds) | 01h | 33h | |
| 36 | Time | Value MSB | 00h | D1h | |
| 37 | Reserved | Reserved, set to 0 | 00h | A2h | |
| 38 | Reserved | Reserved, set to 0 | 00h | A8h | |
| 39 | Reserved | Reserved, set to 0 | 00h | 0Bh | |
| 40 | Reserved | Reserved, set to 0 | 00h | FFh | |
| 41 | Reserved | Reserved, set to 0 | 00h | D3h | |
| 42 | Reserved | Reserved, set to 0 | 00h | B7h | |

| | | | | | | |
|----|------------|----------------------|-----|-----|-----|--|
| 43 | CMD-Verify | Command verification | 2Fh | B6h | | |
| 44 | CMD-Verify | Command verification | 2Fh | A9h | | |
| 45 | CMD-Verify | Command verification | 2Fh | 08h | | |
| 46 | CMD-Verify | Command verification | 2Fh | D7h | | |
| 47 | CRC 3 | | | C5h | DLL | |
| 48 | CRC 3 | | | AAh | | |

ACK (wM-Bus)

| Byte No | OMS wM-Bus frame | | water meter -> GW | Layer |
|---------|------------------|---------------------------------------|-------------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Acknowledge | 00h | |
| 3 | M Field | Manufacturer code | 24h | |
| 4 | M Field | Manufacturer code | 23h | |
| 5 | A Field | Ident No LSB (BCD) | 02h | |
| 6 | A Field | Ident No (BCD) | 61h | |
| 7 | A Field | Ident No (BCD) | 88h | |
| 8 | A Field | Ident No MSB (BCD) of RF-Adapter | 43h | |
| 9 | A Field | Version (or Generation number) | 29h | |
| 10 | A Field | Device type (Medium=Water) | 07h | |
| 11 | CRC 1 | | 77h | ELL |
| 12 | CRC 1 | | 83h | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (bidir, RX off) | 80h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | 51h | |
| 16 | CI Field | 8Bh means long header | 8Bh | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | 44h | |
| 18 | Ident.Nr. | Ident No (BCD) | 22h | |
| 19 | Ident.Nr. | Ident No (BCD) | 75h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) of meter | 92h | |
| 21 | Manufr | Manufacturer code | 93h | |
| 22 | Manufr | Manufacturer code | 44h | |
| 23 | Version | Version (or Generation number) | 00h | |
| 24 | Device type | Device type (Medium=Water) | 07h | |
| 25 | Access No. | Access Number of GW | 7Dh | |
| 26 | Status | Meter state (Appl. error) | 02h | DLL |
| 27 | Config Field | 0000CCRhb | 00h | |
| 28 | Config Field | BASMMMMMb (no encr.) | 00h | |
| 29 | CRC 2 | | A6h | |
| 30 | CRC 2 | | B5h | |

The Status byte indicates an application error, because the applied range for the command time adjustment is out of range (see OMS-S2, Annex M, OMS-UC-04a). The meter will respond with an application error 15_h to the next REQ-UD2.

N.9 Request of the Selected Data

A REQ-UD2 is used either to request the standard meter consumption data or to read responses of a command or prove successful execution of a command. After a command the RSP-UD may consist of either the expected answer to that read command (e.g. “get valve state”) or the standard answer if a write command like “set new key” was applied or an “application error” if the execution of the command was not successful (e.g. using the wrong encryption key for this meter). An application error will be indicated in the Status Byte of the meter’s acknowledge datagram.

5

| Example for GW | |
|-------------------|--------------------------|
| Medium | Communication Controller |
| Manufacturer | TCH |
| Ident number | 66778899 |
| Version | 12 |
| Status (no error) | 0 |
| Meter-RSSI | -84 dBm |

| Example for Heat cost allocator | |
|---------------------------------|----------------------|
| Medium | Heat Cost Allocation |
| Manufacturer | TCH |
| Ident number | 12345678 |
| Version | 143 |
| Status (no error) | 0 |
| current consumption value | 12345 HCA units |
| due date | 31.12.2009 |
| consumption at due date | 23456 HCA units |

| AES Key According to FIPS 197 (see 9.1): |
|--|
| = manu. spec. at least 8 bytes unique for each meter |
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| AES CBC Initial Vector according to FIPS 197 (LSB first): |
|---|
| = M Field + A Field + 8 bytes Acces No |
| = 68 50 78 56 34 12 8F 08 02 02 02 02 02 02 02 |

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This example shows a normal response and an “application error”, which is responded instead of expected data because the gateway applied a wrong CI-Field.

RSP-UD (wM-Bus)

| Byte No | | OMS wM-Bus frame | HCA -> GW | | Layer |
|---------|--------------|--|-------------|-------------|-----------------------|
| | | | | | |
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (33 bytes) | | 21h | Data Link Layer (DLL) |
| 2 | C Field | Respond user data | | 08h | |
| 3 | M Field | Manufacturer code | | 68h | |
| 4 | M Field | Manufacturer code | | 50h | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (=12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) of meter | | 12h | |
| 9 | A Field | Version (or Generation number) | | 8Fh | |
| 10 | A Field | Device type (Medium=HCA) | | 08h | |
| 11 | CRC 1 | | | E4h | ELL |
| 12 | CRC 1 | | | F8h | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (bidir.,RX off) | | 80h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | | 15h | |
| 16 | CI Field | 7Ah (short header) | | 7Ah | |
| 17 | Access No. | Access Number of GW | | 02h | # 1 |
| 18 | Status | Meter state | | 00h | |
| 19 | Config Field | NNNNCCRhb (1 encr. block) | | 10h | |
| 20 | Config Field | BASMMMMMb, (AES) | | 05h | Application Layer |
| 21 | AES-Verify | Encryption verification | 2Fh | FDh | |
| 22 | AES-Verify | Encryption verification | 2Fh | 26h | |
| 23 | DR1 | DIF (24 bit binary, StorageNo 0) | 03h | EFh | # 1 |
| 24 | DR1 | VIF (HCA-units) | 6Eh | 68h | |
| 25 | DR1 | Value LSB | 39h | ACH | |
| 26 | DR1 | Value (= 012345d = 003039h HCA-Units) | 30h | F6h | DLL |
| 27 | DR1 | Value MSB | 00h | 5Bh | |
| 28 | DR2 | DIF (16 bit binary, StorageNo 1) | 42h | Aeh | |
| 29 | CRC 2 | | | 39h | # 1 |
| 30 | CRC 2 | | | F9h | |
| 31 | DR2 | VIF (Date type G) | 6Ch | 02h | |
| 32 | DR2 | Value LSB | 3Fh | 8Bh | Application Layer |
| 33 | DR2 | Value MSB (= 31.12.2009) | 1Ch | FDh | |
| 34 | DR3 | DIF (24 bit binary, StorageNo 1) | 43h | C1h | |
| 35 | DR3 | VIF (HCA-units) | 6Eh | 88h | DLL |
| 36 | DR3 | Value LSB | A0h | D8h | |
| 37 | DR3 | Value (= 023456 = 005BA0h HCA-Units) | 5Bh | A9h | |
| 38 | DR3 | Value MSB | 00h | 72h | Application Layer |
| 39 | CRC 3 | | | D8h | |
| 40 | CRC 3 | | | DCh | |

or alternatively ...

RSP-UD (wM-Bus - Appl. Error)

| Byte No | OMS wM-Bus frame | | HCA -> GW | Layer |
|---------|------------------|---------------------------------------|-------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (18 bytes) | 12h | Data Link Layer (DLL) |
| 2 | C Field | Respond user data | 08h | |
| 3 | M Field | Manufacturer code | 68h | |
| 4 | M Field | Manufacturer code | 50h | |
| 5 | A Field | Ident No LSB (BCD) | 78h | |
| 6 | A Field | Ident No (BCD) | 56h | |
| 7 | A Field | Ident No (BCD) (=12345678) | 34h | |
| 8 | A Field | Ident No MSB (BCD) | 12h | |
| 9 | A Field | Version (or Generation number) | 8Fh | |
| 10 | A Field | Device type (Medium=HCA) | 08h | |
| 11 | CRC 1 | | 96h | ELL |
| 12 | CRC 1 | | 89h | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (bidir.,RX off) | 80h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | 15h | |
| 16 | CI Field | Application Error (short header) | 6Eh | |
| 17 | Access No. | Access Number of GW | 02h | |
| 18 | Status | Meter state "any application error" | 02h | |
| 19 | Config Field | 0000CCRhb | 00h | APL |
| 20 | Config Field | BASMMMMMb (no encryption) | 00h | |
| 21 | Error Code | CI-Field not implemented | 01h | DLL |
| 22 | CRC 2 | | B5h | |
| 23 | CRC 2 | | A3h | |

N.10 Demand for Access

This Example shows a Meter sending a ACC-DMD Message. The gateway acknowledges this demand. Thereafter the gateway is in charge to request the reason of this access demand from the meter.

