kamstrup

OMNIPOWER, K382M, K351C

IEC 1107 Protokol deskription

Contents

1 Revision history:

Meter Type	Meter software revision	Document revision	Description	Additional Remarks
OMNIPOWER	Rev. F1	12.2013/Rev.A1	First release	Updated version of IEC1107 implemented in all three meter types.
K162M & K382M	Rev. Z1			
K351C	Rev. H1			

1.1 Referenced documents

Ref.	Title
IEC 62056-21	*Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange*
IEC 62056-61	*Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: OBIS Object identification system*
5512-1040	*K382M Technical Description*
5512-1235	*OMNIPOWER Technical Description*
5512-1265	*K351C Technical Description*

2 General description

This document describes the implementation details for the IEC 1107 communication in Kamstrup electricity meters (OMNIPOWER, K382M and K351C). The implementation complies with the IEC 62056-21 Standard except for the following three items:

1. Support of Mode D0. Same as Mode D except that the Data Readout is performed with a fixed/configurable time-interval and not initiated by a push button.
2. The communication speed in Mode D0 is not fixed at 2400 Baud, but is configurable. Can be configured to 9600 Baud and downwards.
3. The communication speed is decided by the HHU and not the Kamstrup Meter. In the **Identification Message** the Kamstrup Meter indicates the maximum supported baud rate and not the desired baud rate. The Kamstrup Meter will afterwards communicate with the baud rate indicated by the HHU in the **Acknowledgement Select Message**.
4. Kamstrup Meter support initial communication speed at 9600 Baud.

All IEC 1107 communications is using 7 data bits, one stop bit and even parity.

2.1 Configuration

To configure and control the 1107 protocol some objects are defined. These objects are listed in Figure 1 below. The values marked with are (*) are default values for meters delivered from Kamstrup. However for OMNIPOWER meters it is possible to order a special configuration. The value for each object can be modified via the 1107 protocol.

Data Identifier	Object ID	Channel	Range/default value (*)
User data select	131.0.1 131.0.2 131.0.3	Primary Module port CCC Module port IR port	0 = User data 1 selected 1 = User data 2 selected*
Mode D0 time-out	131.0.4 131.0.5 131.0.6	Primary Module port CCC Module port IR port	0 = Mode D0 disabled* 1 = 5 Sec. 2 = 10 Sec. …. 17280 = 24 h
Mode D0 baud rate	131.0.7 131.0.8 131.0.9	Primary Module port CCC Module port IR port	0 = 300 Bd 1 = 600 Bd 2 = 1200 Bd 3 = 2400 Bd* 4 = 4800 Bd 5 = 9600 Bd
Communication mode select	131.0.10 131.0.11 131.0.12	Primary Module port CCC Module port IR port	0 = No IEC 62056-21 communication 1 = Protocol Mode A and C* 2 = Protocol Mode A, C and D0
Ta	131.0.13	Common	1000 – 65000 ms *1500 ms
Tr	131.0.14	Common	1000 – 65000 ms *1500 ms
Tt	131.0.15	Common	1000 – 65000 ms *1700 ms
Ti	131.0.16	Common	5 – 240 Sec. *90 Sec.

Figure 1 – Overview IEC 1107 Configuration Data

2.1.1 Timing Issues

The IEC 62056-21 Standard defines four Timers:

1. The time between receptions of two characters in a character sequence, **Ta**:

2. The time between reception of a message and the transmission of an answer, **Tr**:

The only message send that needs an answer within **Tr** is the **Programming Command Message** (P0) that needs the answer **Programming Command Message** (P1 or P2).

3. Waiting time before Data Readout is performed in case an **Identification Message** is not responded, **Tt**:

If **Tt** is exceeded a **Data Message** (Data readout) is performed.

4. Inactivity Timer, **Ti**:

Timer is used to detect inactivity in Programming Mode and Manufacturer Specific Mode.

All four timers are configurable, see Figure 1. Note that the timer configuration limits are extended compared with the limits in the IEC 62056-21 Standard.

One additional Timer is used to control Mode D0:

1. Repetition time between Data Readout's in Mode D0, **Td0**:

When Td0 expires a Data Readout is performed if communication channel is vacant.

2.2 Supported Messages

In Figure 2 all supported IEC 62056-21 Standard messages and their direction of flow is listed. **Notice, that partial block communication is not supported – neither is the related messages.**

Message Identifier	Direction HHU ←→ Kamstrup Meter	IEC 62056-21 Ref.
Request Message	→	Section 6.3.1
Identification Message	←	Section 6.3.2
Acknowledgement Select Message	→	Section 6.3.3
Data Message (Data Readout)	←	Section 6.3.4
Acknowledgement Message	←→	Section 6.3.5
Repeat-request Message	←→	Section 6.3.6
Programming Command Message (P0)	←	Section 6.3.7
Programming Command Message (P1)	→	Section 6.3.7
Programming Command Message (R1,R5,R6)	→	Section 6.3.7
Programming Command Message (W1,W5)	→	Section 6.3.7
Data Message (Programming Mode)	←	Section 6.3.9
Data Message (Programming Mode, partial)	←	Section 6.3.10
Error Message	←	Section 6.3.11
Break Message (B0)	←→	Section 6.3.12

Figure 2 – Supported Messages

3 Supported Modes

There is support for three Modes:

1. Mode C, see Section 3.1 for more information.
2. Mode D0 – variant of Mode D, see Section **Error! Reference source not found.** for more information.
3. Mode A, see Section 3.3 for more information.

3.1 Mode C

Mode C supports Data Readout, Programming Mode and Manufacturer Specific Mode (Y = 6). These sub-modes will be described briefly in the following sub-sections.

