HOTTINGER BALDWIN MESSTECHNIK GmbH

Operating Manual

Digital Load Cells
FIT® and PW18i

Part 2,
Command set

Instruction manual Digital Load Cells FIT® and PW18i

Part 1: Hardware and Functions

Description of the hardware and the functions of the Digital Load Cells FIT® and PW18i

Part 2: Command set

Description of the command set for the serial communication of the Digital Load Cells FIT® and PW18i

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Description of the command set for the dosing functions of the Digital Load Cells FIT® and PW18i

Important notes

The complete factory settings are stored nonvolatilely and protected against overwriting. The factory settings can be restored with the TDD0 command at any time, if necessary.

The production number set in the factory should not be changed.

You will find further notes in the 'Individual descriptions of the commands' chapter.

Safety instruction

See instruction manual part 1.

1 Application

The load cell FIT® and PW18i belong to the family of digital load cells, which digitally condition and network with bus capability the measured weight values.

The instruction manual part 1 describes the functions and connections of the Digital Load Cells FIT® and PW18i.

This part 2 describes the commands for the serial communication.

Part 3 describes the dosing functions and the related commands (D-version only).

This instruction manual is valid for the following versions of the Digital Load Cells FIT® and PW18i:

You will find the description of these versions in part 1 of the manual.

FIT/H1SR2	FIT/H4SR2	PW18ISR2
FIT/H1LR2	FIT/H4LR2	PW18ILR2
FIT/H1DR2	FIT/H4DR2	PW18IDR2
FIT/H1SR5	FIT/H4SR5	PW18ISR5
FIT/H1LR5	FIT/H4LR5	PW18ILR5
FIT/H1DR5	FIT/H4DR5	PW18IDR5

The Digital Load Cells FIT® and PW18i are abbreviated with " FIT " in the following text.

2 Command set

The commands can be classified roughly into:

- Interface commands (ADR, BDR, COF, CSM, GRU, Sxx, TEX,)
- Commands for adjusting and scaling (LDW,LWT,NOV,CWT,LIC)
- Commands for the measuring mode (MSV, ASF, ICR,TAR,TAS,TAV,FMD,MTD,TMP, ZSE,ZTR,)
- Inputs, outputs and limit values (IMD,POR,LIV)
- Special commands (TDD,RES,DPW,SPW, IDN,ENU,ESR, STR, TRC, MAV)
- Commands for legal for trade applications (LFT,TCR,CRC)

2.1 Command format

General notes:

The commands can be entered in uppercase or lowercase letters.

Each command has to be terminated by an end-of-command character. This can be optionally a line feed (**LF**) or a semicolon (**;**).

If only an end-of-command character is sent to the FIT, the input buffer of the FIT is cleared.

The statements made in the commands in round brackets () are urgently necessary and must be entered. Parameters in pointed brackets <> are optional and can also be left out. **The brackets themselves are not entered.**

Texts must be included in **" "**.

Leading zeros are suppressed in numerical inputs. Numbers can be entered either directly or in exponent representation, e.g. ±12000lf or ±1.2e4lf.

The exponent **e** can be one- or two-digit, but a number including sign and exponent may not be more than 10 characters in length.

Responses consist of ASCII characters and are concluded with **CRLF**. An exception is the binary character output (see command MSV).

Each command consists of the command code, the parameter(s) and the end-of-command character.

	Command code	Parameter	End-of-command code
Input	ABC	X,Y	LF or ;
Output	ABC?	X,Y	LF or ;

Example: MSV?20;
20 measured values are output after this command.
All ASCII characters ≤ 20_H (blank), except for 11_H (ctrl q) and 13_H (ctrl s) may stand between the command code, parameters and end-of-command code. H: hexadecimal.

2.2 Responses to commands

Responses to inputs (exception COF64...COF79):

	Response	End-of-command code
Correct input	0 (zero)	CRLF
Faulty input	?	CRLF

Exceptions: The commands **RES, STP, S00 ... S99** deliver no response.
The command **BDR** delivers the response in the new baud rate.

An error code is obtained through the command **ESR.**

Responses to output commands:

Correct command	Parameter1, ... Parameter n, or measured value **CRLF**
Faulty command	**? CRLF** (error code through command **ESR**)

2.3 Output modes for the measured values

You can choose between two output modes and a terminator (command **TEX**).

Output mode 1:
The measured values are output arranged below one another.

Value1 CRLF
Value2 CRLF
. . . . . .
Value n CRLF

Output mode 2:
The measured values are output arranged next to one another.