NOTE: This is the only bidirectional communication initiated by the meter.

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 12345678 |
| Version | 2 |

| water meter with RF adapter example | |
|-------------------------------------|------------|
| Medium/device type | Water |
| Manufacturer | ZYX (6B38) |
| Ident number water meter | 38546816 |
| Version | 25 |

| RF adapter example | |
|-------------------------|-----------------|
| Medium/device type | Radio converter |
| Manufacturer | WEP (5CB0h) |
| Ident number RF-Adapter | 08154711 |
| Version | 17 |

ACC-DMD (wM-Bus)

| Byte No | OMS wM-Bus frame | | water meter -> GW | Layer |
|---------|------------------|--------------------------------------|-------------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Access demand to master | 48h | |
| 3 | M Field | Manufacturer code | B0h | |
| 4 | M Field | Manufacturer code | 5Ch | |
| 5 | A Field | Ident No LSB (BCD) | 11h | |
| 6 | A Field | Ident No (BCD) | 47h | |
| 7 | A Field | Ident No (BCD) | 15h | |
| 8 | A Field | Ident No MSB (BCD) of RF-Adapter | 08h | |
| 9 | A Field | Version (or Generation number) | 11h | |
| 10 | A Field | Device type (Medium=RF-Adapter) | 37h | |
| 11 | CRC 1 | | B3h | ELL |
| 12 | CRC 1 | | 65h | |
| 13 | CI Field | Extended Link Layer (2 bytes) | 8Ch | Transport Layer (TPL) |
| 14 | CC Field | Communication Control (bidir. sync.) | A0h | |
| 15 | Access No. | Access Number of Meter | 51h | |
| 16 | CI Field | CI-Field Pure Transport Layer | 8Bh | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | 16h | |
| 18 | Ident.Nr. | Ident No (BCD) | 68h | |
| 19 | Ident.Nr. | Ident No (BCD) | 54h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) of meter | 38h | |
| 21 | Manufr | Manufacturer code | 38h | |
| 22 | Manufr | Manufacturer code | 6Bh | |
| 23 | Version | Version (or Generation number) | 19h | DLL |
| 24 | Device type | Device type (Medium = Water) | 07h | |
| 25 | Access No. | Access Number of Meter | 51h | DLL |
| 26 | Status | Meter state | 00h | |
| 27 | Config Field | 0000CCRhb | 00h | DLL |
| 28 | Config Field | BASMMMMMb | 00h | |
| 29 | CRC 2 | | 0Eh | DLL |
| 30 | CRC 2 | | ACH | |

ACK (wM-Bus)

| Byte No | OMS wM-Bus frame | | GW -> water meter | Layer |
|---------|------------------|---------------------------------------|-------------------|-----------------------|
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| | | | | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Acknowledge | 00h | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 78h | |
| 6 | A Field | Ident No (BCD) | 56h | |
| 7 | A Field | Ident No (BCD) | 34h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 12h | |
| 9 | A Field | Version (or Generation number) | 02h | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | C2h | ELL |
| 12 | CRC 1 | | BAh | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (bidir, RX off) | 80h | Transport Layer (TPL) |
| 15 | Access No. | Access Number of GW | 51h | |
| 16 | CI Field | CI-Field Pure Transport Layer | 80h | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | 16h | |
| 18 | Ident.Nr. | Ident No (BCD) | 68h | |
| 19 | Ident.Nr. | Ident No (BCD) | 54h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) of meter | 38h | |
| 21 | Manufr | Manufacturer code | 38h | |
| 22 | Manufr | Manufacturer code | 6Bh | |
| 23 | Version | Version (or Generation number) | 19h | |
| 24 | Device type | Device type (Medium=Water) | 07h | |
| 25 | Access No. | Access Number of GW | 51h | |
| 26 | Status | GW-state RSSI level (-84 dBm) | 17h | |
| 27 | Config Field | 0000CCRhb | 00h | |
| 28 | Config Field | BASMMMMMb (no encr.) | 00h | |
| 29 | CRC 2 | | 55h | DLL |
| 30 | CRC 2 | | 37h | |

N.11 Reset of the Link by a SND-NKE

If the gateway intends to finish communication it sends a SND-NKE as last. The meter/actuator does not responds to this SND-NKE.

The SND-NKE is also applied by the gateway to signal the capability to receive this meter. The reception level allows an estimation of the link quality.

| GW example | |
|---------------|--------------------------|
| Medium | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 66778899 |
| Version | 12 |
| Meter-RSSI | -66 dBm |
| Access number | 03 |

| Example for cooling meter | |
|---------------------------|-------------|
| Medium | cool_outlet |
| Manufacturer | QDS |
| Ident number of Heatmeter | 11223344 |
| Version | 16 |
| Status (no error) | 0 |

SND-NKE (wM-Bus)

| Byte No | OMS wM-Bus frame | | GW -> cooling meter | Layer |
|---------|------------------|--|---------------------|-----------------------|
| | | | | |
| | Field Name | Content | Bytes [hex] | |
| | | | plain | |
| 1 | L Field | Length of data (25 bytes) | 19h | Data Link Layer (DLL) |
| 2 | C Field | Request user data class 2 (5Bh or 7Bh) | 40h | |
| 3 | M Field | Manufacturer code | 3Ah | |
| 4 | M Field | Manufacturer code | 63h | |
| 5 | A Field | Ident No LSB (BCD) | 99h | |
| 6 | A Field | Ident No (BCD) | 88h | |
| 7 | A Field | Ident No (BCD) (=66778899) | 77h | |
| 8 | A Field | Ident No MSB (BCD) of GW | 66h | |
| 9 | A Field | Version (or Generation number) | 0Ch | |
| 10 | A Field | Device type (Medium=COM) | 31h | |
| 11 | CRC 1 | | 9Bh | ELL |
| 12 | CRC 1 | | B7h | |
| 13 | CI Field | Extended Link Layer (short) | 8Ch | |
| 14 | CC Field | Communication Control (bidir., RX on) | 84h | Transport Layer (TPL) |
| 15 | Access No. | ELL-Access Counter of GW | 32h | |
| 16 | CI Field | GW -> Meter (long header) | 80h | |
| 17 | Ident.Nr. | Ident No LSB (BCD) | 44h | |
| 18 | Ident.Nr. | Ident No (BCD) | 33h | |
| 19 | Ident.Nr. | Ident No (BCD) (=11223344) | 22h | |
| 20 | Ident.Nr. | Ident No MSB (BCD) | 11h | |
| 21 | Manufr | Manufacturer code | 93h | |
| 22 | Manufr | Manufacturer code | 44h | |
| 23 | Version | Version (or Generation number) | 10h | |
| 24 | Device type | Device type (Medium=Cool_outlet) | 0Ah | DLL |
| 25 | Access No. | Access Number of GW | 03h | |
| 26 | Status | GW State RSSI level (-66dBm) | 20h | DLL |
| 27 | Config Field | 0000CCRhb | 00h | |
| 28 | Config Field | BASMMMMMb, (no encr.) | 00h | DLL |
| 29 | CRC 2 | | DAh | |
| 30 | CRC 2 | | 8Eh | |

N.12 Breaker (short ELL+AFL+ASP)

N.12.1 SND-NR (wM-Bus)

| Breaker example | |
|-----------------|-----------------|
| Medium | Breaker |
| Manufacturer | XYZ (633A) |
| Ident number | 12345678 |
| Version | 85 |
| Current state | connected (01h) |

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 87654321 |
| Version | 8 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message using Kenc
3. Calculate MAC using Kmac
4. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Message Counter C _M SND-NR (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc SND-NR |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F |

| MAC Session Key Kmac SND-NR |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C9 CD 19 FF 5A 9A AD 5A 6B BD A1 3B D2 C4 C7 AD |