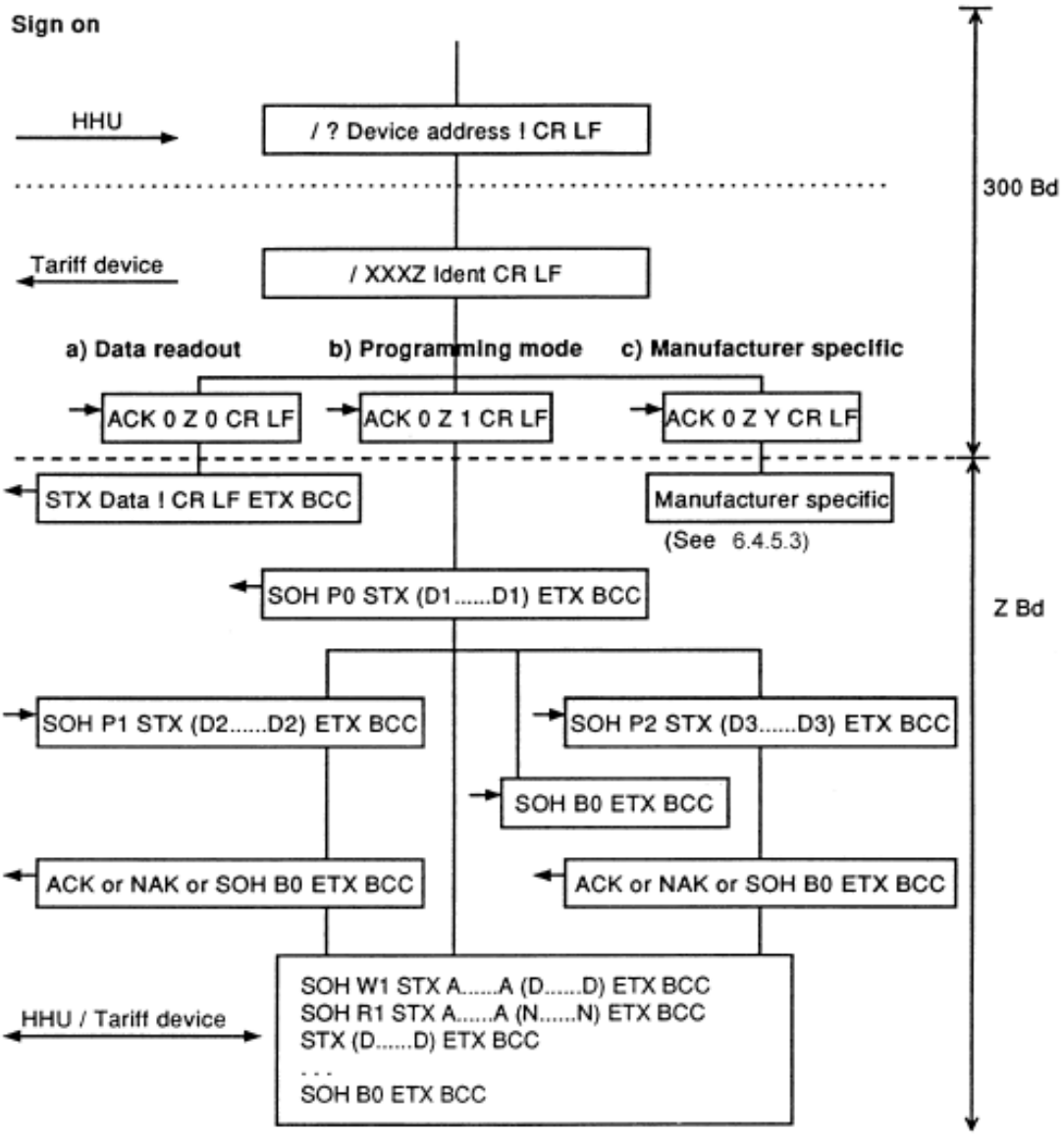


Figure 3 – Overview protocol mode C

3.1.1 Data Readout

The purpose of this mode is to make it possible for a HHU to read out a predefined sequence of elements (OBIS-codes). Which elements are read out is configurable. For further information see section **Error! Reference source not found.**.

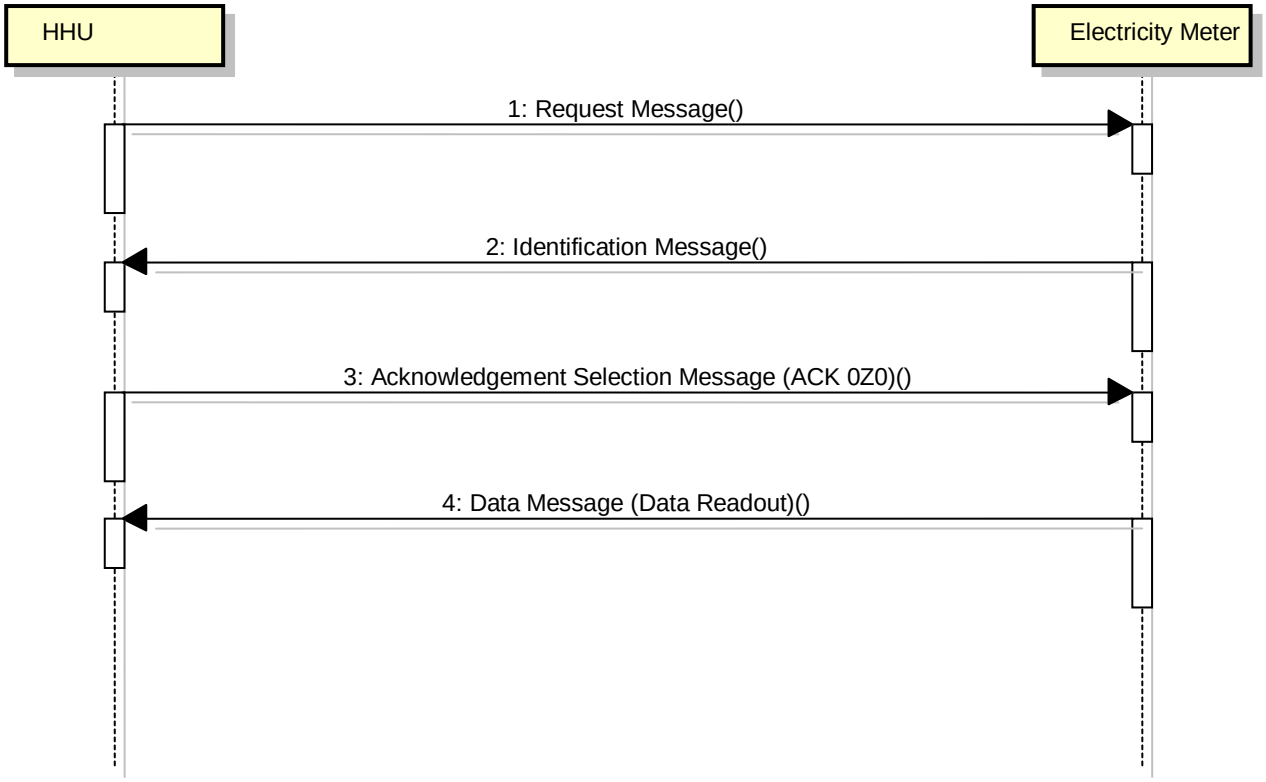


Figure 4 – Normal message flow Mode C (Data Readout)

3.1.2 Programming Mode

The purpose of this mode is to make it possible for a HHU to read out or write to single elements in the Kamstrup Meter. An element is identified by an OBIS-code. Furthermore read out of the different Loggers are possible.
The commands and answers follow the IEC 62056-21 Standard – hence any HHU should be able to communicate with the Kamstrup Meter in this mode. Only a valid password has to be known to operate in this mode