Value1 (terminator) Value2 (terminator) ... Value n CRLF

The value output works with fixed output lengths (see command COF):

Format command	FIT response		Number of bytes
COF0; msv?;	yyyy CR LF	(y- binary)	6
COF2; msv?;	yy CR LF	(y- binary)	4
COF3; msv?;	xxxxxxxx CR LF	(x- ASCII)	10
COF9; msv?;	xxxxxxxx,xx,xxx CR LF	(x- ASCII)	17

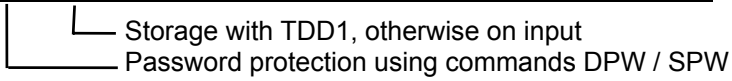
A CRLF or the terminator defined by the command TEX always occurs as end-of-command code of the measured value output. However, these characters may not be filtered out as end-of-command code in the binary output, since these characters can also be contained in the binary code of the measured value. Therefore only counting the bytes helps in the binary output. For the subsequent syntax check, the corresponding places after CR or LF or the terminator can then be enquired.

Password protection:

The password protection of the FIT comprises important settings for the characteristic of the scale and its identification. Commands with password protection are activated only after the password is input using the SPW command. Without input of the password these commands are answered with "?".

2.4 Command overview

Command	PW	TDD1	Function	Page
ADR		x	Address	8
ASF		x	Amplifier Signal Filter	31
BDR		x	Baud rate	9
COF		x	Configurate Output format	11
CRC			Cyclic Redundancy Check	57
CSM		x	Checksum	15
CWT	x	x	Calibration weight	20
DPW			Define Password	47
ENU			Engineering Unit	48
ESR			Event Status Register	55
FMD		x	Filter mode	33
ICR		x	Internal Conversion Rate	34
IDN			Identification	49
IMD		x	Input mode	46
LDW	x		Load cell Dead Load Weight	21
LFT		x	Legal for Trade	56
LIC	x		Linearization Coefficients	26
LIV		x	Limit values (only L- or D- version)	42
LWT	x		Load cell weight	22
MAV			Measured Alternative Value	53
MSV			Measured Signal value	27
MTD		x	Motion detection	39
NOV	x	x	Nominal value	24
POR		x	Port Set and Read	44
RES			Restart	48
RSN			Resolution	25
S...			Select	17
SPW			Set Password	47
STP			Stop	31
STR		x	Set terminating resistor	10
TAR			Tare	36
TAS		x	Tare Set	38
TAV		x	Tare value	37
TCR			Trade counter	50
TDD1/2			Transmit Device Data	50
TDD0	x		Factory setting	50
TEX		x	Terminator Execution	16
TRC		x	Trigger Command	53
ZSE		x	Zero Setting	41
ZTR		x	Zero Tracking	40



3 Individual descriptions of the commands

3.1 Interface commands (asynchronous, serial)

Characteristic data of the interfaces:

Start bit: 1

Word length: 8 bits

Parity: none / even

Stop bit: 1

Software handshake (XON / XOFF) is possible

Baud rate: 1200; 2400; 4800; 9600;19200; 38400 Baud

The asynchronous interface of the FIT is a serial interface, i.e. the data are transferred bit for bit one after the other and asynchronously. Asynchronous means that the transmission works without clock signal.

A start bit is set **in front of** each data byte. The bits of the word, a parity bit for the transmission check (optional) and a stop bit then follow.

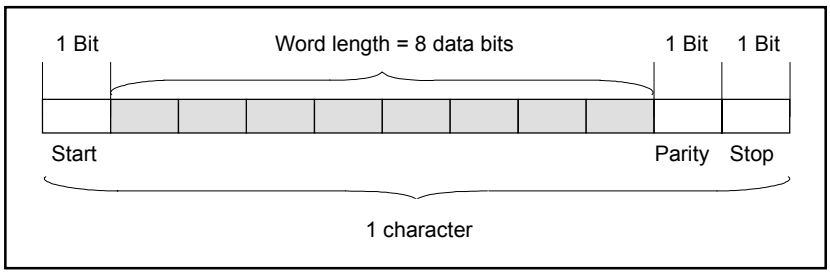


Fig. 7.1.1: Components of a character

As the data are transferred bit by bit, the transmission speed must fit with the reception speed. The number of bits per second is called the baud rate.

With each transferred character the exact baud rate of the receiver is synchronized with the start bit. Then following the data bits, all having the same length. When the stop bit is reached, the receiver changes to "Waiting position" until it is reactivated by the next start bit.

The number of characters per measured value depends upon the selected output format (**COF** command) and can be 2 to 27 characters (see also **COF** command).