SND-NR (wM-Bus)

| Byte No | | OMS wM-Bus frame | Breaker example | | Layer | |
|---------|--------------|--|-----------------|-----------|--|----|
| | | | | | | |
| | Field Name | Content | Bytes [hex] | | | |
| | | | plain | AES coded | | |
| 1 | L Field | Length of data (51 bytes) | | 33h | Data Link Layer (DLL) | |
| 2 | C Field | Send - No Reply | | 44h | | |
| 3 | M Field | Manufacturer code | | 3Ah | | |
| 4 | M Field | Manufacturer code | | 63h | | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | | |
| 6 | A Field | Ident No (BCD) | | 56h | | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | | |
| 9 | A Field | Version (or Generation number) | | 55h | | |
| 10 | A Field | Device type (Breaker) | | 20h | | |
| 11 | CRC 1 | | | E4h | | |
| 12 | CRC 1 | | | C9h | | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | ELL | |
| 14 | CC Field | Communication Control (bidi., RX on, Sync.) | | A4h | | |
| 15 | Access No. | ELL-Access Counter of actuator | | E5h | | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | Authentication and Fragmentation Layer (AFL) | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | | |
| 20 | MCL | Message Control Field | | 25h | | |
| 21 | MCR | Message Counter C _M (LSB) | | B3h | | |
| 22 | MCR | Message Counter C _M | | 0Ah | | |
| 23 | MCR | Message Counter C _M (e.g. = 2739) | | 00h | | |
| 24 | MCR | Message Counter C _M (MSB) | | 00h | | |
| 25 | MAC | AES-CMAC (MSB) | | EDh | | |
| 26 | MAC | AES-CMAC | | 17h | | |
| 27 | MAC | AES-CMAC | | 23h | | |
| 28 | MAC | AES-CMAC | | 68h | | |
| 29 | CRC 2 | | | E6h | DLL | |
| 30 | CRC 2 | | | B5h | | |
| 31 | MAC | AES-CMAC | | 27h | AFL | |
| 32 | MAC | AES-CMAC | | CEh | | |
| 33 | MAC | AES-CMAC | | A2h | | |
| 34 | MAC | AES-CMAC (LSB) | | FFh | | |
| 35 | CI Field | 7Ah (short header) | | 7Ah | Transport Layer TPL | |
| 36 | Access No. | TPL Access Counter of actuator | | 75h | | |
| 37 | Status | Status | | 00h | | |
| 38 | Config Field | NNNNPIIIb | | 10h | | |
| 39 | Config Field | CCZMMMMMb | | 07h | | |
| 40 | CFE | 0VDDKKKKb | | 10h | | |
| 41 | AES-Verify | Decryption verification | 2Fh | B3h | | |
| 42 | AES-Verify | Decryption verification | 2Fh | 8Ch | | |
| 43 | DR1 | DIF (8 bit integer) | 01h | 55h | | |
| | | | | | # | AP |

| | | | | | | |
|----|-------|---------------------------|-----|-----|-----|-------------------------|
| 44 | DR1 | VIF (2nd Extension table) | FDh | 00h | | |
| 45 | DR1 | VIFE (Remote control) | 1Fh | 99h | | |
| 46 | DR1 | Value (breaker conencted) | 01h | 33h | | |
| 47 | CRC 3 | | | A6h | DLL | |
| 48 | CRC 3 | | | 04h | | |
| 49 | Dummy | Fill Byte due to AES | 2Fh | 41h | # 1 | Application Layer (APL) |
| 50 | Dummy | Fill Byte due to AES | 2Fh | B1h | | |
| 51 | Dummy | Fill Byte due to AES | 2Fh | 23h | | |
| 52 | Dummy | Fill Byte due to AES | 2Fh | 67h | | |
| 53 | Dummy | Fill Byte due to AES | 2Fh | 4Fh | | |
| 54 | Dummy | Fill Byte due to AES | 2Fh | 59h | | |
| 55 | Dummy | Fill Byte due to AES | 2Fh | 38h | | |
| 56 | Dummy | Fill Byte due to AES | 2Fh | D2h | | |
| 57 | Dummy | Fill Byte due to AES | 2Fh | 99h | | |
| 58 | Dummy | Fill Byte due to AES | 2Fh | 33h | | |
| 59 | CRC 4 | | | 08h | DLL | |
| 60 | CRC 4 | | | 13h | | |

N.12.2 SND-UD2 (wM-Bus)

| Breaker example | |
|-----------------|-----------------|
| Medium | Breaker |
| Manufacturer | XYZ (633A) |
| Ident number | 12345678 |
| Version | 85 |
| Current state | connected (01h) |

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 87654321 |
| Version | 8 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message using Kenc
3. Calculate MAC using Kmac
4. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Message Counter C _{GW} SND-UD2 (LSB first): |
|--|
| = F0 0A 00 00 |

| Encryption Session Key Lenc SND-UD2 |
|---|
| = CMAC(Mk, 0x10 MCR IdentNo padding) |
| = CMAC(Mk, 10 F0 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C8 07 12 E7 20 02 5D B9 B4 B5 08 19 C2 44 50 35 |

| MAC Session Key Lmac SND-UD2 |
|---|
| = CMAC(Mk, 0x11 MCR IdentNo padding) |
| = CMAC(Mk, 11 F0 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = B6 85 94 D4 42 12 BB BB FD 99 05 CC 40 21 23 5B |

| |
|--|
| Application security key for disconnection & reconnection: (Key ID: 20h / Key Version: 00h) |
| = 08 15 47 11 08 15 47 11 08 15 47 11 08 15 47 11 |

SND-UD2 (wM-Bus)

| Byte No | | OMS wM-Bus frame | GW -> Breaker | | Layer |
|---------|-------------|---|---------------|-----------|--|
| | | | | | |
| | Field Name | Content | Bytes [hex] | | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (75 bytes) | | 4Bh | Data Link Layer (DLL) |
| 2 | C Field | Send - UserData2 | | 43h | |
| 3 | M Field | Manufacturer code | | 3Ah | |
| 4 | M Field | Manufacturer code | | 63h | |
| 5 | A Field | Ident No LSB (BCD) | | 21h | |
| 6 | A Field | Ident No (BCD) | | 43h | |
| 7 | A Field | Ident No (BCD) (= 87654321) | | 65h | |
| 8 | A Field | Ident No MSB (BCD) | | 87h | |
| 9 | A Field | Version (or Generation number) | | 08h | |
| 10 | A Field | Device type (Medium=COM) | | 31h | |
| 11 | CRC 1 | | | 87h | ELL |
| 12 | CRC 1 | | | 71h | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (bidir., RX on) | | 84h | Authentication and Fragmentation Layer (AFL) |
| 15 | Access No. | Access Number of GW | | 23h | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 20 | MCL | Message Control Field | | 25h | |
| 21 | MCR | Message Counter C _{GW} (LSB) | | F0h | |
| 22 | MCR | Message Counter C _{GW} | | 0Ah | |
| 23 | MCR | Message Counter C _{GW} (e.g. = 2800) | | 00h | |
| 24 | MCR | Message Counter C _{GW} (MSB) | | 00h | |
| 25 | MAC | AES-CMAC (MSB) | | 87h | DLL |
| 26 | MAC | AES-CMAC | | E2h | |
| 27 | MAC | AES-CMAC | | 77h | AFL |
| 28 | MAC | AES-CMAC | | 72h | |
| 29 | CRC 2 | | | 72h | AFL |
| 30 | CRC 2 | | | 44h | |
| 31 | MAC | AES-CMAC | | 2Eh | AFL |
| 32 | MAC | AES-CMAC | | 67h | |
| 33 | MAC | AES-CMAC | | 60h | |
| 34 | MAC | AES-CMAC (LSB) | | 3Dh | |
| 35 | CI Field | SITP command header long | | C3h | Transport Layer (TPL) |
| 36 | Ident.Nr. | Meter-ID | | 78h | |
| 37 | Ident.Nr. | Meter-ID | | 56h | |
| 38 | Ident.Nr. | Meter-ID | | 34h | |
| 39 | Ident.Nr. | Meter-ID | | 12h | |
| 40 | Manufr | Meter-Manufacturer-ID | | 3Ah | |
| 41 | Manufr | Meter-Manufacturer-ID | | 63h | |
| 42 | Version | Meter-Version | | 55h | |
| 43 | Device type | Meter-Device-Type | | 20h | |