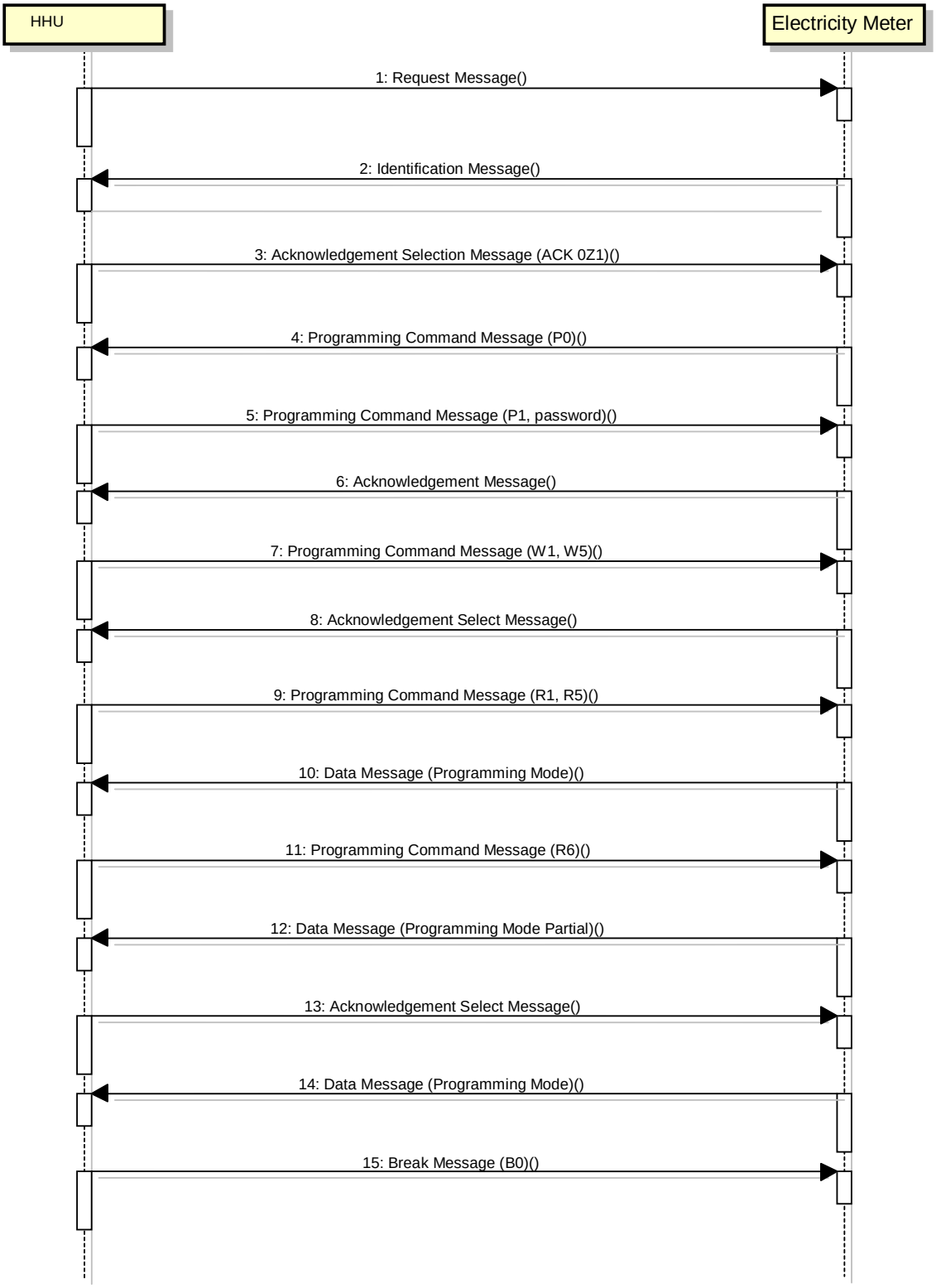


Figure 5 – Normal message flow Mode C (Programming Mode)

3.1.3 Manufacturer Specific Mode (Y = 6)

The purpose of this mode is to make it possible for a HHU to utilize some Kamstrup specific functionalities.

The commands and answers in this mode are not standardized – hence the HHU has to know/support this interface to utilize it. Also here a valid password has to be known to operate in this mode.

Currently the only functionality in this mode is configuration of "User data 2".

