



Open Metering System Specification

Message examples

**Annex N to
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Issue 4.0.2**

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N.1 Gas Meter with different Security profiles

N.1.1 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
Serial 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

AES Key according to FIPS 197 (LSB first):
= 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	Serial No LSB (BCD)		78h	
6	A Field	Serial No (BCD)		56h	
7	A Field	Serial No (BCD) (= 12345678)		34h	
8	A Field	Serial 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	

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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	NNNNCCHHb (2 encr. blocks)		20h	
17	Config Field	BASOMMMMb (unidir., sync., AES)		25h	
18	AES-Verify	Encryption verification	2Fh	59h	
19	AES-Verify	Encryption verification	2Fh	23h	Application Layer (APL)
20	DR1	DIF (8 digit BCD)	0Ch	C9h	
21	DR1	VIF (Volume 0,01 m ³)	14h	5Ah	
22	DR1	Value LSB	27h	AAh	
23	DR1	Value	04h	26h	
24	DR1	Value (= 28504,27 m ³)	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	
29	CRC 2			C2h	DLL
30	CRC 2			ADh	
31	DR2	Value	37h	01h	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	
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	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.1.2 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.	Serial No LSB (BCD)	78h	
9	Ident.Nr.	Serial No (BCD)	56h	
10	Ident.Nr.	Serial No (BCD) (=12345678)	34h	
11	Ident.Nr.	Serial 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	no Encryption	00h	
19	Config Field	no Encryption	00h	
20	DR1	DIF (8 digit BCD)	0Ch	Application Layer (APL)
21	DR1	VIF (Volume 0,01 m ³)	14h	
22	DR1	Value LSB	27h	
23	DR1	Value	04h	
24	DR1	Value (= 28504,27 m ³)	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.1.3 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
Serial 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 (LSB first):
=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	
12	CRC 1			C9h	
13	CI Field	Extended Link Layer (short)		8Ch	ELL
14	CC Field	Communication Control		20h	
15	Access No.	ELL-Access Counter of Meter		75h	Authentication and Fragmentation Layer (AFL)
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		04h	
23	MCR	Message Counter C (e.g. = 1203)		00h	
24	MCR	Message Counter C (MSB)		00h	
25	MAC	AES-CMAC (MSB)		81h	
26	MAC	AES-CMAC		69h	
27	MAC	AES-CMAC		39h	
28	MAC	AES-CMAC		62h	
29	CRC 2			DEh	DLL
30	CRC 2			9Fh	
31	MAC	AES-CMAC		2Bh	AFL
32	MAC	AES-CMAC		49h	
33	MAC	AES-CMAC		7Eh	
34	MAC	AES-CMAC (LSB)		98h	
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	Configuration Field (LSB)		20h	
39	Config Field	Configuration Field		07h	
40	Config Field	Configuration Field (MSB)		10h	
41	AES-Verify	Decryption verification	2Fh	90h	
42	AES-Verify	Decryption verification	2Fh	58h	

43	DR1	DIF (8 digit BCD)	0Ch	47h	APL
44	DR1	VIF (Volume 0,01 m ³)	14h	5Fh	
45	DR1	Value LSB	27h	4Bh	
46	DR1	Value	04h	C9h	
47	CRC 3			2Dh	DLL
48	CRC 3			BEh	
49	DR1	Value (= 28504,27 m ³)	85h	1Dh	Application Layer (APL)
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	DLL
66	CRC 4			98h	
67	Dummy	Fill Byte due to AES	2Fh	BFh	APL
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	DLL
78	CRC 5			A1h	

N.1.4 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)
Serial 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)
Serial number water meter	11223344
Version	3