| | | | | | |
|----|---------------------|---|-----|-----|-------------------------|
| 44 | Access No. | TPL Access Counter of GW | | 51h | |
| 45 | Status | GW State RSSI level (-66dBm) | | 20h | |
| 46 | Config Field | NNNNPIIIb | | 20h | |
| 47 | CRC 3 | | | FBh | DLL |
| 48 | CRC 3 | | | 1Bh | |
| 49 | Config Field | CCZMMMMMb | | 07h | |
| 50 | CFE | 0VDDKKKKb | | 10h | |
| 51 | AES-Verify | Decryption verification | 2Fh | 28h | |
| 52 | AES-Verify | Decryption verification | 2Fh | B2h | TPL |
| 53 | SITP BL | Block length (28 bytes) | 1Ch | 73h | |
| 54 | SITP BL | Block length | 00h | 59h | # 1 |
| 55 | SITP BID | Block ID field | 00h | ACH | |
| 56 | SITP BCF | Block control filed | 20h | 9Bh | |
| 57 | SITP Rec. ID | Recipient ID: No dedicated application | 00h | 83h | |
| 58 | SITP DSI | DSI Auth. AES128-CMAC (8 Byte MAC) | 32h | ABh | |
| 59 | SITP DSH1 | Wrapper Key ID | 20h | CDh | |
| 60 | SITP DSH2 | Wrapper Key Version | 00h | C8h | |
| 61 | SITP DS Key counter | Authentication Key counter = 15 | 0Fh | 7Fh | |
| 62 | SITP DS Key counter | Authentication Key counter | 00h | FDh | |
| 63 | SITP DS Key counter | Authentication Key counter | 00h | F8h | |
| 64 | SITP DS Key counter | Authentication Key counter | 00h | F2h | |
| 65 | CRC 4 | | | BAh | DLL |
| 66 | CRC 4 | | | D9h | |
| 67 | SITP DS Target Time | Target time "zero" for immediate action | 00h | FEh | # 1 |
| 68 | SITP DS Target Time | Target time | 00h | 8Eh | |
| 69 | SITP DS Target Time | Target time | 00h | 1Eh | # 2 |
| 70 | SITP DS Target Time | Target time | 00h | D8h | |
| 71 | SITP DS Target Time | Target time | 30h | F1h | |
| 72 | SITP DS PID | Protocol ID: M-Bus | 01h | 97h | |
| 73 | SITP DS APDU | DIF (8 bit integer) | 01h | 18h | |
| 74 | SITP DS APDU | VIF (2nd Extension table) | FDh | B7h | |
| 75 | SITP DS APDU | VIFE (Remote control) | 1Fh | 43h | |
| 76 | SITP DS APDU | Value (breaker disconnect) | 00h | 4Ch | |
| 77 | SITP DS MAC | MAC | FAh | 5Eh | |
| 78 | SITP DS MAC | MAC | 41h | AEh | |
| 79 | SITP DS MAC | MAC | E2h | D8h | Application Layer (APL) |
| 80 | SITP DS MAC | MAC | 81h | 66h | |
| 81 | SITP DS MAC | MAC | 2Dh | 3Fh | |
| 82 | SITP DS MAC | MAC | 44h | 15h | |
| 83 | CRC 5 | | | F3h | DLL |
| 84 | CRC 5 | | | 3Ah | |
| 85 | SITP DS MAC | MAC | 9Bh | C5h | # 2 |
| 86 | SITP DS MAC | MAC | 4Dh | CAh | APL |



| | | | | | |
|----|-------|--|--|-----|-----|
| 87 | CRC 6 | | | A1h | DLL |
| 88 | CRC 6 | | | 38h | |

N.12.3 RSP-UD (wM-Bus Set Breaker - successful)

| Breaker example | |
|-----------------|-----------------|
| Medium | Breaker |
| Manufacturer | XYZ (633A) |
| Ident number | 12345678 |
| Version | 85 |
| Current state | connected (01h) |

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 87654321 |
| Version | 8 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message using Kenc
3. Calculate MAC using Kmac
4. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Message Counter C _M RSP-UD (LSB first): |
|--|
| = F1 0A 00 00 |

| 'Encryption Session Key Kenc RSP-UD |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 F1 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = B1 F1 00 E8 F4 3B B4 48 02 95 F1 DC 4F 73 16 55 |

| MAC Session Key Kmac RSP-UD |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 F1 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = 2A DD 03 97 29 C2 85 3E 78 16 C5 DE 1C 21 BC 69 |

RSP-UD (wM-Bus successful command)

| Byte No | | OVS wM-Bus frame | Breaker -> GW | | Layer |
|---------|--------------|--|---------------|-----------|--|
| | | | | | |
| | Field Name | Content | Bytes [hex] | | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (67 bytes) | | 43h | Data Link Layer (DLL) |
| 2 | C Field | Response User Data | | 08h | |
| 3 | M Field | Manufacturer code | | 3Ah | |
| 4 | M Field | Manufacturer code | | 63h | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 55h | |
| 10 | A Field | Device type (Breaker) | | 20h | |
| 11 | CRC 1 | | | F2h | ELL |
| 12 | CRC 1 | | | 4Fh | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (bidir., RX on) | | 84h | Authentication and Fragmentation Layer (AFL) |
| 15 | Access No. | Access Number of GW | | 23h | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 20 | MCL | Message Control Field | | 25h | |
| 21 | MCR | Message Counter C _M (LSB) | | F1h | |
| 22 | MCR | Message Counter C _M | | 0Ah | |
| 23 | MCR | Message Counter C _M (e.g. = 2801) | | 00h | |
| 24 | MCR | Message Counter C _M (MSB) | | 00h | DLL |
| 25 | MAC | AES-CMAC (MSB) | | 1Ch | |
| 26 | MAC | AES-CMAC | | 56h | |
| 27 | MAC | AES-CMAC | | 6Dh | |
| 28 | MAC | AES-CMAC | | 47h | AFL |
| 29 | CRC 2 | | | D3h | |
| 30 | CRC 2 | | | EEh | |
| 31 | MAC | AES-CMAC | | ABh | |
| 32 | MAC | AES-CMAC | | 61h | Transport Layer TPL |
| 33 | MAC | AES-CMAC | | 87h | |
| 34 | MAC | AES-CMAC (LSB) | | 54h | |
| 35 | CI Field | SITP response header short | | C4h | |
| 36 | Access No. | TPL Access Counter of GW | | 51h | Transport Layer TPL |
| 37 | Status | Status | | 00h | |
| 38 | Config Field | NNNNPIIIb | | 20h | |
| 39 | Config Field | CCZMMMMMb | | 07h | |
| 40 | CFE | 0VDDKKKKb | | 10h | |
| 41 | AES-Verify | Decryption verification | 2Fh | 2Dh | |
| 42 | AES-Verify | Decryption verification | 2Fh | A5h | |

| | | | | | | |
|----|---------------------|---|-----|-----|-----|-------------------------|
| 43 | SITP BL | Block length (28 bytes) | 1Ch | 7Dh | # 1 | APL |
| 44 | SITP BL | Block length | 00h | 88h | | |
| 45 | SITP BID | Block ID field | 00h | 41h | | |
| 46 | SITP BCF | Block control filed | A0h | 81h | | |
| 47 | CRC 3 | | | FFh | DLL | |
| 48 | CRC 3 | | | 44h | | |
| 49 | SITP Rec. ID | Recipient ID: No dedicated application | 00h | E5h | # 1 | Application Layer (APL) |
| 50 | SITP DSI | DSI Auth. AES128-CMAC (8 Byte MAC) | 32h | 37h | | |
| 51 | SITP DSH1 | Wrapper Key ID | 20h | 6Ch | | |
| 52 | SITP DSH2 | Wrapper Key Version | 00h | 0Fh | | |
| 53 | SITP DS Key counter | Authentication Key counter = 15 | 0Fh | 7Ch | | |
| 54 | SITP DS Key counter | Authentication Key counter | 00h | 9Fh | | |
| 55 | SITP DS Key counter | Authentication Key counter | 00h | 86h | | |
| 56 | SITP DS Key counter | Authentication Key counter | 00h | 10h | | |
| 57 | SITP DS Target Time | Target time "zero" for immediate action | 00h | 08h | | |
| 58 | SITP DS Target Time | Target time | 00h | 22h | | |
| 59 | SITP DS Target Time | Target time | 00h | C3h | | |
| 60 | SITP DS Target Time | Target time | 00h | 3Ch | | |
| 61 | SITP DS Target Time | Target time | 30h | F7h | | |
| 62 | SITP DS PID | Protocol ID: M-Bus | 01h | CDh | | |
| 63 | SITP DS APDU | DIF (8 bit integer) | 01h | FDh | | |
| 64 | SITP DS APDU | VIF (2nd Extension table) | FDh | B8h | | |
| 65 | CRC 4 | | | 33h | DLL | |
| 66 | CRC 4 | | | 73h | | |
| 67 | SITP DS APDU | VIFE (Remote control) | 1Fh | 41h | #2 | Application Layer (APL) |
| 68 | SITP DS APDU | Value (breaker disconnected) | 00h | 1Ch | | |
| 69 | SITP DS MAC | MAC | FAh | 20h | | |
| 70 | SITP DS MAC | MAC | 41h | D4h | | |
| 71 | SITP DS MAC | MAC | E2h | 77h | | |
| 72 | SITP DS MAC | MAC | 81h | D8h | | |
| 73 | SITP DS MAC | MAC | 2Dh | C5h | | |
| 74 | SITP DS MAC | MAC | 44h | A6h | | |
| 75 | SITP DS MAC | MAC | 9Bh | 7Fh | | |
| 76 | SITP DS MAC | MAC | 4Dh | 37h | | |
| 77 | CRC 5 | | | 57h | DLL | |
| 78 | CRC 5 | | | 29h | | |