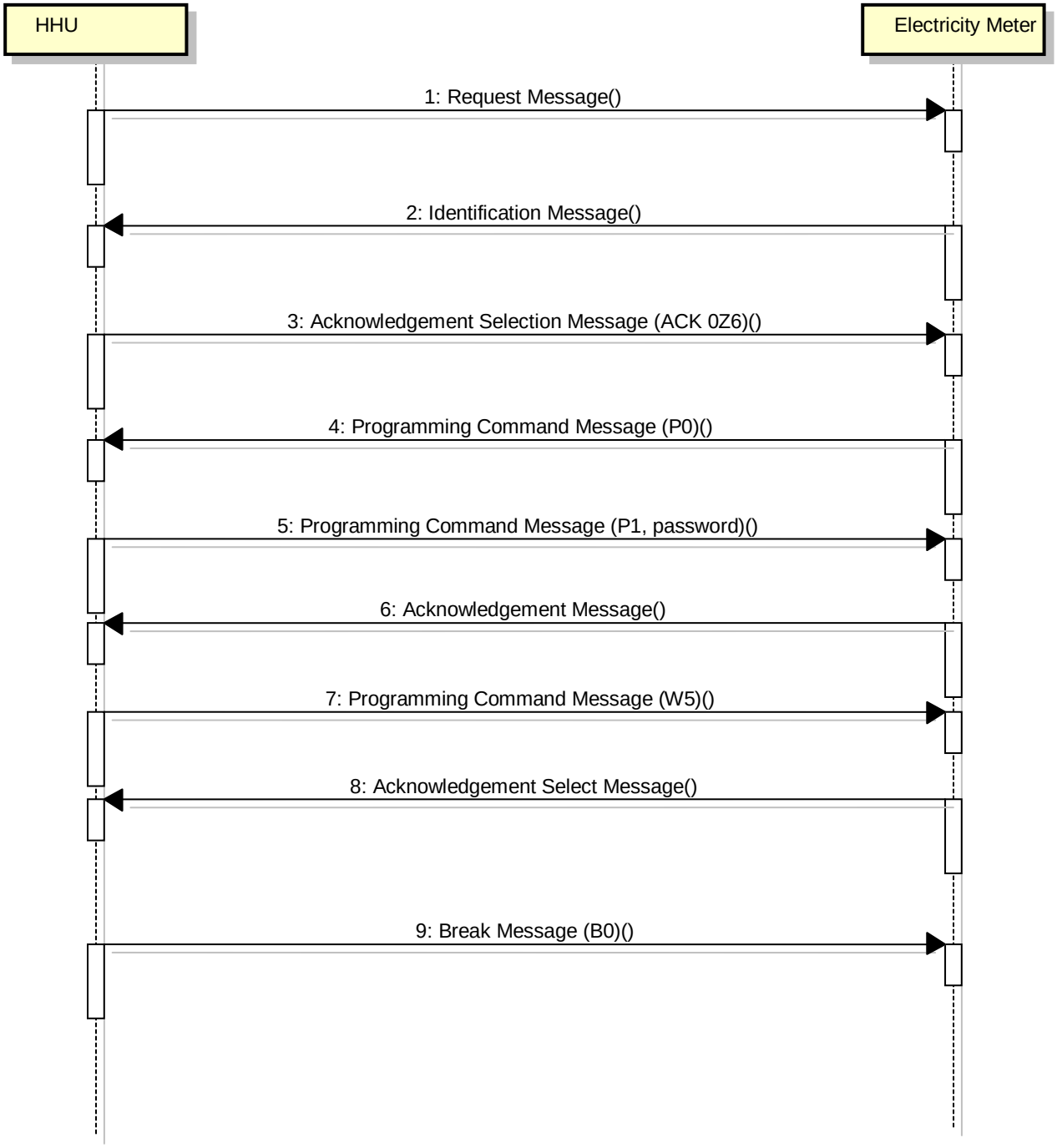


Figure 6 – Normal message flow Mode C (Manufacturer Specific Mode)

3.2 Mode D0

The purpose of this mode is to setup the Kamstrup Meter to perform a Data Readout with a fixed time-interval.

The repetition time and the communication speed of the Data Readout is configurable (see Section 2.1).

The Kamstrup Meter normally acts as a slave and all communication is initiated from outside the Kamstrup Meter. In Mode D0 the communication is initiated from the Kamstrup Meter itself. This makes collision possible.

To avoid collision Data Readout in Mode D0 is only performed if the specific channel is not used by any protocol at the time the Mode D0 request arise. This will cause that a Data Readout can be missed.

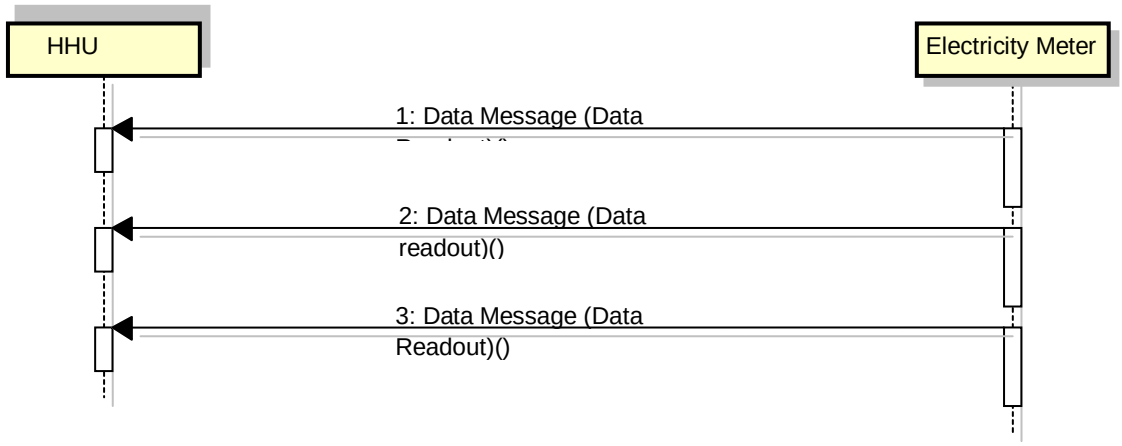


Figure 7 – Message flow in Mode D0

3.3 Mode A

Only Data Readout is possible. In case a HHU operating in Mode A is requesting a Data Readout by sending a **Request Message** there will be a delay between the **Identification Message** and the **Data Message** (Data Readout) sent by the Kamstrup Meter. The delay will be equal the value of Timer

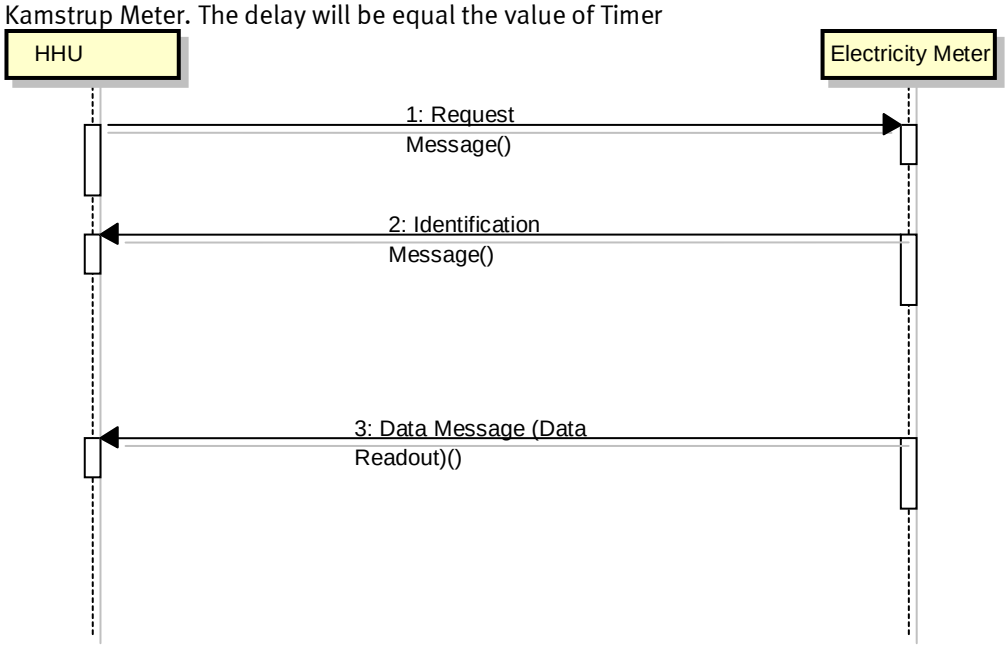


Figure 8 – Normal message flow Mode A (Data Readout)

4 User Data

When a Data Readout is requested either the elements listed in **User data 1** or **User data 2** are read out.
It is configurable (**User data select**) by the W1-command in Programming Mode which list is active.