For communication between the FIT and computer the interface must be configured. The following commands are provided for this in the FIT: **ADR; BDR; COF; TEX; S..**;

ADR **Address**

(device address)

Range:	0...89
Factory setting:	31
Response time:	<10 msec
Parameters:	2
Password protection:	no
Data storage:	with command **TDD1**

Input: ADR(new address),<"Production No.">;

Input of the device address as decimal number 0...89.

The production number can be stated optionally as 2nd parameter. The new device address is then input only for the FIT with the stated production No. In the case of several FITs with the same address (initialization of the bus mode) changing device addresses without addressing more than one FITs is facilitated.

The production number must be stated in **" "** as for the command **IDN**.

Example: ADR25,"007" CRLF

Output command: ADR?;

Effect: Output of the device address as decimal number 0...89

BDR Baud Rate

(baud rate)

Baud rates	1200,2400,4800,9600,19200,38400
Factory setting:	9600 baud and parity bit even
Response time:	<10 msec
Parameters:	2
Password protection:	no
Data storage:	with command **TDD1**

Input: **BDR<baud rate>,<parity>**

Input of the required baud rate as decimal number.

The following baud rates are possible: 1200, 2400, 4800, 9600, 19200, 38400 baud.

Input of the required parity: 0 – without parity bit
1 – with parity bit even

Caution: *The response is given in the new setting (baud rate, parity). After the baud rate is changed, communication is no longer possible initially. The computer must also be changed over to the newly selected baud rate setting.*

So that the baud rate remains changed permanently, it must be stored in the EEPROM with the command TDD1. This procedure also serves as safeguard that no baud rates are set in the FIT which the remote station does not support. If the newly input baud rate is not stored, the FIT reports after a reset or power on again in the previously valid baud rate.

Output command: **BDR?;**

Effect: Output of the set baud rate,
Code for parity bit

Example: *BDR?;* *9600,1crlf* *corresponds to 9600 baud, parity bit even*

STR

Set Terminating Resistor
(Bus termination resistors)

Range:	0/1
Factory setting:	0 (off)
Reaction time:	<15msec
Parameters:	1
Password protection:	no
Parameter protect.:	with command TDD1

Query: **STR?**

Effect: **0/1 crlf**

Command: **STR0/1;**

Effect: 0 = Bus termination switched off,
1 = Bus termination switched on

Each FIT module provides a bus termination which can be switched on by software. This ensures the correct level on the master line in the passive state if none of the connected modules is transmitting. The necessary measures for the electrical bus termination (resistors) were described in manual part 1. Observe here that this bus termination must be switched on only twice per bus system (master line), and is generally located at the line ends of the master line.

Normally the interface of the master contains such a bus termination, so that the termination has to be switched on at the most remote FIT module via the command STR1;.

The bus termination can only work properly with a RS-485 interface. Do not switch on the resistors when using a FIT RS-232 version.

COF

Configurate Output Format

(output format for the measured value output)

Range: 0...255
Factory setting: 9
Response time: <10 msec
Parameters: 1
Password protection: no
Data storage: with command **TDD1**

Input: COF(0...255);

Input of the output format for measured value command **MSV?**

The possible formats and decimal number to be entered for these are listed in the following table. The measured value output refers in this case to the set nominal value of the FIT (see command **NOV**).

Output format	Output at nominal load	
(see following tables)	**NOV > 0**	**NOV = 0**
2 bytes binary	NOV value	20000
4 bytes binary	NOV value	5120000
ASCII	NOV value	1000000

In the 2-byte binary output the NOV value must be ≤ 30000, otherwise the measured value is output with overflow or underflow ($7fff_H$ or 8000_H). With NOV30000 the overmodulation reserve is only approx. 2700 digits.

Output command: COF?;

Effect: Output of the selected output format as three-digit decimal number from 0...255

COF formats:

On input of **COF0** to **COF15** the following combinations result:

- MSB = most significant bit
- LSB = least significant bit

The sequence of the bytes MSB → LSB or LSB → MSB can be selected for binary output. The device address and/or measured value status information can be output in addition with ASCII output.

Binary format:

	Parameter	Length	Sequence in the measured value output
COF0	Measured value	4 bytes	MSB before LSB LSB = 0 (no status)
COF2	Measured value	2 bytes	MSB/LSB
COF4	Measured value	4 bytes	LSB before MSB LSB = 0 (no status)
COF6	Measured value	2 bytes	LSB/MSB
COF8	Measured value	4 bytes	MSB before LSB LSB = Status/CRC
COF12	Measured value	4 bytes	LSB before MSB LSB = Status/CRC

ASCII format:

In ASCII output a freely selectable terminator is set between the parameters (see command **TEX**). crlf or the selected terminator follows after the last parameter.