N.12.4 RSP-UD (wM-Bus Set Breaker - failure)

| Breaker example | |
|-----------------|-----------------|
| Medium | Breaker |
| Manufacturer | XYZ (633A) |
| Ident number | 12345678 |
| Version | 85 |
| Current state | connected (01h) |

| GW example | |
|--------------------|--------------------------|
| Medium/device type | Communication Controller |
| Manufacturer | XYZ (633A) |
| Ident number | 87654321 |
| Version | 8 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message using Kenc
3. Calculate MAC using Kmac
4. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Message Counter C _M RSP-UD (LSB first): |
|--|
| = F1 0A 00 00 |

| 'Encryption Session Key Kenc RSP-UD |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 F1 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = B1 F1 00 E8 F4 3B B4 48 02 95 F1 DC 4F 73 16 55 |

| MAC Session Key Kmac RSP-UD |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 F1 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = 2A DD 03 97 29 C2 85 3E 78 16 C5 DE 1C 21 BC 69 |

RSP-UD (wM-Bus Key version error)

| Byte No | | OMS wM-Bus frame | Breaker -> GW | | Layer |
|---------|--------------|--|---------------|-----------|--|
| | | | | | |
| | Field Name | Content | Bytes [hex] | | |
| | | | plain | AES coded | |
| 1 | L Field | Length of data (51 bytes) | | 33h | Data Link Layer (DLL) |
| 2 | C Field | Response User Data | | 08h | |
| 3 | M Field | Manufacturer code | | 3Ah | |
| 4 | M Field | Manufacturer code | | 63h | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 55h | |
| 10 | A Field | Device type (Breaker) | | 20h | |
| 11 | CRC 1 | | | 71h | ELL |
| 12 | CRC 1 | | | 58h | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control (bidi., RX on) | | 84h | Authentication and Fragmentation Layer (AFL) |
| 15 | Access No. | Access Number of GW | | 23h | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 20 | MCL | Message Control Field | | 25h | |
| 21 | MCR | Message Counter C _M (LSB) | | F1h | |
| 22 | MCR | Message Counter C _M | | 0Ah | |
| 23 | MCR | Message Counter C _M (e.g. = 2801) | | 00h | |
| 24 | MCR | Message Counter C _M (MSB) | | 00h | DLL |
| 25 | MAC | AES-CMAC (MSB) | | 42h | |
| 26 | MAC | AES-CMAC | | 2Fh | AFL |
| 27 | MAC | AES-CMAC | | B1h | |
| 28 | MAC | AES-CMAC | | 26h | |
| 29 | CRC 2 | | | DEh | |
| 30 | CRC 2 | | | C8h | Transport Layer TPL |
| 31 | MAC | AES-CMAC | | 14h | |
| 32 | MAC | AES-CMAC | | 37h | |
| 33 | MAC | AES-CMAC | | 55h | |
| 34 | MAC | AES-CMAC (LSB) | | 97h | Transport Layer TPL |
| 35 | CI Field | SITP response header short | | C4h | |
| 36 | Access No. | TPL Access Counter of GW | | 51h | |
| 37 | Status | Status (application error) | | 02h | |
| 38 | Config Field | NNNNPIIb (TPL-Padding) | | 18h | |
| 39 | Config Field | CCZMMMMMb | | 07h | |
| 40 | CFE | 0VDDKKKKb | | 10h | |
| 41 | AES-Verifv | Decryption verification | 2Fh | B3h | |

| | | | | | | |
|----|--------------|---|-----|-----|-----|-----|
| 42 | AES-Verify | Decryption verification | 2Fh | 15h | # 1 | APL |
| 43 | SITP BL | Block length (7 bytes) | 07h | C2h | | |
| 44 | SITP BL | Block length | 00h | E1h | | |
| 45 | SITP BID | Block ID field | 00h | A0h | | |
| 46 | SITP BCF | Block control field | A0h | 72h | | |
| 47 | CRC 3 | | | 39h | DLL | |
| 48 | CRC 3 | | | 2Eh | | |
| 49 | SITP Rec. ID | Recipient ID: No dedicated application | 00h | 1Eh | # 1 | APL |
| 50 | SITP DSI | DSI Status response | 22h | E7h | | |
| 51 | SITP DSH1 | Key ID | 20h | 4Eh | | |
| 52 | SITP DSH2 | Key Version | 00h | 35h | | |
| 53 | SITP SR | Stat. Rsp. "DSH error: Unknown or invalid Key ID/Version" | 19h | 03h | #1 | TPL |
| 54 | TPL-Padding | Padding | 05h | ADh | | |
| 55 | TPL-Padding | Padding | 05h | 47h | | |
| 56 | TPL-Padding | Padding | 05h | 9Fh | | |
| 57 | TPL-Padding | Padding | 05h | 0Fh | | |
| 58 | TPL-Padding | Padding | 05h | 0Dh | | |
| 59 | CRC 4 | | | 12h | DLL | |
| 60 | CRC 4 | | | 41h | | |

N.13 SND-NR (wM-Bus) with TAF7 Data with compact profile (acc. to Annex R)

| Electricity meter example | |
|---------------------------|-------------|
| Medium | Electricity |
| Manufacturer | OMG |
| Ident number | 12345678 |
| Version | 1 |
| Total energy import (+A) | 1966,0 Wh |
| Total energy export (-A) | 305,1 Wh |
| Actuality duration | 3 s |
| Error code binary | 0 |

ToDo:

1. Calculate Session Keys
2. Encrypt Message using Kenc
3. Calculate MAC using Kmac
4. Calculate CRCs

| Individual Master Key Mk (see 9.1): |
|---|
| = 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F |

| Current Message Counter C (LSB first): |
|--|
| = B3 0A 00 00 |

| Encryption Session Key Kenc |
|---|
| = CMAC(Mk, 0x00 MCR IdentNo padding) |
| = CMAC(Mk, 00 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = EC CF 39 D4 75 D7 30 B8 28 4F DF DC 19 95 D5 2F |

| MAC Session Key Kmac |
|---|
| = CMAC(Mk, 0x01 MCR IdentNo padding) |
| = CMAC(Mk, 01 B3 0A 00 00 78 56 34 12 ... |
| ... 07 07 07 07 07 07 07) |
| = C9 CD 19 FF 5A 9A AD 5A 6B BD A1 3B D2 C4 C7 AD |

SND-NR (wM-Bus)

| Byte No | OMS wM-Bus frame | | Electricity meter example | | Layer |
|---------|------------------|--|---------------------------|-------------|--|
| | Field Name | Content | Bytes [hex] | Bytes [hex] | |
| | | | plain | AES coded | |
| | | | | | |
| 1 | L Field | Length of data (211 bytes) | | D3h | Data Link Layer (DLL) |
| 2 | C Field | Send - No Reply | | 44h | |
| 3 | M Field | Manufacturer code | | A7h | |
| 4 | M Field | Manufacturer code | | 3Dh | |
| 5 | A Field | Ident No LSB (BCD) | | 78h | |
| 6 | A Field | Ident No (BCD) | | 56h | |
| 7 | A Field | Ident No (BCD) (= 12345678) | | 34h | |
| 8 | A Field | Ident No MSB (BCD) | | 12h | |
| 9 | A Field | Version (or Generation number) | | 01h | |
| 10 | A Field | Device type (Electricity) | | 02h | |
| 11 | CRC 1 | | | ABh | ELL |
| 12 | CRC 1 | | | FDh | |
| 13 | CI Field | Extended Link Layer (short) | | 8Ch | |
| 14 | CC Field | Communication Control | | 20h | Authentication and Fragmentation Layer (AFL) |
| 15 | Access No. | ELL-Access Counter of Meter | | 0Ah | |
| 16 | CI Field | Authentication and Fragmentation layer | | 90h | |
| 17 | AFL | AFL Length (all AFL bytes after AFL) | | 0Fh | |
| 18 | FCL | Fragmentation Control Field (LSB) | | 00h | |
| 19 | FCL | Fragmentation Control Field (MSB) | | 2Ch | |
| 20 | MCL | Message Control Field | | 25h | |
| 21 | MCR | Message Counter C (LSB) | | B3h | |
| 22 | MCR | Message Counter C | | 0Ah | |
| 23 | MCR | Message Counter C (e.g. = 2739) | | 00h | |
| 24 | MCR | Message Counter C (MSB) | | 00h | |
| 25 | MAC | AES-CMAC (MSB) | | B2h | DLL |
| 26 | MAC | AES-CMAC | | 7Ch | |
| 27 | MAC | AES-CMAC | | 7Eh | |
| 28 | MAC | AES-CMAC | | BEh | |
| 29 | CRC 2 | | | 85h | AFL |
| 30 | CRC 2 | | | D0h | |
| 31 | MAC | AES-CMAC | | A0h | Transport Layer |
| 32 | MAC | AES-CMAC | | 10h | |
| 33 | MAC | AES-CMAC | | C9h | |
| 34 | MAC | AES-CMAC (LSB) | | 53h | |
| 35 | CI Field | 7Ah (short header) | | 7Ah | Transport Layer |
| 36 | Access No. | TPL Access Counter of Meter | | 0Ah | |
| 37 | Status | Meter status | | 00h | |
| 38 | Config Field | NNNNPIIIb | | B0h | |
| 39 | Config Field | CCZMMMMMb | | 07h | |