Gateway example	
Medium/device type	Comm. controller
Manufacturer	OMS (3DB3h)
Serial 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 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	B3h	
4	M Field	Manufacturer code	3Dh	
5	A Field	Serial No LSB (BCD)	66h	
6	A Field	Serial No (BCD)	55h	
7	A Field	Serial No (BCD) (=66778899)	44h	
8	A Field	Serial 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		13h	
12	CRC 1		CFh	
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) (= 33445566)	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	No encr., Link control bits not used	00h	
38	Config Field	No encr., Link control bits not used	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	
12	CRC 1			46h	
13	CI Field	Extended Link Layer (long)		8Eh	ELL
14	CC Field	Communication Control		80h	
15	Access No.	ELL-Access number of GW		75h	
16	M Field	Manufacturer code		B3h	
17	M Field	Manufacturer code		3Dh	
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 and Fragmentation layer		90h	AFL
25	AFL	AFL Length (all AFL bytes after AFL)		0Fh	
26	FCL	Fragmentation Control Field (LSB)		00h	
27	FCL	Fragmentation Control Field (MSB)		2Ch	
28	MCL	Message Control Field		25h	DLL
29	CRC 2			ECh	
30	CRC 2			33h	Authentication and Fragmentation Layer (AFL)
31	MCR	Message Counter C (LSB)		B3h	
32	MCR	Message Counter C		04h	
33	MCR	Message Counter C (e.g. = 1203)		00h	
34	MCR	Message Counter C (MSB)		00h	
35	MAC	AES-CMAC (MSB)		11h	
36	MAC	AES-CMAC		5Dh	
37	MAC	AES-CMAC		02h	
38	MAC	AES-CMAC		2Ah	
39	MAC	AES-CMAC		01h	
40	MAC	AES-CMAC		73h	
41	MAC	AES-CMAC		32h	
42	MAC	AES-CMAC (LSB)		C8h	
43	CI Field	72h (long header)		72h	TPL
44	Ident.Nr.	Serial No LSB (BCD)		78h	
45	Ident.Nr.	Serial No (BCD)		56h	
46	Ident.Nr.	Serial No (BCD)		34h	

47	CRC 3			6Bh	DLL	
48	CRC 3			5Bh		
49	Ident.Nr.	Serial 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	Configuration Field (LSB)		20h		
57	Config Field	Configuration Field		07h		
58	Config Field	Configuration Field (MSB)		10h		
59	AES-Verify	Decryption verification	2Fh	90h	APL	
60	AES-Verify	Decryption verification	2Fh	58h		
61	DR1	DIF (8 digit BCD)	0Ch	47h		
62	DR1	VIF (Volume 0,01 m ³)	14h	5Fh		
63	DR1	Value LSB	27h	4Bh	APL	
64	DR1	Value	04h	C9h		
65	CRC 4			55h		DLL
66	CRC 4			CFh		
67	DR1	Value (= 28504,27 m ³)	85h	1Dh	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		
78	DR3	Value LSB	00h	4Ah		
79	DR3	Value MSB (= 0)	00h	ACH		
80	Dummy	Fill Byte due to AES	2Fh	72h	APL	
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	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 wM-Bus Water Meter with a fragmented message

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.

5 N.2.1 Input parameters

Water meter example	
Medium	water
Manufacturer	ZRI
Serial 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	OMS (3DB3h)
Serial number	33445566
Version	10 (e.g. V 1.0)

Individual Master Key Mk (LSB first):
=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.2.2 Calculate Message

To build a message following order has to be applied.

1. Derive Kenc and Kmac
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)
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	LSB, 5 blocks	50h	50h
Config Field	Enc. mode 7, no signature in APL	07h	07h
Config Field	MSB, , 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

Fields to be considered by the CMAC-Calculation

Fragment 1 (length = 26 bytes)



DR1	Value current volume	41h	BCh
DR1	Value current volume (MSB)	00h	A6h
DR2	DIF storage #0, 16bit	02h	D4h
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
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
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
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

Fragment 2 (length = 33 bytes)

DR6	Value n-6 (July)	31h	06h
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
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

Fields to be considered by the CMAC-Calculation

Fragment 3 (length = 27 bytes)

N.2.3 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 (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	B3h	
4	M Field	Manufacturer code	3Dh	
5	A Field	Serial No LSB (BCD)	66h	
6	A Field	Serial No (BCD)	55h	
7	A Field	Serial No (BCD) (=66778899)	44h	
8	A Field	Serial 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		CCh	
12	CRC 1		F6h	
13	CI Field	Extended Link Layer (short)	8Ch	ELL
14	CC Field	Communication Control	84h	
15	Access No.	Access Number of GW	11h	
16	CI Field	GW -> Meter	80h	Transport Layer (TPL)
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	
26	Status	GW State RSSI level (-84dBm)	17h	
27	Config Field	NNNCCHb	00h	
28	Config Field	BASOMMMb (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	
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		11h	
16	M Field	Manufacturer code		B3h	
17	M Field	Manufacturer code		3Dh	
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		09h	
26	FCL	FID, Fragment-ID		01h	
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			D8h	DLL
30	CRC 2			01h	
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	LSB: 5 blocks		50h	
41	Config Field	encr. mode 7, no signature in APL		07h	
42	Config Field	MSB: 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	APL
46	DR1	VIF volume liter	13h	7Ch	
47	CRC 3			63h	DLL
48	CRC 3			ABh	
49	DR1	Value current volume (LSB)	79h	DBh	APL
50	DR1	Value current volume	19h	1Ch	
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	
64	DR4	DIFE storage #8, acc. to EN13757-3, Annex I	04h	0Eh	
65	CRC 4			8Eh	DLL
66	CRC 4			95h	