User data 1 is unconfigurable/hardcoded. See Figure 9 for the content.
User data 2 is configurable. By a W1-command in Manufacturer Specific Mode the content/elements can be modified. In Figure 10 the default content of **User data 2** is shown.

Note: Whenever an element/register is read out the format will follow the LCD-format. This means, if a register is read out in 7.2 format in the LCD the same register is also read out in 7.2 format in the 1107 protocol.

Description	OBIS	Format
Frame start character		<STX>
Identification number 1.0 Meter number 1	0.0.1	(xxxxxxxx)<CR><LF>
Active Energy A14	1.8.0	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A14 Tariff 1	1.8.1	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A14 Tariff 2	1.8.2	(xxxxxxx.xx*kWh) <CR><LF>
Active Energy A14 Tariff 3	1.8.3	(xxxxxxx.xx*kWh) <CR><LF>
Active Energy A14 Tariff 4	1.8.4	(xxxxxxx.xx*kWh) <CR><LF>
Hour counter	96.8.0	(xxxxxxx)<CR><LF>
Pulse Input	0.128.1	(xxxxxxx)<CR><LF>
Max power P14	1.6.0	(xxxxx.xxx*kW)(timestamp)<CR><LF>
End character		!<CR><LF>
End Character in the block		<ETX>
Block check character		<BCC>

Figure 9 – User data 1 (fixed)

Description	OBIS	Format
Frame start character		<STX>
Identification number 1.0 Meter number 1	0.0.1	(xxxxxxxx)<CR><LF>
Meter status	97.97.0	(xxxxxxxx)<CR><LF>
Active Energy A14	1.8.0	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A14 Tariff 1	1.8.1	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A14 Tariff 2	1.8.2	(xxxxxxx.xx*kWh) <CR><LF>
Active Energy A23	2.8.0	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A23 Tariff 1	2.8.1	(xxxxxxx.xx*kWh)<CR><LF>
Active Energy A23 Tariff 2	2.8.2	(xxxxxxx.xx*kWh)<CR><LF>
Reactive Energy R12	3.8.0	(xxxxxxx.xx*kvarh)<CR><LF>
Reactive Energy R12 Tariff 1	3.8.1	(xxxxxxx.xx*kWh)<CR><LF>
Reactive Energy R12 Tariff 2	3.8.2	(xxxxxxx.xx*kWh)<CR><LF>
Reactive Energy E34	4.8.0	(xxxxxxx.xx*kvarh)<CR><LF>
Reactive Energy R34 Tariff 1	4.8.1	(xxxxxxx.xx*kWh)<CR><LF>
Reactive Energy R34 Tariff 2	4.8.2	(xxxxxxx.xx*kWh)<CR><LF>
Max power P14	1.6.0	(xxxxx.xxx*kW)(timestamp)<CR><LF>
Max power P14 Tariff 1	1.6.1	(xxxxx.xxx*kW)(timestamp)<CR><LF>
Max power P14 Tariff 2	1.6.2	(xxxxx.xxx*kW)(timestamp)<CR><LF>
Max power P23	2.6.0	(xxxxx.xxx*kW)(timestamp)<CR><LF>
Accumulated max power P14	1.2.0	(xxxxxx.xxx*kW)<CR><LF>
Accumulated max power P23	2.2.0	(xxxxxx.xxx*kW)<CR><LF>
Max power Q12	3.6.0	(xxxxx.xxx*kvar)(timestamp)<CR><LF>
Accumulated max power Q12	3.2.0	(xxxxxx.xxx*kvar)<CR><LF>
Max power Q34	4.6.0	(xxxxx.xxx*kvar)(timestamp)<CR><LF>
Accumulated max power Q34	4.2.0	(xxxxxx.xxx*kvar)<CR><LF>

Number of debiting periods	0.1.0	(xx)<CR><LF>
Hour counter	96.8.0	(xxxxxxx)<CR><LF>
Date RTC (Real time clock)	1.0.0	(NVYYMMDDHHMMSS)<CR><LF>
End character		!<CR><LF>
End Character in the block		<ETX>
Block check character		<BCC>

Figure 10 – User data 2 (configurable)

5 Object Support in Programming mode

Object	Access	Representation	Data format	Example
Logger	R6 (partial)	Load profile logger is used as example of logger readout, but this is general for all loggers	[SOH]R6[STX]P.1.0(;;)[ETX][BCC]	
Register	R1	Read object (Register)	XXX.XXX.XXX	131.0.3
Register	W1	Write is only possible to certain objects	XXX.XXX.XXX(X..X)	131.0.3(0)
1.0.0	R5	Current time & date	NVYYMMDDhhmmss	1.0.0(01050201075133)
1.0.0	W5	Current time & date	NYYMMDDhhmmss	1.0.0(0050201075133)

hh: Hour, 00-23.
mm: Minute, 00-59.
DD: Day, 01-31.
MM: Month, 01-12.
YY: Year, 00-99.
ss: Second, 00-59.
N: Normal (winther) or Summer time, 0=Normal, 1=Summer.
V: Valid time indication, 0=Invalid, 1=Valid.
A: Alpha numeric value, A-Z & 0-9.
X: Numeric value, 0-9.

5.1 Object Identification System

All objects are identified by the reduced ID code presentation described in IEC 62056-61 (Annex A).
The rules are as follows:

- Value groups A and B are always suppressed/never used.
- Value groups C, D and E are mandatory and separated by (.).
- Value group F is optional, if present the delimiter is (*).

Name	Object ID	K351C	K382M	OMNIPOWER
RTC	1.0.0	●	●	●
ActualTariff	129.0.0	●	●	●
OperateState	96.5.1	●	●	●
Trafo ratio	0.4.2	●	-	-

Figure 11 List of writable registers

Figure 12 lists all available loggers together with its Obis code for each electricity meter. For details of what is include in each logger and an overview of available objects (registers) refer to the technical description for applicable electricity meter.

Name	Object ID	K351C	K382M	OMNIPOWER
Billing logger	98.1.0	●	●	●
Billing logger 2	98.2.0	●	●	●
Load Profile logger	99.1.0	●	●	●
Analysis logger	99.1.1	●	●	●
Status logger	99.98.2	●	●	●
RTC logger	99.98.3	●	●	●
Voltage quality logger	99.98.4	●	●	-
Cut Off logger	99.98.5	-	●	●
Trafo ratio logger	99.98.9	●	-	-
Load Profile event logger	99.98.10	●	●	●
NeutralFault eventlogger	99.98.12	●	●	●
Upload Audit success	99.98.13	●	●	●
Upload Audit fail	99.98.14	●	●	●
VoltageQualityLogger1	99.98.16	-	-	●
VoltageQualityLogger2	99.98.17	-	-	●

Figure 12 – List of available loggers

Table 4-1 below show the generic layout of all loggers within the electricity meters. The DataQuality object is only available for the debiting loggers, load profile logger and analysis logger (Data loggers). For details on the logger specific register values refer to Technical description for actual electricity meter.