| | | | | | | |
|----|------------|---------------------------------------|-----|------|-----|-------------------------|
| 40 | CFE | 0VDDKKKKb | | 10h | | |
| 41 | AES-Verify | Decryption verification | 2Fh | 0Dh | | |
| 42 | AES-Verify | Decryption verification | 2Fh | 5Eh | | |
| 43 | DR1 | DIF (12 digit BCD) | 0Eh | E0h | # 1 | APL |
| 44 | DR1 | VIF (Energy 0,1 Wh) | 02h | 6Ch | | |
| 45 | DR1 | Value LSB | 60h | 03h | | |
| 46 | DR1 | Value | 99h | 08h | | |
| 47 | CRC 3 | | | 8Eh | DLL | |
| 48 | CRC 3 | | | ABh | | |
| 49 | DR1 | Value | 01h | 5Eh | # 1 | Application Layer (APL) |
| 50 | DR1 | Value | 00h | FCCh | | |
| 51 | DR1 | Value (1996,0 Wh) | 00h | 73h | | |
| 52 | DR1 | Value MSB | 00h | ACCh | | |
| 53 | DR2 | DIF (12 digit BCD) | 0Eh | C3h | | |
| 54 | DR2 | VIF (Energy 0,1 Wh) + | 82h | D8h | | |
| 55 | DR2 | VIFE (Backward Flow) | 3Ch | 39h | | |
| 56 | DR2 | Value LSB | 51h | C7h | | |
| 57 | DR2 | Value | 30h | E8h | | |
| 58 | DR2 | Value | 00h | 7Eh | | |
| 59 | DR2 | Value | 00h | B4h | # 2 | |
| 60 | DR2 | Value (305,1 Wh) | 00h | 1Fh | | |
| 61 | DR2 | Value MSB | 00h | BFh | | |
| 62 | DR3 | DIF (Varlen) + | CDh | 95h | | |
| 63 | DR3 | DIFE (Storagenumber 3 - Base Time) | 01h | 59h | | |
| 64 | DR3 | VIF (Time Offset - Type M) | 6Dh | E6h | DLL | |
| 65 | CRC 4 | | | 3Bh | | |
| 66 | CRC 4 | | | 7Ch | # 2 | Application Layer (APL) |
| 67 | DR3 | LVAR (2 Byte) | E2h | 6Fh | | |
| 68 | DR3 | Value LSB (Date Type M, Offset 3 Sec) | 03h | ABh | | |
| 69 | DR3 | Value MSB | 30h | 2Bh | | |
| 70 | DR4 | DIF (12 digit BCD) + | CEh | 35h | | |
| 71 | DR4 | DIFE (Storagenumber 3 - Base Value) | 01h | 2Bh | | |
| 72 | DR4 | VIF (Energy 1,0 Wh) | 03h | F3h | | |
| 73 | DR4 | Value LSB | 95h | F0h | | |
| 74 | DR4 | Value | 19h | A0h | | |
| 75 | DR4 | Value | 00h | 93h | | |
| 76 | DR4 | Value | 00h | 6Ch | # 3 | |
| 77 | DR4 | Value (1995 Wh) | 00h | 58h | | |
| 78 | DR4 | Value MSB | 00h | 96h | | |
| 79 | DR5 | DIF (VarLen) + | CDh | 78h | | |
| 80 | DR5 | DIFE (Storagenumber 3) | 01h | 1Bh | | |
| 81 | DR5 | VIF (Energy 1,0 Wh) + | 83h | 37h | DLL | |
| 82 | DR5 | VIFE (Inverse Compact Profile) | 13h | 6Dh | | |
| 83 | CRC 5 | | | 78h | DLL | |
| 84 | CRC 5 | | | A5h | | |
| 85 | DR5 | LVAR (48 Byte) | 30h | 18h | # 3 | Application Layer (APL) |
| 86 | DR5 | SCB (Increments + 1 Byte) | 41h | 1Dh | | |
| 87 | DR5 | SVB (8 seconds spacing) | 08h | D0h | | |
| 88 | DR5 | Value (1994 Wh) #01 | 01h | CDh | | |

| | | | | | | |
|-----|-------|---------------------|-----|------|-----|-------------------------|
| 89 | DR5 | Value (1991 Wh) #02 | 03h | 6Ah | # 4 | |
| 90 | DR5 | Value (1986 Wh) #03 | 05h | CDh | | |
| 91 | DR5 | Value (1979 Wh) #04 | 07h | 20h | | |
| 92 | DR5 | Value (1970 Wh) #05 | 09h | BAh | | |
| 93 | DR5 | Value (1962 Wh) #06 | 08h | 20h | | |
| 94 | DR5 | Value (1956 Wh) #07 | 06h | 03h | | |
| 95 | DR5 | Value (1952 Wh) #08 | 04h | D8h | | |
| 96 | DR5 | Value (1950 Wh) #09 | 02h | 23h | | |
| 97 | DR5 | Value (1950 Wh) #10 | 00h | BEh | | |
| 98 | DR5 | Value (1950 Wh) #11 | 00h | 0Ah | | |
| 99 | DR5 | Value (1950 Wh) #12 | 00h | 2Ah | | |
| 100 | DR5 | Value (1950 Wh) #13 | 00h | BBh | | |
| 101 | CRC 6 | | | 7Fh | DLL | |
| 102 | CRC 6 | | | 01h | | |
| 103 | DR5 | Value (1950 Wh) #14 | 00h | 9Fh | # 4 | Application Layer (APL) |
| 104 | DR5 | Value (1950 Wh) #15 | 00h | 16h | | |
| 105 | DR5 | Value (1950 Wh) #16 | 00h | 42h | | |
| 106 | DR5 | Value (1950 Wh) #17 | 00h | E9h | | |
| 107 | DR5 | Value (1950 Wh) #18 | 00h | E4h | | |
| 108 | DR5 | Value (1950 Wh) #19 | 00h | EAh | | |
| 109 | DR5 | Value (1950 Wh) #20 | 00h | F1h | | |
| 110 | DR5 | Value (1949 Wh) #21 | 01h | FCCh | | |
| 111 | DR5 | Value (1946 Wh) #22 | 03h | 7Eh | | |
| 112 | DR5 | Value (1941 Wh) #23 | 05h | 4Eh | | |
| 113 | DR5 | Value (1934 Wh) #24 | 07h | 52h | # 5 | |
| 114 | DR5 | Value (1925 Wh) #25 | 09h | 6Fh | | |
| 115 | DR5 | Value (1917 Wh) #26 | 08h | 07h | | |
| 116 | DR5 | Value (1911 Wh) #27 | 06h | 93h | | |
| 117 | DR5 | Value (1907 Wh) #28 | 04h | 13h | | |
| 118 | DR5 | Value (1905 Wh) #29 | 02h | 05h | | |
| 119 | CRC 7 | | | C4h | DLL | |
| 120 | CRC 7 | | | 60h | | |
| 121 | DR5 | Value (1905 Wh) #30 | 00h | A8h | # 5 | Application Layer (APL) |
| 122 | DR5 | Value (1905 Wh) #31 | 00h | E3h | | |
| 123 | DR5 | Value (1905 Wh) #32 | 00h | DEh | | |
| 124 | DR5 | Value (1905 Wh) #33 | 00h | CCh | | |
| 125 | DR5 | Value (1905 Wh) #34 | 00h | AFh | | |
| 126 | DR5 | Value (1905 Wh) #35 | 00h | 99h | | |
| 127 | DR5 | Value (1905 Wh) #36 | 00h | A0h | | |
| 128 | DR5 | Value (1905 Wh) #37 | 00h | 63h | | |
| 129 | DR5 | Value (1905 Wh) #38 | 00h | 74h | | |
| 130 | DR5 | Value (1905 Wh) #39 | 00h | 9Ah | | |
| 131 | DR5 | Value (1905 Wh) #40 | 00h | 10h | # 6 | |
| 132 | DR5 | Value (1904 Wh) #41 | 01h | 9Eh | | |
| 133 | DR5 | Value (1901 Wh) #42 | 03h | 78h | | |
| 134 | DR5 | Value (1896 Wh) #43 | 05h | 2Bh | | |
| 135 | DR5 | Value (1889 Wh) #44 | 07h | B1h | | |
| 136 | DR5 | Value (1880 Wh) #45 | 09h | 16h | | |
| 137 | CRC 8 | | | A4h | DLL | |
| 138 | CRC 8 | | | 78h | | |