N.2.4 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	B3h	
4	M Field	Manufacturer code	3Dh	
5	A Field	Serial No LSB (BCD)	66h	
6	A Field	Serial No (BCD)	55h	
7	A Field	Serial No (BCD) (=66778899)	44h	
8	A Field	Serial 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		09h	
12	CRC 1		E1h	
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	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) (= 33445566)	34h	
21	A Field	Ident No MSB (BCD)	12h	
22	A Field	Version	01h	
23	A Field	Device type (Communication controller)	07h	
24	CRC 2		53h	DLL
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		B3h	
17	M Field	Manufacturer code		3Dh	
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	DLL
29	CRC 2			E5h	
30	CRC 2			8Ah	
31	DR4	Value base date (LSB) 1-Jan-2012	81h	90h	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	
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	APL
50	DR6	Value n-11 (February)	26h	EFh	
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	
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.2.5 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	B3h	
4	M Field	Manufacturer code	3Dh	
5	A Field	Serial No LSB (BCD)	66h	
6	A Field	Serial No (BCD)	55h	
7	A Field	Serial No (BCD) (=66778899)	44h	
8	A Field	Serial 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		F8h	
12	CRC 1		D4h	
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	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) (= 33445566)	34h	
21	A Field	Ident No MSB (BCD)	12h	
22	A Field	Version	01h	
23	A Field	Device type (Communication controller)	07h	
24	CRC 2		C3h	DLL
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	
12	CRC 1			42h	
13	CI Field	Extended LinkLayer		8Eh	ELL
14	CC Field	Communication Control (bidir.)		80h	
15	Access No.	ELL-Access number of Meter		13h	
16	M Field	Manufacturer code		B3h	
17	M Field	Manufacturer code		3Dh	
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		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			4Dh	DLL
30	CRC 2			96h	
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	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	APL
50	DR6	Value (MSB)	00h	E7h	
51	DR6	Value (LSB)	64h	FEh	
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	
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	APL
68	Dummy	Idle filler	2Fh	7Ah	
69	CRC 5			C7h	DLL
70	CRC 5			F2h	

N.3 Heat Cost Allocator

N.3.1 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
Serial 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
Serial number water meter	11223344
Version	85

AES Key according to FIPS 197 (LSB first):
= 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.3.2 wM-Bus Example with ACC-NR

ACC-NR (wM-Bus)

Byte No	OMS wM-Bus frame		cooling meter -> GW	Layer
	Field Name	Content	Bytes [hex]	
			plain	
1	L Field	Length of data (46 bytes)	16h	Data Link Layer (DLL)
2	C Field	44h in Normal mode	44h	
3	M Field	Manufacturer code	93h	
4	M Field	Manufacturer code	44h	
5	A Field	Serial No LSB (BCD)	44h	
6	A Field	Serial No (BCD)	33h	
7	A Field	Serial No (BCD) (= 11223344)	22h	
8	A Field	Serial No MSB (BCD)	11h	
9	A Field	Version (or Generation number)	55h	
10	A Field	Device type (RF-Adapter)	37h	
11	CRC 1		FAh	
12	CRC 1		63h	Transport Layer (TPL)
13	CI Field	8Bh (long header)	8Bh	
14	Meter-ID	Serial No LSB (BCD)	88h	
15	Meter-ID	Serial No (BCD)	77h	
16	Meter-ID	Serial No (BCD) (= 55667788)	66h	
17	Meter-ID	Serial No MSB (BCD)	55h	
18	Meter-Man.	Meter Manufacturer code	93h	
19	Meter-Man.	Meter Manufacturer code	44h	
20	Meter-Vers.	Version (or Generation number)	55h	
21	Meter-Med.	Device type (Medium=HCA)	08h	
22	Access No.	Access Number of Meter	FFh	
23	Status	Meter state (Low power)	04h	
24	Config Field	NNNNCCHHb (no encryption)	00h	
25	Config Field	BAS0MMMMb (unidir.)	00h	
26	CRC 2		B4h	DLL
27	CRC 2		18h	