T = Terminator () = Number of characters

	1st parameter	T	2nd parameter	T	3rd parameter	End-of-command code
COF1	Measured value(8)	T(1)	Address(2)		----	crlf or T
COF3	Measured value(8)		----		----	crlf or T
COF5	identical with COF1					
COF7	identical with COF3					
COF9	Measured value(8)	T(1)	Address(2)	T(1)	Status (3)	crlf or T
COF11	Measured value(8)	T(1)		-	Status (3)	crlf or T

Important: *In bus mode the output format may not be set to COF9.*

COF16 to COF 28 bus mode:

If the decimal number 16 is added to the above stated output formats COF0...COF12, then one switches the FIT into the bus output mode. A measured value is output. The FIT switches over to the partly active mode (each new measured value is stored in the output buffer but not output). With the Select command S..; the measured value is output on the bus. The measured value is output without CR/LF.

Example (2 FIT):

Command	Effect
S98;	All FITs are partly active (listening, but not sending)
COF18;	Output in 2 byte binary output
ICR0;	Highest measuring rate
MSV?0;	Continuous measurement in the FIT
S01;	Read measured value of the 1st FIT
S02;	Read measured value of the 2nd FIT if response received completely from first FIT
S01;	Read measured value of the 1st FIT if response received completely from second FIT
S02;	Read measured value of the 2nd FIT if response received completely from first FIT
.....	
S98;	All FITs are partly active (listening, but not sending)
STP;	End measured value output
S01;	Possibly new setting of the 1st FIT

COF32 to COF44 binary measured value output without CRLF:

If the decimal number 32 is added to the above stated binary output formats COF0...COF12, then one switches the FIT into the following output mode for the measured values.

In the **binary measured value output** the end-of-command code CR LF is left off, so that only 2 or 4 characters per measured value are output. This measure increases the output speed of the measured values.

Format	Length	Sequence in the measured value output
COF32	4 bytes	MSB before LSB LSB=0 (no status)
COF34	2 bytes	MSB/ LSB
COF36	4 bytes	LSB before MSB, LSB=0 (no status)
COF38	2 bytes	LSB/ MSB,
COF40	4 bytes	MSB before LSB LSB= Status/CRC
COF44	4 bytes	LSB before MSB LSB= Status/CRC

COF64 ... COF76 2-wire bus mode:

If the decimal number 64 is added to the above stated output formats COF0...COF12, then one switches the FIT into the 2-wire bus mode. This means that the FIT no longer answers with "0" or "?" with command inputs. The response with the parameter or in the case of MSV? with the measured value occurs only with output commands (e.g. ASF?). The command MSV?0; (sending measured value permanently) may not be used in this mode since otherwise there is no longer a possibility of stopping this output (apart from supply voltage off).

COF128 to COF 140 continuous output after power on:

Caution: *Not for bus mode*

If the decimal number 128 is added to the above stated output formats COF0...COF12, then one switches the FIT into the continuous output mode. After power on or the RES command, the FIT transmits the measured values *without* a MSV? request. The continuous output can be switched off with the command STP.

The setting is made with the following inputs (COF ≥128):

- .... (make necessary settings)
- ICRi (set measuring rate of the FIT)
- COF+128 (the FIT sends measured values continuously, time interval corresponding to ICR)
- STP (stop continuous transmission)
- TDD1 (store power failure-protected)
- COF+128 (the FIT sends measured values continuously, time interval corresponding to ICR)

The FIT starts the measured value output without separate request also after switching on the voltage. These output formats have a further special feature (depending upon the setting of the triggering, command TRC):

Trigger switched off: continuous, automatic measured value output

Trigger switched on: automatic measured value output only if a new measured value has been formed after triggering

Output speed of measured values:

The FIT can output a maximum of 600 values per second. This data rate also depends upon the baud rate (BDR), the data format of the value output, the set averaging (ICR) and filter mode (fmd = 0).