Generic Logger layout		
OBIS code		
1.0.0		RTC
96.56.2		LoggerStatus
96.56.3		DataQuality
Register 1 OBIS code		Logger specific register value
..		Logger specific register value
Register n OBIS code		Logger specific register value

Table 4-1 Generic logger layout (data loggers)

5.2 LoggerStatus object

Value	Description	
2bytes 0-65535	Bit 0	Unused
	Bit 1	Unused
	Bit 2	Unused
	Bit 3	1 = Log invalid due to incorrect crc
	Bit 4	Unused
	Bit 5	Unused
	Bit 6	1 = Time discontinuity – Log's are not filled up after SetClk or PowerOutage
	Bit 7	1 = Logger is reconfigured
	Bit 8	1 = Log interval changed
	Bit 9	1 = LogId has reached 0xFFFFFFFF – no further logs
	Bit 12-15	Unused

Figure 13 – LoggerStatus (Obis 96.56.2)

5.3 DataQuality object

Value	Description	
4 bytes	Bit 0	Clock set between 7-15s (default values)
	Bit 1	Clock set between 15-30s (default values)
	Bit 2	Clock set between 30-60s (default values)
	Bit 3	Clock set more than 60s (default values)
	Bit 4	Clock set forward
	Bit 5	Clock set backward
	Bit 6	Legal Param error
	Bit 7	Overvoltage
	Bit 8	Undervoltage
	Bit 9	Neutral Error
	Bit 10	Power Outage
	Bit 11-31	For future use

Figure 14 – DataQuality in loggers (Obis 96.56.3)

5.4 Logger Readout - Load profile object (99.1.0) used as example

All loggers are readout as shown in this section.
The load profile (99.1.0) is a log of actual load values logged at given intervals (15 min default). Each load value is time stamped.

Data format for requesting the load profile.

99.1.0(*StartTime* ; *EndTime* ; *BlockSize*)
StartTime Oldest record to return formatted as NYYMMDDhhmmss (Optional.).
EndTime Newest record to return formatted as NYYMMDDhhmmss.
(Optional. If used, StartTime must also be provided.

BlockSize Max no of log-records to return in each partial block formatted as XX.

(Optional. Default is 6 records per block readout).

99.1.0(NYYMMDDhhmmss;NYYMMDDhhmmss;XX)

Defaults related to the optional parameters:

[SOH]R6[STX]99.1.0(;;)[ETX][BCC]

Returns all data in the logger sending 6 records pr block readout.

[SOH]R6[STX]99.1.0(NYYMMDDhhmmss;;)[ETX][BCC]

Returns data from the given start time to 'now', sending 6 records pr block readout.

[SOH]R6[STX]99.1.0(NYYMMDDhhmmss;NYYMMDDhhmmss;)[ETX][BCC]

Returns data using the given start time and end time, sending 6 records pr block readout.

Data format for each partial-block returning the actual load profile.

Header:

99.1.0 (Objects)(Obj1)(Unit1)(Obj2)(Unit2)

Body:

(Record1 Object1) (Record1 Object2)[CR][LF]

(Record2 Object1) (Record2 Object2)[CR][LF]

:

(RecordM Object1) (RecordM Object2)[CR][LF]

Obj*n*: OBIS object representing measure point no *n*.

Unit*n*: Unit used by object *n*.

6 Object Support in Manufacturer Specific mode

Object	Access	Representation	Data format	Example
131.0.17	W5	Configure “User data 2”	[SOH]W5[STX]131.0.17(n)(Object1)..(Objectn)[ETX][BCC]	

Data format for configuration of “User data 2”.

U.02(*n*)(Object1)....(Objectn)

n Number of objects in “User data 2”. Must match the following list of objects. Max. value is 40.

Object Object in logger to readout C.D.E*F. *F is optional.

7 Command Set Overview

7.1 Control Characters

The protocol uses a few unique control characters. The characters are:

SOH	0x01	Start of header (Start of request).
STX	0x02	Start of block in reply frame
ETX	0x03	End of reply frame .
EOT	0x04	End of block in reply frame .
ACK	0x06	Acknowledge, Data was received and accepted.
LF	0x0A	Completion character.
CR	0x0D	Completion character.
NAK	0x15	Data was not acknowledged , repeat the transmission.
BCC		Calculated block check character.

7.2 Calculation of Block Check Character

The block check character is calculated according to IEC 62056-21.

Bit:	2^0	2^1	2^2	2^3	2^4	2^5	2^6	**Parity**	
	0	1	0	0	0	0	0	1	STX or SOH if present (see note)
									Information area
	1	1	0	0	0	0	0	0	ETX/EOT
	b	b	b	b	b	b	b	P	BCC (Block Check Character)

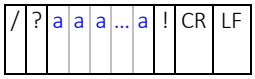
The block check character is calculated within the green area.

Note: The scope of the block check character BCC is from the character immediately following the first SOH or STX character detected up to and including the ETX/EOT character which terminates the message.

BCC = EXOR connection all characters after STX or SOH character up to and including the ETX character.

The calculated BCC is placed immediately following the ETX/EOT.

7.3 Sign On

To Meter: 

Request message

Reply: 

Identification message

Value	Description
aaa…a	Meter address (Serial number) (0-9, A-Z, a-z, space ( )) 0 to 32 characters 0 characters ⇒ Reply All
XXX	Manufacture id = “KAM” – According to FLAG
Z	Baud rate 5 9600 Baud
iii…i	Meter identification (Meter type) (0-9, A-Z, a-z, space) Up to 16 characters

Example: To Meter: /?![CR][LF]

Reply: / KAM5 6841138AN141001 [CR][LF]

The Meter is suggesting 9600baud as communication speed (highest possible speed).

Meter identification is no 6841138AN141001 .

7.4 Data Readout

To Meter:

ACK	V	Z	Y	CR	LF

Option select message

Reply:

STX	Data block	!	CR	LF	ETX	BCC

Data message (Std)

Value	Description
V	Protocol control character 0 Normal procedure
Z	Baud rate 0 300 Baud 1 600 Baud 2 1200 Baud 3 2400 Baud 4 4800 Baud 5 9600 Baud All other values will cause a baud-rate of 300 baud
Y	Mode control character 0 Data readout 1 Programming mode 6 Manufacturer Specific mode
Data block	Se section 6.5 in IEC 62056-21 Spec.