N.3.3 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 (45 bytes)		2Dh	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	Serial No LSB (BCD)		44h	
6	A Field	Serial No (BCD)		33h	
7	A Field	Serial No (BCD) (= 11223344)		22h	
8	A Field	Serial No MSB (BCD)		11h	
9	A Field	Version (or Generation number)		55h	
10	A Field	Device type (RF-Adapter)		37h	
11	CRC 1			69h	
12	CRC 1			EFh	
13	CI Field	72h (long header)		72h	Transport Layer (TPL)
14	Meter-ID	Serial No LSB (BCD)		88h	
15	Meter-ID	Serial No (BCD)		77h	
16	Meter-ID	Serial No (BCD) (= 55667788)		66h	
17	Meter-ID	Serial No MSB (BCD)		55h	
18	Meter-Man.	Meter Manufacturer code		93h	
19	Meter-Man.	Meter Manufacturer code		44h	
20	Meter-Vers.	Version (or Generation number)		55h	
21	Meter-Med.	Device type (Medium=HCA)		08h	
22	Access No.	Access Number of Meter		00h	
23	Status	Meter state (Low power)		04h	
24	Config Field	NNNNCCHHb (1 encr. block)		10h	
25	Config Field	BAS0MMMMb (unidir., async., AES)		05h	
26	AES-Verify	Encryption verification	2Fh	00h	
27	AES-Verify	Encryption verification	2Fh	DFh	
28	DR1	DIF (6 digit BCD)	0Bh	E2h	APL
29	CRC 2			27h	DLL
30	CRC 2			F9h	
31	DR1	VIF (HCA-units)	6Eh	A7h	Application Layer (APL)
32	DR1	Value LSB	34h	82h	
33	DR1	Value (= 001234 HCA-Units)	12h	14h	
34	DR1	Value MSB	00h	6Dh	
35	DR2	DIF (Data type G, StorageNo 1)	42h	15h	
36	DR2	VIF (Date)	6Ch	13h	
37	DR2	Value LSB	FEh	58h	
38	DR2	Value MSB (= 30.04.2007)	04h	1Ch	
39	DR3	DIF (6 digit BCD, StorageNo 1)	4Bh	D2h	
40	DR3	VIF (HCA-units)	6Eh	F8h	
41	DR3	Value LSB	56h	3Fh	
42	DR3	Value (= 023456 HCA-Units)	34h	39h	



43	DR3	Value MSB	02h	04h	
44	DR4	DIF (8 digit BCD)	0Ch	0Ch	
45	DR4	VIF (Extension Table FDh)	FDh	FDh	
46	DR4	VIFE (Customer Location)	10h	10h	
47	CRC 3			40h	DLL
48	CRC 3			C4h	
49	DR4	Value LSB	78h	78h	APL
50	DR4	Value (Location ID)	56h	56h	
51	DR4	Value	34h	34h	
52	DR4	Value MSB	12h	12h	
53	CRC 4			81h	DLL
54	CRC 4			34h	

N.3.4 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.	Serial No LSB (BCD)		88h	
9	Ident.Nr.	Serial No (BCD)		77h	
10	Ident.Nr.	Serial No (BCD) (=12345678)		66h	
11	Ident.Nr.	Serial 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	NNNNCCHHb (1 encr. block)		10h	
19	Config Field	BAS0MMMMb (AES)		05h	
20	AES-Verify	Encryption verification	2Fh	00h	
21	AES-Verify	Encryption verification	2Fh	DFh	
22	DR1	DIF (6 digit BCD)	0Bh	E2h	Application Layer (APL)
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	
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.4 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	OMS
Serial number	33445566
Version	10 (e.g. V 1.0)

