

SF-586x: M-Bus Extension

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1 Preface

The used M-Bus protocol equates generally the recommendation version 4.8 from November 1997 (www.m-bus.com).

1.1 Validaty

This document is valid for all firmware versions of SF-586aM without pressure sensor..

1.2 Abbreviations

Abbreviation	Explanation
REQ_UD2	master > slave: request data from slave
SND_NKE	master > slave: initialisation of slave
SND_UD	master > slave: send data to slave
RSP_UD	slave > master: send requested date to master
ACK	slave > master: data respectively instruction of master is recognized
PADR	primary address (1 byte)
LEN	len (1 Byte), calculated after EN13757
IDENT	secondary address (4 Bytes)
MAN	manufacture ID (2 Byte)
DEV	device version (1 Byte)
MED	medium (1Byte)
ACC	access counter (1 Byte)
STAT	status (1 Byte)
CS	checksum (1 Byte), calculated after EN13757
SIGN	signature (2 Byte)
A	address field
C	control field
CI	control information field

1.3 Checksum

The checksum is calculated from the arithmetical sum of the data initiated after the (2nd) start character (for control and long frames), without taking carry digits into account.

1.4 Telegram format

1.4.1 Single Character

This format consists of a single character, namely the E5h (decimal 229), and serves to acknowledge receipt of transmissions.

Format:

ACK	E5H	answer
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1.4.2 Short Frame

This format with a fixed length begins with the start character 10h, and besides the C and A fields includes the check sum (this is made up from the two last mentioned characters), and the stop character 16h.

Use:

REQ_UD2 request data from slave
 SND_NKE initialisation of slave

Format:

Start	10H	start character
C-field		control , function field
A-field		address field
checksum	CS	
Stop	16H	end character

1.4.3 Control Frame

Use:

SND_UD send data to slave

Format:

Start	68H	1 st start character
L-field	03H	len
L-field	03H	len
Start	68H	2 nd start character
C-field		control , function field
A-field		address field
checksum	CS	
Stop	16H	end character

1.4.4 Long Frame

Use:

RSP_UD send requested data to master

1.4.4.1 Common format

Start	68H	1 st start character
L-field		len
L-field		len
Start	68H	2 nd start character
C-field		control , function field
A-field		address field
CI-field		control information field
Header		12 byte (see 1.4.4.2 Format header)
User Data		0 .. 234 byte (see 1.4.4.3 Common ...)
Checksum	CS	
Stop	16H	end character

1.4.4.2 Format Header

Name	No. of Bytes	Hint
IDENT	4 Byte	8 character BCD, used for extended addressing (secondary address)
MAN	2 Byte	manufacture ID
DEV	1 Byte	device version
MED	1 Byte	medium
ACC	1 Byte	access counter
STAT	1 Byte	status
SIGN	2 Byte	reserved

1.4.4.3 Common user data format

A data set consists of blocks in the following format:

- Data Information Block: Typ and coding of data
- Value Information Block: Value and unit of data
- data: data in used format

Data Information Field (DIF)	Data Information Field Extension (DIFE)	Value Information Field (VIF)	Value Information Field Extension (VIF)	Data
1 Byte	0 .. 10 Byte	1 Byte	0 .. 10 Byte	0 – n Byte
Data Information Block (DIB)		Value Information Block (VIB)		
Data Record Header (DRH)				

1.5 Baud rates

The M-Bus communication happens with 300, 2400 and 9600 Baud (factory delivery: 2400 Baud). An automatic baud rate recognition is **not** supported. The device has to configure before use to the right baud rate.

1.6 M-Bus modes

Mode	Master	CI	SF-586x	Hint
Slave select	SND_UD	52h	ACK	
Slave deselect	SND_NKE		ACK	
Data read	REQ_UD2		RSP_UD	
Parametrization	SND_UD	51h	ACK	
Application RESET	SND_UD	50h	ACK	

In the C-field of a master request is no difference if bit 5 (FCB, Frame Count Bit) is set or not. Both requests get the same handling.