Example 1: To Meter: [ACK]050[CR][LF]

Reply: [STX]A…A(V…V*U…U)[CR][LF]

A…A(V…V*U…U)[CR][LF]

…

A…A(V…V*U…U)[CR][LF]

![CR][LF][ETX][BCC]

Where A…A represents an OBIS object, V…V the current value and U…U the value unit.

Example 2: To Meter: /?![CR][LF]

Reply: /KAM5 68535CC453010 [CR][LF]

To Meter: [ACK]050[CR][LF]

Reply: [STX]

0.0.1(12345678)[CR][LF]
97.97.0(210)[CR][LF]
1.8.0(0000010*kwh)[CR][LF]
1.8.1(0000010*kwh)[CR][LF]
1.8.2(0000000*kwh)[CR][LF]
2.8.0(0000010*kwh)[CR][LF]
2.8.1(0000010*kwh)[CR][LF]
2.8.2(0000000*kwh)[CR][LF]
3.8.0(0000000*kvarh)[CR][LF]
3.8.1(0000000*kwh)[CR][LF]
3.8.2(0000000*kwh)[CR][LF]
4.8.0(0000000*kvarh)[CR][LF]
4.8.1(0000000*kwh)[CR][LF]
4.8.2(0000000*kwh)[CR][LF]
1.6.0(0.000*kW)(00000101000000)[CR][LF]
1.6.1(0.000*kW)(00000101000000)[CR][LF]
1.6.2(0.000*kW)(00000101000000)[CR][LF]
2.6.0(0.000*kW)(00000101000000)[CR][LF]
1.2.0(0.000*kW)[CR][LF]
2.2.0(0.000*kW)[CR][LF]
3.6.0(0.000*kvar)(00000101000000)[CR][LF]
3.2.0(0.000*kvar)[CR][LF]
4.6.0(0.000*kvar)(00000101000000)[CR][LF]
4.2.0(0.000*kvar)[CR][LF]
0.1.0(0)[CR][LF]
96.8.0(49)[CR][LF]
1.0.0(01131212114656)[CR][LF]
![CR][LF][ETX][BCC]

7.5 Programming Mode

7.5.1 Selecting programming mode

To Meter:

ACK	V	Z	Y	CR	LF

Option select message

Reply:

SOH	C	D	STX	dataset	ETX	BCC

Prg command message

Value	Description
V	Protocol control character. 0 Normal procedure.
Z	Baud rate 0 300 Baud 1 600 Baud 2 1200 Baud 3 2400 Baud 4 4800 Baud 5 9600 Baud All other values will cause a baud-rate of 300 baud
Y	Mode control character. 0 Data readout. 1 Programming mode. 6 Manufacturer Specific mode.
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level password. Read commands. R1 ASCII data. R5 Object ”time,date”. R6 Object ”logger”. Write commands. W1 ASCII data. W5 Object ”time,date”. Break commands. B0 Break. Complete sign-off.
dataset	Se section 6.5 in IEC 62056-21 Spec.

Example: To Meter: [ACK]051[CR][LF]

Reply: [SOH]P0[STX]()[ETX][BCC]

Before the Meter is ready/allowed for communication a valid Level1 password is required.

To Meter: [SOH]P1[STX](*password*)[ETX][BCC]

Reply: [ACK]

When the Meter has acknowledged the password the Programming Mode is fully entered.

In case an invalid password is received the Meter sends a Break Message and is ready for a new Sign On sequence.

7.5.2 Reading in programming mode

To Meter:	SOH | C | D | STX | dataset | ETX | BCC	Prg command message
reply:	STX | dataset | ETX | BCC	Data message (PM)

Alternative: used when reading out Logger's

To Meter:	SOH | C | D | STX | dataset | ETX | BCC	Prg command message
Reply:	STX | dataset | EOT | BCC	Data message opt (PM)
To Meter:	ACK	ACK or NACK
Reply:	STX | dataset | EOT | BCC	Data message opt (PM)
To Meter:	ACK	ACK or NACK
Reply:	STX | dataset | ETX | BCC	Data message (PM)

In case of failure

Reply:	STX | error | ETX | BCC	Error message (PM)

Value	Description
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level pass. Read commands. R1 ASCII data. R5 Object "time,date". R6 Object "logger". Write commands. W1 ASCII data. W5 Object "time,date". Break commands. B0 Break. Complete sign-off.
dataset	Se section 6.5 in IEC 62056-21 Spec.
error	Error description. Up to 32 characters (no spec chars) Always starts with "ER".

Example:

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]R5[STX]*obj*()[ETX][BCC]
Reply: [STX]*obj*(*dd…d*)(*dd…d*)[ETX][BCC]

7.5.3 Writing in programming mode

To Meter:	SOH C D STX dataset ETX BCC	Prg command message
Reply:	ACK	ACK or NACK

Alternative:

To Meter:	SOH C D STX dataset EOT BCC	Prg command message
Reply:	ACK	ACK or NACK
To Meter:	STX dataset EOT BCC	Data message opt (PM)
Reply:	ACK	ACK or NACK
To Meter:	STX dataset EOT BCC	Data message opt (PM)
Reply:	ACK	ACK or NACK
To Meter:	STX dataset ETX BCC	Data message (PM)
Reply:	ACK	ACK or NACK

Value	Description
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level pass. Read commands. R1 ASCII data. R5 Object ”time,date”. R6 Object ”logger”. Write commands. W1 ASCII data. W5 Object ”time,date”. Break commands. B0 Break. Complete sign-off.
Dataset	Se section 6.5 in IEC 62056-21 Spec.
Error	Error description. Up to 32 characters (no spec chars) Always starts with ”ER”.

Example:

To Meter: [ACK]051[CR][LF]

Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W5[STX]*obj*(*dd…d*)[ETX][BCC]
Reply: [ACK]

7.6 Manufacturer Specific Mode

Selecting manufacturer mode

To Meter:

ACK	V	Z	Y	CR	LF

Option select message

Reply:

SOH	C	D	STX	dataset	ETX	BCC

Prg command message

Value	Description
V	Protocol control character. 0 Normal procedure.
Z	Baud rate 0 300 Baud 1 600 Baud 2 1200 Baud 3 2400 Baud 4 4800 Baud 5 9600 Baud All other values will cause a baud-rate of 300 baud
Y	Mode control character. 0 Data readout. 1 Programming mode. 6 Manufacturer Specific mode.
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level pass. Read commands. Write commands. W5 ”User data 2”. Break commands. B0 Break. Complete sign-off.
dataset	Se section 6.5 in IEC 62056-21 Spec.

Example: To Meter: [ACK]056[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

Before the Meter is ready/allowed for communication a valid Level1 password is required.

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

When the Meter has acknowledged the password the Programming Mode is fully entered.

In case an invalid password is received the Meter sends a Break Message and is ready for a new Sign On sequence.