Gas meter example	
Medium	Gas
Manufacturer	ELS
Serial 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 (LSB first):
= 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]		
			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	Serial No LSB (BCD)		78h	
6	A Field	Serial No (BCD)		56h	
7	A Field	Serial No (BCD) (=12345678)		34h	
8	A Field	Serial No MSB (BCD)		12h	
9	A Field	Version (or Generation number)		33h	
10	A Field	Device type (Medium=Gas)		03h	
11	CRC 1			EFh	
12	CRC 1			B5h	
13	CI Field	Extended Link Layer (short)		8Ch	ELL
14	CC Field	Communication Control (bidir., RX off)		80h	
15	Access No.	Access Number of Meter		45h	
16	CI Field	7Ah (short header)		7Ah	Transport Layer (TPL)
17	Access No.	Access Number of Meter		01h	
18	Status	Meter state		00h	
19	Config Field	NNNNCCHHb (4 encr. blocks, static tlg.)		48h	
20	Config Field	BAS0MMMMb (AES)		05h	
21	AES-Verify	Encryption verification	2Fh	C8h	
22	AES-Verify	Encryption verification	2Fh	51h	
23	DR1	DIF (Variable length)	0Dh	9Ch	APL
24	DR1	VIF (Extension)	FDh	92h	
25	DR1	VIFE (Version)	0Ch	ABh	
26	DR1	LVAR (= 4 byte text string)	04h	D2h	
27	DR1	Value (LSB)	34h	F3h	
28	DR1	Value (= BKG4)	47h	B2h	
29	CRC 2			6Ch	DLL
30	CRC 2			C4h	
31	DR1	Value	4Bh	DFh	Application Layer (APL)
32	DR1	Value (MSB)	42h	1Fh	
33	DR2	DIF (16-bit Integer/Binary)	02h	63h	
34	DR2	VIF (Extension)	FDh	87h	
35	DR2	VIFE (Hardware version)	0Dh	30h	
36	DR2	Value LSB (=1.5)	05h	2Ch	
37	DR2	Value MSB	01h	5Ah	
38	DR3	DIF (16-bit Integer/Binary)	02h	23h	
39	DR3	VIF (Extension)	FDh	A7h	
40	DR3	VIFE (Metrology Firmware version)	0Eh	6Ah	
41	DR3	Value LSB (= 1.1)	01h	1Fh	
42	DR3	Value MSB	01h	96h	
43	DR4	DIF (16-bit Integer/Binary)	02h	29h	
44	DR4	VIF (Extension)	FDh	CBh	
45	DR4	VIFE (Other firmware version)	0Fh	65h	

46	DR4	Value LSB (= 1.0)	00h	64h	DLL
47	CRC 3			53h	
48	CRC 3			08h	
49	DR4	Value MSB	01h	8Ah	APL
50	DR5	DIF (Variable length)	0Dh	3Eh	
51	DR5	VIF (Extension)	FDh	A5h	
52	DR5	VIFE (customer location)	10h	A9h	
53	DR5	LVAR (=33 byte text string)	21h	31h	
54	DR5	Value LSB	38h	54h	
55	DR5	Value (= 00000000000012345678)	37h	3Eh	
56	DR5	Value	36h	9Eh	
57	DR5	Value	35h	C8h	
58	DR5	Value	34h	4Dh	
59	DR5	Value	33h	37h	
60	DR5	Value	32h	6Eh	
61	DR5	Value	31h	80h	
62	DR5	Value	30h	9Ch	
63	DR5	Value	30h	C6h	
64	DR5	Value	30h	CEh	
65	CRC 4			61h	DLL
66	CRC 4			36h	
67	DR5	Value	30h	C7h	APL
68	DR5	Value	30h	3Ch	
69	DR5	Value	30h	B9h	
70	DR5	Value	30h	91h	
71	DR5	Value	30h	68h	
72	DR5	Value	30h	4Eh	
73	DR5	Value	30h	B3h	
74	DR5	Value	30h	B3h	
75	DR5	Value	30h	21h	
76	DR5	Value (= 49074)	34h	BFh	
77	DR5	Value	37h	39h	
78	DR5	Value	30h	FBh	
79	DR5	Value	39h	F6h	
80	DR5	Value	34h	7Eh	
81	DR5	Value (= 123456)	36h	64h	
82	DR5	Value	35h	4Fh	
83	CRC 5			B3h	DLL
84	CRC 5			CEh	
85	DR5	Value	34h	4Fh	APL
86	DR5	Value	33h	EAh	
87	DR5	Value	32h	A0h	
88	DR5	Value	31h	EFh	
89	DR5	Value (= DE)	45h	AAh	
90	DR5	Value MSB	44h	D8h	
91	Dummy	Fill Byte due to AES	2Fh	58h	
92	Dummy	Fill Byte due to AES	2Fh	12h	
93	CRC 6			41h	DLL
94	CRC 6			11h	