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|-----|--------|-------------------------------------|-----|------|-----|-------------------------|
| 139 | DR5 | Value (1872 Wh) #46 | 08h | 28h | # 6 | Application Layer (APL) |
| 140 | DR6 | DIF (12 digit BCD) + | CEh | 14h | | |
| 141 | DR6 | DIFE (Storagenumber 3 - Base Value) | 01h | 82h | | |
| 142 | DR6 | VIF (Energy 1,0 Wh) + | 83h | 85h | | |
| 143 | DR6 | VIFE (Backward Flow) | 3Ch | EFh | | |
| 144 | DR6 | Value LSB | 05h | 59h | | |
| 145 | DR6 | Value | 03h | 10h | # 7 | Application Layer (APL) |
| 146 | DR6 | Value | 00h | 7Fh | | |
| 147 | DR6 | Value | 00h | 54h | | |
| 148 | DR6 | Value (305 Wh) | 00h | 93h | | |
| 149 | DR6 | Value MSB | 00h | D8h | | |
| 150 | DR7 | DIF (VarLen) + | CDh | D2h | | |
| 151 | DR7 | DIFE (Storagenumber 3) | 01h | 80h | # 7 | Application Layer (APL) |
| 152 | DR7 | VIF (Energy 1,0 Wh) + | 83h | 73h | | |
| 153 | DR7 | VIFE (Backward Flow) + | BCh | 1Ah | | |
| 154 | DR7 | VIFE (Inverse Compact Profile) | 13h | BEh | | |
| 155 | CRC 9 | | | 8Fh | DLL | Application Layer (APL) |
| 156 | CRC 9 | | | 5Bh | | |
| 157 | DR7 | LVAR (48 Byte) | 30h | ABh | # 7 | Application Layer (APL) |
| 158 | DR7 | SCB (Increments + 1 Byte) | 41h | FEh | | |
| 159 | DR7 | SVB (8 seconds spacing) | 08h | 1Ch | | |
| 160 | DR7 | Value (305 Wh) #01 | 00h | 42h | | |
| 161 | DR7 | Value (305 Wh) #02 | 00h | 49h | | |
| 162 | DR7 | Value (305 Wh) #03 | 00h | 53h | | |
| 163 | DR7 | Value (305 Wh) #04 | 00h | E7h | | |
| 164 | DR7 | Value (305 Wh) #05 | 00h | D6h | | |
| 165 | DR7 | Value (305 Wh) #06 | 00h | EBh | # 8 | Application Layer (APL) |
| 166 | DR7 | Value (305 Wh) #07 | 00h | 10h | | |
| 167 | DR7 | Value (305 Wh) #08 | 00h | 10h | | |
| 168 | DR7 | Value (305 Wh) #09 | 00h | CCCh | | |
| 169 | DR7 | Value (305 Wh) #10 | 00h | 6Eh | | |
| 170 | DR7 | Value (304 Wh) #11 | 01h | 07h | | |
| 171 | DR7 | Value (301 Wh) #12 | 03h | 13h | | |
| 172 | DR7 | Value (296 Wh) #13 | 05h | 32h | | |
| 173 | CRC 10 | | | 6Ah | DLL | Application Layer (APL) |
| 174 | CRC 10 | | | BAh | | |
| 175 | DR7 | Value (289 Wh) #14 | 07h | A6h | # 8 | Application Layer (APL) |
| 176 | DR7 | Value (280 Wh) #15 | 09h | E1h | | |
| 177 | DR7 | Value (272 Wh) #16 | 08h | 4Eh | | |
| 178 | DR7 | Value (266 Wh) #17 | 06h | B2h | | |
| 179 | DR7 | Value (262 Wh) #18 | 04h | 96h | | |
| 180 | DR7 | Value (260 Wh) #19 | 02h | B1h | | |
| 181 | DR7 | Value (260 Wh) #20 | 00h | 08h | | |
| 182 | DR7 | Value (260 Wh) #21 | 00h | D2h | | |
| 183 | DR7 | Value (260 Wh) #22 | 00h | 94h | # 9 | Application Layer (APL) |
| 184 | DR7 | Value (260 Wh) #23 | 00h | ADh | | |
| 185 | DR7 | Value (260 Wh) #24 | 00h | 08h | | |
| 186 | DR7 | Value (260 Wh) #25 | 00h | FAh | | |
| 187 | DR7 | Value (260 Wh) #26 | 00h | 93h | | |

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|-----|--------|--------------------------------------|-----|-----|------|-------------------------|
| 188 | DR7 | Value (260 Wh) #27 | 00h | 9Ah | | |
| 189 | DR7 | Value (260 Wh) #28 | 00h | 71h | | |
| 190 | DR7 | Value (260 Wh) #29 | 00h | 64h | | |
| 191 | CRC 11 | | | E2h | DLL | |
| 192 | CRC 11 | | | 08h | | |
| 193 | DR7 | Value (260 Wh) #30 | 00h | 13h | # 9 | Application Layer (APL) |
| 194 | DR7 | Value (259 Wh) #31 | 01h | 25h | | |
| 195 | DR7 | Value (256 Wh) #32 | 03h | E1h | | |
| 196 | DR7 | Value (251 Wh) #33 | 05h | AFh | | |
| 197 | DR7 | Value (244 Wh) #34 | 07h | 8Fh | | |
| 198 | DR7 | Value (235 Wh) #35 | 09h | 7Eh | | |
| 199 | DR7 | Value (227 Wh) #36 | 08h | 78h | | |
| 200 | DR7 | Value (221 Wh) #37 | 06h | BAh | | |
| 201 | DR7 | Value (217 Wh) #38 | 04h | B4h | | |
| 202 | DR7 | Value (215 Wh) #39 | 02h | B8h | | |
| 203 | DR7 | Value (215 Wh) #40 | 00h | B8h | # 10 | Application Layer (APL) |
| 204 | DR7 | Value (215 Wh) #41 | 00h | 0Fh | | |
| 205 | DR7 | Value (215 Wh) #42 | 00h | 50h | | |
| 206 | DR7 | Value (215 Wh) #43 | 00h | 1Ch | | |
| 207 | DR7 | Value (215 Wh) #44 | 00h | 33h | | |
| 208 | DR7 | Value (215 Wh) #45 | 00h | CBh | | |
| 209 | CRC 12 | | | 06h | DLL | |
| 210 | CRC 12 | | | 03h | | |
| 211 | DR7 | Value (215 Wh) #46 | 00h | 9Fh | # 10 | Application Layer (APL) |
| 212 | DR8 | DIF (1 Byte) + | C1h | 99h | | |
| 213 | DR8 | DIFE (Storagenumber 3) | 01h | 41h | | |
| 214 | DR8 | VIF (Actuality duration) | 74h | B1h | | |
| 215 | DR8 | Value (3 s) | 03h | 33h | | |
| 216 | DR9 | DIF (2 Byte) | 02h | 83h | | |
| 217 | DR9 | VIF (Extension Table) | FDh | 67h | | |
| 218 | DR9 | VIFE (Error Flags Field) | 97h | 78h | | |
| 219 | DR9 | VIFE (Standard conform data content) | 1Dh | 91h | | |
| 220 | DR9 | Value (LSB) | 00h | 09h | | |
| 221 | DR9 | Value (MSB) | 00h | 75h | # 11 | Application Layer (APL) |
| 222 | Dummy | Fill Byte due to AES | 2Fh | 39h | | |
| 223 | Dummy | Fill Byte due to AES | 2Fh | 89h | | |
| 224 | Dummy | Fill Byte due to AES | 2Fh | FDh | | |
| 225 | Dummy | Fill Byte due to AES | 2Fh | 1Ch | | |
| 226 | Dummy | Fill Byte due to AES | 2Fh | 5Dh | | |
| 227 | CRC 13 | | | 5Ah | DLL | |
| 228 | CRC 13 | | | 87h | | |
| 229 | Dummy | Fill Byte due to AES | 2Fh | A2h | # 11 | Application Layer (APL) |
| 230 | Dummy | Fill Byte due to AES | 2Fh | 7Eh | | |
| 231 | Dummy | Fill Byte due to AES | 2Fh | A5h | | |
| 232 | Dummy | Fill Byte due to AES | 2Fh | 25h | | |
| 233 | Dummy | Fill Byte due to AES | 2Fh | BCh | | |
| 234 | Dummy | Fill Byte due to AES | 2Fh | 99h | | |
| 235 | Dummy | Fill Byte due to AES | 2Fh | F1h | | |
| 236 | Dummy | Fill Byte due to AES | 2Fh | 3Bh | | |