7.6.1 Reading in manufacturer mode

Not possible.

7.6.2 Writing in manufacturer mode

To Meter:	SOH | C | D | STX | dataset | ETX | BCC	Prg command message
Reply:	ACK	ACK or NACK

Alternative:

To Meter:	SOH | C | D | STX | dataset | EOT | BCC	Prg command message
Reply:	ACK	ACK or NACK
To Meter:	STX | dataset | EOT | BCC	Data message opt (PM)
Reply:	ACK	ACK or NACK
To Meter:	STX | dataset | EOT | BCC	Data message opt (PM)
Reply:	ACK	ACK or NACK
To Meter:	STX | dataset | ETX | BCC	Data message (PM)
Reply:	ACK	ACK or NACK

Value	Description
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level pass. Read commands. Write commands. W5 ”User data 2”. Break commands. B0 Break. Complete sign-off.
Dataset	Se section 6.5 in IEC 62056-21 Spec.
Error	Error description. Up to 32 characters (no spec chars) Always starts with ”ER”.

Example:

To Meter: [ACK]056[CR][LF]

Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W5[STX]*obj*(*noobj*)(*obj*)..(*obj*)[ETX][BCC]
Reply: [ACK]

7.7 Ending Programming and Manufacturer Specific Mode

To Meter:

SOH	C	D	ETX	BCC

Break message

Reply:

None

Value	Description
CD	Command message & type identifier Password commands. P0 Dummy operand. P1 Low level pass. P2 Write access pass. Read commands. R1 ASCII data. R5 Object ”time,date”. R6 Object ”logger”. Write commands. W1 ASCII data. W5 Object ”time,date”. Break commands. B0 Break. Complete sign-off.

Example: To module: [SOH]B0[ETX][BCC]

Any ongoing communication from the Meter now stops. No reply is transmitted.
To continue communication a new Sign On sequence has to be performed.

8 Communication Examples

Following, is a few examples of IEC1107 communication with the devise.

8.1.1 Reading time & date

Example:

To Meter:	/?![CR][LF]
Reply:	/KAM5 6841138BN143002 [CR][LF]
To Meter:	[ACK]051[CR][LF]
Reply:	[SOH]P0[STX]()[ETX][BCC]
To Meter:	[SOH]P1[STX](password)[ETX][BCC]
Reply:	[ACK]
To Meter:	[SOH]R5[STX]1.0.0()[ETX][BCC]
Reply:	[STX]1.0.0(01050201075012)[ETX][BCC]

The system date and time is 2005-02-01 07:50:12 (normal time/valid time).

8.1.2 Setting time & date

Example: Setting the system date-time to 2005-03-21 07:38:00 normal time.

To Meter:	/?![CR][LF]
Reply:	/KAM5 6841138BN143002 [CR][LF]
To Meter:	[ACK]051[CR][LF]
Reply:	[SOH]P0[STX]()[ETX][BCC]
To Meter:	[SOH]P1[STX](password)[ETX][BCC]
Reply:	[ACK]
To Meter:	[SOH]W5[STX]1.0.0(0050321073800)[ETX][BCC]
Reply:	[ACK]

The time is now set to 2005-03-21 07:38:00.

Example: Setting the system date-time to 2005-03-21 00:38:00 summer time.

To Meter: /?![CR][LF]
Reply: /KAM5 6841138BN143002 [CR][LF]

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W5[STX]1.0.0(1050321003800)[ETX][BCC]
Reply: [ACK]

The date and time is now set to 2005-03-20 23:38:00 normal time.

Example: Setting the system time to 2005-03-21 07:38:00.

To Meter: /?![CR][LF]
Reply: /KAM5 6841138BN143002 [CR][LF]

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W5[STX]1.0.0(0050321073800)[ETX][BCC]

Reply: [ACK]

The time is now set to 2005-03-21 07:38:00.

8.1.3 Reading the User data configuration for the IR port

Example:

To Meter: /?![CR][LF]

Reply: /KAM5 6841138BN143002 [CR][LF]

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]R1[STX]131.0.3()[ETX][BCC]
Reply: [STX] 131.0.3(1)[ETX][BCC]

The IR port is configured for User Data 2.

8.1.4 Writing User data configuration for the IR port

Example:

To Meter: /?![CR][LF]
Reply: /KAM5 6841138BN143002[CR][LF]

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W1[STX] 131.0.3(0)[ETX][BCC]
Reply: [ACK]

Configuring the IR port for User Data 1.

8.1.5 Reading the load profile

Example: Reading out the load profile from 2005-01-01 00:00:00 to 2005-01-01 08:00:33 with 6 records per partial block.

To Meter: /?![CR][LF]
Reply: /KAM5 6841138BN113002[CR][LF]

To Meter: [ACK]051[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]
To Meter: [SOH]R6[STX]99.1.0(0050101000000;0050101080033;6)[ETX][BCC]
From Meter: [STX]99.1.0(4)(1.0.0)()(96.56.2)()(96.56.3)()(1.8.0)(kWh)

[CR][LF]
(01050101000000)(0)(0)(0000586.12)[CR][LF]
(01050101010000)(0)(0)(0000587.23)[CR][LF]
(01050101020000)(0)(0)(0000588.34)[CR][LF]
(01050101030000)(0)(0)(0000589.11)[CR][LF]
(01050101040000)(0)(0)(0000589.11)[CR][LF]
(01050101050000)(0)(0)(0000590.25)[CR][LF]
[EOT][BCC]

To Meter: [ACK]
From Meter: [STX]99.1.0(4)(1.0.0)()(96.56.2)()(96.56.3)()(1.8.0)(kWh)
[CR][LF]
(01050101060000)(0)(0)(0000590.78)[CR][LF]
(01050101070000)(0)(0)(0000592.89)[CR][LF]
(01050101080000)(0)(0)(0000592.95)[CR][LF]
[ETX][BCC]

8.1.6 Configuring User data 2

To Meter: /?![CR][LF]
Reply: /KAM5 6841138BN143002 [CR][LF]

To Meter: [ACK]056[CR][LF]
Reply: [SOH]P0[STX]()[ETX][BCC]

To Meter: [SOH]P1[STX](password)[ETX][BCC]
Reply: [ACK]

To Meter: [SOH]W5[STX]131.0.17(3)(1.0.0)(1.8.0)(1.8.1)[ETX][BCC]
From Meter: [ACK]

An ERROR-message is returned is case of mismatch between the number of OBIS elements given in the first parameter and the actual number of OBIS elements listed afterwards or one or more of the listed OBIS elements are invalid/unknown or the number of OBIS elements exceeds 40.

User data 2 is now configured to contain 3 OBIS elements. These elements will be readout in a Data Readout if User data 2 is enabled.