1.7 M-Bus addressing

Both, primary and secondary addressing are supported.

With the factory delivery the default device address is set to 0.

Addressing	PADR	Hint
Primary addressing	0 .. 250	
Secondary addressing	253	
Point-to-point addressing	254	
Broadcast	255	

1.8 Readout

On a request the following data will sent:

- Medium temperature
- Standard speed
- Standard volume
- Mass flow
- Volume counter
- Mass counter
- Error/status regarding description

2 Addressing

2.1 Primary Addressing

2.2 Primary Addressing

SF-586x devices can be addressed in the M-Bus network via the primary address. Valid addresses are 0 ... 250.

Every data telegram contains the primary address in the A-field

2.2.1 Point-to-point addressing

This addressing is possible if the network contains only a master and one slave.

The A-field in the data telegram to the slave is set to 254 (FEh).

The slave answers independent of its primary address.

2.2.2 Broadcast

If all devices of a network are to receive a data telegram and effect the command, there is used this type of addressing.

The A-field in the data telegram to the slave is set to 255 (FFh).

All devices will effect the command independent of its primary address, but no device will send an acknowledge.

2.3 Secondary addressing

If above 250 devices in the network, there is used the secondary addressing.

The A-field in the data telegram to the slave is set to 253 (FDh).

Start the secondary addressing via a slave-select telegram.

The secondary addressing is valid until a slave-deselect telegram or a communication with invalid data to the slave.

2.3.1 Slave-select telegram

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	0Bh	
L-field	1	0Bh	
Start	1	68h	
C-field	1	53h/73h	SND_UD
A-field	1	FDh	secondary addressing
CI-field	1	52h	Slave-select
Second.-adr.	4	IDENT	device no.
Man. ID	2	MAN	4DE6 (SOF, softflow.de GmbH)
Dev. version	1	DEV	
Medium	1	MED	
Checksum	1	CS	
Stop	1	16h	

The devices is selected and answers with ACK if all data matches.
For all but MAN will accept 'wild cards'.

2.3.2 Deselect-slave telegram

Name	No. of bytes	Value	Hint
Start	1	10h	
C-field	1	40h	SND_NKE
A-field	1	FDh	
Checksum	1	CS	
Stop	1	16h	

Secondary addressing will ends. The slave answers with ACK.

3 Readout

The readout starts with a REQ_UD2 telegram to the slave.
The device answers with its standard RSP_UD telegram.

3.1 Data request

Name	No. of bytes	Value	Hint
Start	1	10h	
C-field	1	5Bh/7Bh	SND_NKE
A-field	1	PADR	Primäradresse
Checksum	1	CS	
Stop	1	16h	

The device answers with the following RSP_UD telegram.

3.2 Device data

This telegram is valid for SF-586x devices without pressure sensor.
The access counter (ACC) is incremented with every RSP_UD (mod 255).

Hint:

The readout values will set to zero, if jumper JP1 (on base PCD) is recognized (the serial communication link is used for other things) or the data of the SF-586x are invalid. In both cases bit 1 of the status byte is set.

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	xxh	
L-field	1	xxh	
Start	1	68h	
C-field	1	08h	RSP_UD
A-field	1	PADR	primary address
CI-field	1	72h	readout (LSB first)
Second.-adr.	4	IDEN T	device no.
Man. ID	2	MAN	4DE6 (SOF, softflow.de GmbH)
Device version	1	DEV	0xh ... test 1xh ... external M-Bus basic PCB (ATmega 328P) 2xh ... external M-Bus basic PCB (ATmega 128) x ... main revision of firmware
Medium	1	09h 00h	air, also pressure air (another) Gas
Access counter	1	ACC	
Status	1	00h	bit 1: 1 .. 'any application error', else 0
Signature	2	0000h	at time not used
DIF	1	05h	instantaneous value, 32 bit real
VIF	1	5Bh	flow temperature [1 * °C]
Value	4		medium temperature (0 ...)
DIF	1	05h	instantaneous value, 32 bit real
VIF	1	7Ch	string
	1	04h	string len: 5 byte
	4		's' '/' 'm' 'N(S)' → N(S)m/s, LSB first
Value	4		standard speed [N(S)m/s]
DIF	1	05h	instantaneous value, 32 bit real
VIF	1	3Eh	volume flow [1 * N(S)m³/h]
Wert	4		standard volume flow