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	B3h	
4	M Field	Manufacturer code	3Dh	
5	A Field	Serial No LSB (BCD)	66h	
6	A Field	Serial No (BCD)	55h	
7	A Field	Serial No (BCD) (=33445566)	44h	
8	A Field	Serial No MSB (BCD)	33h	
9	A Field	Version (or Generation number)	0Ah	
10	A Field	Device type (Medium=COM)	31h	
11	CRC 1		DEh	
12	CRC 1		AAh	
13	CI Field	Extended Link Layer (short)	8Ch	ELL
14	CC Field	Communication Control (bidir., RX on)	84h	
15	Access No.	Access Number of Meter	45h	
16	CI Field	80h means 12 byte header	80h	Transport Layer (TPL)
17	Ident.Nr.	Serial No LSB (BCD)	78h	
18	Ident.Nr.	Serial No (BCD)	56h	
19	Ident.Nr.	Serial No (BCD) (=12345678)	34h	
20	Ident.Nr.	Serial 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	
26	Status	GW state cont. recept. level (-80dBm)	19h	
27	Config Field	NNNCCHHb	00h	
28	Config Field	BAS0MMMMb (no encr.)	00h	
29	CRC 2		93h	DLL
30	CRC 2		FDh	

N.5 Send a Command with an Acknowledge

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.

5

GW example	
Medium/device type	Communication Controller
Manufacturer	HYD
Serial number	90123456
Version	8

RF adapter example	
Medium/device type	Radio converter
Manufacturer	HYD
Serial number RF adapter	43886102
Version	41

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

AES Key According to FIPS 197 (LSB first):
= 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
= 24 23 44 22 75 92 29 07 7D 7D 7D 7D 7D 7D 7D 7D

10

SND-UD; Correction of 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	Serial No LSB (BCD)		56h	
6	A Field	Serial No (BCD)		34h	
7	A Field	Serial No (BCD)		12h	
8	A Field	Serial 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	
12	CRC 1			8Ah	
13	CI Field	Extended Link Layer (short)		8Ch	ELL
14	CC Field	Communication Control (bidir., RX on)		84h	
15	Access No.	Access Number of GW		51h	
16	CI Field	Special CI to add/subtract time offset		6Dh	Transport Layer (TPL)
17	Ident.Nr.	Serial No LSB (BCD)		44h	
18	Ident.Nr.	Serial No (BCD)		22h	
19	Ident.Nr.	Serial No (BCD)		75h	
20	Ident.Nr.	Serial 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	GW state (no RSSI level available)		00h	
27	Config Field	NNNNCCHHb (1 encr. block)		10h	
28	Config Field	BAS0MMMMb (AES)		05h	
29	CRC 2			60h	DLL
30	CRC 2			9Fh	
31	AES-Verify	Encryption verification	2Fh	3Ah	TPL
32	AES-Verify	Encryption verification	2Fh	97h	
33	TC-Field	Add time difference	01h	31h	Application Layer (APL)
34	Time	Value format J, LSB	32h	FBh	
35	Time	Value (add 1 minute, 50 seconds)	01h	F4h	
36	Time	Value MSB	00h	34h	
37	Reserved	Reserved, set to 0	00h	68h	
38	Reserved	Reserved, set to 0	00h	1Ch	
39	Reserved	Reserved, set to 0	00h	41h	
40	Reserved	Reserved, set to 0	00h	54h	
41	Reserved	Reserved, set to 0	00h	78h	
42	Reserved	Reserved, set to 0	00h	FBh	
43	CMD-Verify	Command verification	2Fh	EAh	
44	CMD-Verify	Command verification	2Fh	0Bh	

45	CMD-Verify	Command verification	2Fh	C6h	
46	CMD-Verify	Command verification	2Fh	6Eh	
47	CRC 3			2Ah	DLL
48	CRC 3			23h	

ACK (wM-Bus)