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|-----|--------|----------------------|-----|-----|-----|--|
| 237 | Dummy | Fill Byte due to AES | 2Fh | 3Eh | | |
| 238 | Dummy | Fill Byte due to AES | 2Fh | 3Ah | | |
| 239 | CRC 14 | | | 19h | DLL | |
| 240 | CRC 14 | | | 57h | | |

| Time (RX-Timestamp) = 12:16:05 pm | Time | Value in Wh (Import +A) | Diff. value in Wh (+A) | Value in Wh (Export -A) | Diff. value in Wh (-A) | Explanation |
|---|----------|----------------------------------|------------------------------|----------------------------------|------------------------------|--------------------------|
| (RX-Timestamp) - 3s | 12:16:02 | 1995 | | 305 | | Base value |
| (RX-Timestamp) - 3s - 8s | 12:15:54 | 1994 | 1 | 305 | 0 | inv. compact profile #01 |
| (RX-Timestamp) - 3s - 16s | 12:15:46 | 1991 | 3 | 305 | 0 | inv. compact profile #02 |
| (RX-Timestamp) - 3s - 24s | 12:15:38 | 1986 | 5 | 305 | 0 | inv. compact profile #03 |
| (RX-Timestamp) - 3s - 32s | 12:15:30 | 1979 | 7 | 305 | 0 | inv. compact profile #04 |
| (RX-Timestamp) - 3s - 40s | 12:15:22 | 1970 | 9 | 305 | 0 | inv. compact profile #05 |
| (RX-Timestamp) - 3s - 48s | 12:15:14 | 1962 | 8 | 305 | 0 | inv. compact profile #06 |
| (RX-Timestamp) - 3s - 56s | 12:15:06 | 1956 | 6 | 305 | 0 | inv. compact profile #07 |
| (RX-Timestamp) - 3s - 64s | 12:14:58 | 1952 | 4 | 305 | 0 | inv. compact profile #08 |
| (RX-Timestamp) - 3s - 72s | 12:14:50 | 1950 | 2 | 305 | 0 | inv. compact profile #09 |
| (RX-Timestamp) - 3s - 80s | 12:14:42 | 1950 | 0 | 305 | 0 | inv. compact profile #10 |
| (RX-Timestamp) - 3s - 88s | 12:14:34 | 1950 | 0 | 304 | 1 | inv. compact profile #11 |
| (RX-Timestamp) - 3s - 96s | 12:14:26 | 1950 | 0 | 301 | 3 | inv. compact profile #12 |
| (RX-Timestamp) - 3s - 104s | 12:14:18 | 1950 | 0 | 296 | 5 | inv. compact profile #13 |
| (RX-Timestamp) - 3s - 112s | 12:14:10 | 1950 | 0 | 289 | 7 | inv. compact profile #14 |
| (RX-Timestamp) - 3s - 120s | 12:14:02 | 1950 | 0 | 280 | 9 | inv. compact profile #15 |
| (RX-Timestamp) - 3s - 128s | 12:13:54 | 1950 | 0 | 272 | 8 | inv. compact profile #16 |
| (RX-Timestamp) - 3s - 136s | 12:13:46 | 1950 | 0 | 266 | 6 | inv. compact profile #17 |
| (RX-Timestamp) - 3s - 144s | 12:13:38 | 1950 | 0 | 262 | 4 | inv. compact profile #18 |
| (RX-Timestamp) - 3s - 152s | 12:13:30 | 1950 | 0 | 260 | 2 | inv. compact profile #19 |
| (RX-Timestamp) - 3s - 160s | 12:13:22 | 1950 | 0 | 260 | 0 | inv. compact profile #20 |
| (RX-Timestamp) - 3s - 168s | 12:13:14 | 1949 | 1 | 260 | 0 | inv. compact profile #21 |
| (RX-Timestamp) - 3s - 176s | 12:13:06 | 1946 | 3 | 260 | 0 | inv. compact profile #22 |
| (RX-Timestamp) - 3s - 184s | 12:12:58 | 1941 | 5 | 260 | 0 | inv. compact profile #23 |
| (RX-Timestamp) - 3s - 192s | 12:12:50 | 1934 | 7 | 260 | 0 | inv. compact profile #24 |
| (RX-Timestamp) - 3s - 200s | 12:12:42 | 1925 | 9 | 260 | 0 | inv. compact profile #25 |
| (RX-Timestamp) - 3s - 208s | 12:12:34 | 1917 | 8 | 260 | 0 | inv. compact profile #26 |
| (RX-Timestamp) - 3s - 216s | 12:12:26 | 1911 | 6 | 260 | 0 | inv. compact profile #27 |

| | | | | | | |
|----------------------------|----------|------|---|-----|---|--------------------------|
| (RX-Timestamp) - 3s - 224s | 12:12:18 | 1907 | 4 | 260 | 0 | inv. compact profile #28 |
| (RX-Timestamp) - 3s - 232s | 12:12:10 | 1905 | 2 | 260 | 0 | inv. compact profile #29 |
| (RX-Timestamp) - 3s - 240s | 12:12:02 | 1905 | 0 | 260 | 0 | inv. compact profile #30 |
| (RX-Timestamp) - 3s - 248s | 12:11:54 | 1905 | 0 | 259 | 1 | inv. compact profile #31 |
| (RX-Timestamp) - 3s - 256s | 12:11:46 | 1905 | 0 | 256 | 3 | inv. compact profile #32 |
| (RX-Timestamp) - 3s - 264s | 12:11:38 | 1905 | 0 | 251 | 5 | inv. compact profile #33 |
| (RX-Timestamp) - 3s - 272s | 12:11:30 | 1905 | 0 | 244 | 7 | inv. compact profile #34 |
| (RX-Timestamp) - 3s - 280s | 12:11:22 | 1905 | 0 | 235 | 9 | inv. compact profile #35 |
| (RX-Timestamp) - 3s - 288s | 12:11:14 | 1905 | 0 | 227 | 8 | inv. compact profile #36 |
| (RX-Timestamp) - 3s - 296s | 12:11:06 | 1905 | 0 | 221 | 6 | inv. compact profile #37 |
| (RX-Timestamp) - 3s - 304s | 12:10:58 | 1905 | 0 | 217 | 4 | inv. compact profile #38 |
| (RX-Timestamp) - 3s - 312s | 12:10:50 | 1905 | 0 | 215 | 2 | inv. compact profile #39 |
| (RX-Timestamp) - 3s - 320s | 12:10:42 | 1905 | 0 | 215 | 0 | inv. compact profile #40 |
| (RX-Timestamp) - 3s - 328s | 12:10:34 | 1904 | 1 | 215 | 0 | inv. compact profile #41 |
| (RX-Timestamp) - 3s - 336s | 12:10:26 | 1901 | 3 | 215 | 0 | inv. compact profile #42 |
| (RX-Timestamp) - 3s - 344s | 12:10:18 | 1896 | 5 | 215 | 0 | inv. compact profile #43 |
| (RX-Timestamp) - 3s - 352s | 12:10:10 | 1889 | 7 | 215 | 0 | inv. compact profile #44 |
| (RX-Timestamp) - 3s - 360s | 12:10:02 | 1880 | 9 | 215 | 0 | inv. compact profile #45 |
| (RX-Timestamp) - 3s - 368s | 12:09:54 | 1872 | 8 | 215 | 0 | inv. compact profile #46 |