Name	No. of bytes	Value	Hint
DIF	1	05h	instantaneous value, 32 bit real
VIF	1	16h	volume [1 * N(S)m³]
Value	4		volume counter
DIF	1	05h	instantaneous value, 32 bit real
VIF	1	53h	mass flow [1 * Kg/h]
Value	4		mass flow
DIF	1	04h	instantaneous value, 32 bit Integer
VIF	1	1Bh	mass [1 * kg]
Value	4		mass counter
DIF	1	01h	instantaneous value, 1 byte
VIF	1	FDh	
VIFE	1	17h	error/status
Value	1		status: bit 0: 1 .. standard volume counter ON, else 0 bit 1: 1 .. overflow volume counter, else 0 bit 2: 1 .. mass counter ON, else 0 bit 3: 1 .. overflow mass counter, else 0 bit 4: 1 .. common metering range overflow, else 0 bit 5: 1 .. metering range overflow:temperature, else 0 bit 6: 0 .. n.n. bit 7: 0 .. n.n.
Checksum	1	CS	
Stop	1	16h	

4 Parametrization

All parameter are stored permanently in an intern EEPROM.
There can change only one parameter at request.

The manufacture ID MAN is set to SOF (4DE6h).
The device ID DEV is set to 00h.

4.1 Baud rate

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	03h	
L-field	1	03h	
Start	1	68h	
C-field	1	53h/73h	SND_UD
A-field	1	PADR	primary address
CI-field	1	B8h BBh BDh	300 Baud 2400 Baud (factory default) 9600 Baud
Checksum	1	CS	
Stop	1	16h	

Answer telegram: ACK (E5h)

4.2 Primary address

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	06h	
L-field	1	06h	
Start	1	68h	
C-field	1	53h/73h	SND_UD
A-field	1	PADR	(old) primary address
CI-field	1	51h	parametrization
DIF	1	01h	
VIF	1	7Ah	
Value	1	xxh	(new) primary address 0 .. 250
Checksum	1	CS	
Stop	1	16h	

Answer telegram: ACK (E5h)

4.3 Identifications number

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	09h	
L-field	1	09h	
Start	1	68h	
C-field	1	53h/73h	SND_UD
A-field	1	PADR	primary address
CI-field	1	51h	parametrization
DIF	1	0Ch	
VIF	1	79h	
Value	4	xxh	8 BCD characters: i.e. '78' '56' '34' '12' for "12345678"
Checksum	1	CS	
Stop	1	16h	

Answer telegram: ACK (E5h)

5 Application Layer RESET

Initialisation of application layer, clear response selection and reset to standard response.
Because there is at time no possibility to select a response, these request has no visible effect.

Name	No. of bytes	Value	Hint
Start	1	68h	
L-field	1	03h	
L-field	1	03h	
Start	1	68h	
C-Feld	1	53h/73h	SND_UD
A-field	1	PADR	primary address
CI-field	1	50h	
Checksum	1	CS	
Stop	1	16h	

Answer telegram: ACK (E5h)

6 Error handling

If the SF-596x can not handle a M-Bus request correctly, in the [status byte](#) of the RSP_UD telegram bit 1 is set for 'any application error'.

The status of data (metering range overflow, ...) is handled with one special byte in the RSP_UD telegram.

7 Document history

Date	Revision	Hint	Author
08.04.10	1.00	1. English revision (from rev. 1.02 DE)	J. Radzewitz
05.07.10	1.04	Translate corrections Use the same notation as the German version	J. Radzewitz