Byte No	Field Name	Content	Bytes [hex]	water meter -> GW	Layer
		OMS wM-Bus frame			
			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	Serial No LSB (BCD)	02h		
6	A Field	Serial No (BCD)	61h		
7	A Field	Serial No (BCD)	88h		
8	A Field	Serial 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		
12	CRC 1		83h		
13	CI Field	Extended Link Layer (short)	8Ch		ELL
14	CC Field	Communication Control (bidir, RX off)	80h		
15	Access No.	Access Number of GW	51h		
16	CI Field	8Bh means long header	8Bh		Transport Layer (TPL)
17	Ident.Nr.	Serial No LSB (BCD)	44h		
18	Ident.Nr.	Serial No (BCD)	22h		
19	Ident.Nr.	Serial No (BCD)	75h		
20	Ident.Nr.	Serial 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	00h		
27	Config Field	NNNNCCHHb	00h		
28	Config Field	BAS0MMMMb (no encr.)	00h		
29	CRC 2		50h		DLL
30	CRC 2		84h		

N.6 Request of the Selected Data

5 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.

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

Example for Heat cost allocator	
Medium	Heat Cost Allocator
Manufacturer	TCH
Serial 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 (LSB first):
= 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

10

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	Serial No LSB (BCD)		78h	
6	A Field	Serial No (BCD)		56h	
7	A Field	Serial No (BCD) (=12345678)		34h	
8	A Field	Serial 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	
12	CRC 1			F8h	
13	CI Field	Extended Link Layer (short)		8Ch	ELL
14	CC Field	Communication Control (bidir.,RX off)		80h	
15	Access No.	Access Number of GW		15h	
16	CI Field	7Ah (short header)		7Ah	Transport Layer (TPL)
17	Access No.	Access Number of GW		02h	
18	Status	Meter state		00h	
19	Config Field	NNNNCCHHb (1 encr. block)		10h	
20	Config Field	BAS0MMMMb, (AES)		05h	
21	AES-Verify	Encryption verification	2Fh	FDh	
22	AES-Verify	Encryption verification	2Fh	26h	
23	DR1	DIF (24 bit binary, StorageNo 0)	03h	EFh	Application Layer (APL)
24	DR1	VIF (HCA-units)	6Eh	68h	
25	DR1	Value LSB	39h	ACH	
26	DR1	Value (= 012345d = 003039h HCA-Units)	30h	F6h	
27	DR1	Value MSB	00h	5Bh	
28	DR2	DIF (16 bit binary, StorageNo 1)	42h	Aeh	
29	CRC 2			39h	DLL
30	CRC 2			F9h	
31	DR2	VIF (Date type G)	6Ch	02h	APL
32	DR2	Value LSB	3Fh	8Bh	
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	
36	DR3	Value LSB	A0h	D8h	
37	DR3	Value (= 023456 = 005BA0h HCA-Units)	5Bh	A9h	
38	DR3	Value MSB	00h	72h	
39	CRC 3			D8h	DLL
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]	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	Serial No LSB (BCD)		78h	
6	A Field	Serial No (BCD)		56h	
7	A Field	Serial No (BCD) (=12345678)		34h	
8	A Field	Serial No MSB (BCD)		12h	
9	A Field	Version (or Generation number)		8Fh	
10	A Field	Device type (Medium=HCA)		08h	
11	CRC 1			E4h	
12	CRC 1			F8h	
13	CI Field	Extended Link Layer (short)		8Ch	ELL
14	CC Field	Communication Control (bidir.,RX off)		80h	
15	Access No.	Access Number of GW		15h	
16	CI Field	Application Error (short header)		6Eh	Transport Layer (TPL)
17	Access No.	Access Number of GW		02h	
18	Status	Meter state "any application error"		00h	
19	Config Field	NNNNCCHHb (1 encr. block)		10h	
20	Config Field	BAS0MMMMb, (AES)		05h	
21	AES-Verify	Encryption verification	2Fh	D4h	
22	AES-Verify	Encryption verification	2Fh	82h	
23	Error Code	CI-Field not implemented	01h	75h	Application Layer (APL)
24	Dummy	Parameter	00h	F9h	
25	Dummy	Fill byte due to AES	2Fh	B6h	
26	Dummy	Fill byte due to AES	2Fh	B3h	
27	Dummy	Fill byte due to AES	2Fh	FEh	
28	Dummy	Fill byte due to AES	2Fh	70h	
29	CRC 2			0Ah	DLL
30	CRC 2			67h	
31	Dummy	Fill byte due to AES	2Fh	50h	APL
32	Dummy	Fill byte due to AES	2Fh	CDh	
33	Dummy	Fill byte due to AES	2Fh	91h	
34	Dummy	Fill byte due to AES	2Fh	12h	
35	Dummy	Fill byte due to AES	2Fh	94h	
36	Dummy	Fill byte due to AES	2Fh	FCh	
37	Dummy	Fill byte due to AES	2Fh	7Ah	
38	Dummy	Fill byte due to AES	2Fh	52h	
39	CRC 3			A6h	DLL
40	CRC 3			1Ah	

N.7 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	OMS (3DB3h)
Serial number	12345678
Version	2

water meter with RF adapter example	
Medium/device type	Water
Manufacturer	CEN (0CAEh)
Serial number water meter	38546816
Version	25

RF adapter example	
Medium/device type	Radio converter
Manufacturer	WEP (5CB0h)
Serial number water meter	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	Serial No LSB (BCD)	11h	
6	A Field	Serial No (BCD)	47h	
7	A Field	Serial No (BCD)	15h	
8	A Field	Serial 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	
12	CRC 1		65h	
13	CI Field	Extended Link Layer (2 bytes)	8Ch	ELL
14	CC Field	Communication Control (bidi. sync.)	A0h	
15	Access No.	Access Number of Meter	51h	
16	CI Field	CI-Field Pure Transport Layer	8Bh	Transport Layer (TPL)
17	Ident.Nr.	Serial No LSB (BCD)	16h	
18	Ident.Nr.	Serial No (BCD)	68h	
19	Ident.Nr.	Serial No (BCD)	54h	
20	Ident.Nr.	Serial No MSB (BCD) of meter	38h	
21	Manufr	Manufacturer code	A Eh	
22	Manufr	Manufacturer code	0Ch	
23	Version	Version (or Generation number)	19h	
24	Device type	Device type (Medium = Water)	07h	
25	Access No.	Access Number of Meter	51h	
26	Status	Meter state (Application Error)	02h	
27	Config Field	NNNNCCHHb	00h	
28	Config Field	BAS0MMMMb	00h	
29	CRC 2		DAh	DLL
30	CRC 2		69h	

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	B3h		
4	M Field	Manufacturer code	3Dh		
5	A Field	Serial No LSB (BCD)	78h		
6	A Field	Serial No (BCD)	56h		
7	A Field	Serial No (BCD)	34h		
8	A Field	Serial No MSB (BCD) of RF-Adapter	12h		
9	A Field	Version (or Generation number)	02h		
10	A Field	Device type (Medium=Water)	31h		
11	CRC 1		8Ch	ELL	
12	CRC 1		62h		
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	80h		
17	Ident.Nr.	Serial No LSB (BCD)	16h		
18	Ident.Nr.	Serial No (BCD)	68h		
19	Ident.Nr.	Serial No (BCD)	54h		
20	Ident.Nr.	Serial No MSB (BCD) of meter	38h		
21	Manufr	Manufacturer code	A Eh		
22	Manufr	Manufacturer code	0Ch		
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	Meter state	17h		
27	Config Field	NNNCCHb	00h		
28	Config Field	BAS0MMMMb (no encr.)	00h		
29	CRC 2		77h		DLL
30	CRC 2		C3h		

N.8 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	OMS
Serial number	66778899
Version	12
Meter-RSSI	-66 dBm
Access number	03

Example for cooling meter	
Medium	cool_outlet
Manufacturer	QDS
Serial 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	68h	
4	M Field	Manufacturer code	50h	
5	A Field	Serial No LSB (BCD)	99h	
6	A Field	Serial No (BCD)	88h	
7	A Field	Serial No (BCD) (=66778899)	77h	
8	A Field	Serial 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		73h	ELL
12	CRC 1		ADh	
13	CI Field	Extended Link Layer (short)	8Ch	
14	CC Field	Communication Control (bidir., RX on)	84h	ELL
15	Access No.	ELL-Access Counter of GW	32h	
16	CI Field	GW -> Meter (long header)	80h	Transport Layer (TPL)
17	Ident.Nr.	Serial No LSB (BCD)	44h	
18	Ident.Nr.	Serial No (BCD)	33h	
19	Ident.Nr.	Serial No (BCD) (=12345678)	22h	
20	Ident.Nr.	Serial 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	
25	Access No.	Access Number of GW	03h	
26	Status	GW State RSSI level (-66dBm)	20h	
27	Config Field	NNNNCCHb	00h	
28	Config Field	BAS0MMMMb, (no encr.)	00h	
29	CRC 2		DAh	DLL
30	CRC 2		8Eh	