Table 1 states this relationship for continuous measured value output (**MSV?**):

Measured values/s	**600**	**300**	**150**	**75**	**37,5**	**18,75**	**9,375**	**4,688**
(ICR)	**(0)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Time in ms	**1.66**	**3.33**	**6.66**	**13.33**	**26.66**	**53.33**	**106.7**	**213.3**
Output format (COF)	**necessary baud rates at MSV?0; (BDR)**							
Binary format 2 characters for COF2/COF6	19200	9600	4800	2400	1200	1200	1200	1200
Binary format 4 characters for COF0/COF4	38400	19200	9600	4800	2400	1200	1200	1200
ASCII format measured value 10 characters for COF3	------	38400	19200	9600	4800	2400	1200	1200
ASCII format measured value + address 13 characters for COF1	------	------	38400	19200	9600	4800	2400	1200
ASCII format measured value + address + status 17 characters for COF9	-------	-------	38400	19200	9600	4800	2400	1200
	necessary baud rates at MSV?1; (BDR)							
Binary format 6 characters MSV?1 for COF0/COF4	------	38400	19200	9600	4800	2400	1200	1200

Table 1: Baud rate depending upon the measuring rate and output format

Note for evaluating the binary measured values:

The binary codes for CR and LF can occur in the measured value output in binary format within the bytes which represent the measured value. Therefore the contents of the measured value output may not be tested for the characters CR/LF in order to check possibly an end of the measured value transmission. Rather in the case of binary output the number of characters which are received should be registered. The control characters CR/LF are appended to the measured value also in the binary output (sole exception: MSV?0;).

CSM

Checksum

(Checksum in the measured value status in binary output)

Range:	0/1
Factory setting:	0
Response time:	<10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **CSM(0/1);**

Output command: **CSM?;**

Effect: The set function is output as single-digit decimal number (0/1)

Checksum formation can be used for locating transmission errors in the 4-byte binary output.

At CSM=0 the checksum formation is switched off in the measured value status. The normal measured value status is output (see MSV).

At CSM=1 a checksum (EXOR) is formed over the three-byte measured value and output instead of the measured value status. This checksum output can be used only in the COF8 and COF12 output formats (+i*16, i=0.1...7).

TEX

Terminator Execution

(Terminators between measured values)

Range:	0...255
Factory setting:	172
Response time:	<10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **TEX(0..255);**

The required terminator is input in decimal form as ASCII character (e.g. comma = $2C_H$ = 44 $_D$ → input **TEX44;** H: hexadecimal, D: decimal). Any ASCI character from 0...127_D (0...$7F_H$) can be taken as terminator. The terminator is set between the parameters in the measured value output (see also commands MSV and COF).

Example: *tex 44;*

Measured value output: *-0123456, 12, 000, -0123457, 12, 000 etc. (for COF9)*

If the selected ASCII character is input with an offset of 128 (above example: comma = 44 $_D$ + 128 $_D$ = 172 $_D$ → input **TEX172;**), then the parameters of a measured value are separated as previously by a comma, but crlf is output at the measured value end.

Example: tex 172

Measured value output: -123456,12,000
-123457,12,000 etc.

Output command: **TEX?;**

Effect: The set terminator is output as 3-digit decimal number (0...255)

S...

Select

(Selection of FITs in the bus mode)

Range: 0...89, 98
Factory setting: -----
Response time: <10msec
Parameters: 1
Password protection: no
Data storage: no data to be stored

Input: S(00...89, 98);

The Select command generates no response. Several FITs connected together to form a BUS can be addressed individually or jointly with it. An FIT is always active after reset or power on (apart from COF>127) and must be addressed in the bus mode using the Select command so that the other bus subscribers do not answer. The S command is not required with only one FIT. A maximum of 89 addresses (00...89) can be allocated using the command ADR.

***Note:** The command S.. alone generates no response. The selected FIT responds only together with a further command. Exception in the bus mode : COF16...COF28 (after MSV?0;)*

Selection	Effect for FIT	Effect for PC
s00 to s89	Only the FIT with the stated address performs all commands and responds. All other FITs understand only the Select commands **S00** to **S98** and do not respond.	1:1 communication with a selected FIT.
s98	**All FITs perform all commands but do not respond**	

Example: *Select 00*
Command 1
Command 2 ...n
Select 01
Command 1 etc.

The command **S98**; is intended for special functions (broadcast). All FITs connected to the bus are addressed by it. All FITs perform the following commands. No FIT responds. This occurs until a certain FIT is addressed again through S00 ... S89.

A measured value enquiry in the bus can be performed as follows:

- S98; All FITs selected,
- MSV?; Measured value enquiry, all FITs form the measured value and file this value in the output buffer after the integration time (ICR), but no FIT transmits,
- S01; FIT with the address 01 is selected and outputs the measured value,
- S02; FIT with the address 02 is selected and outputs the measured value etc.

3.2 Adjustment and scaling

The following commands serve for setting the user characteristic.

Commands for adjusting the user characteristic: **LDW**, **LWT**

Commands for adjusting the user characteristic with part load: **CWT**

The command **NOV** is available for scaling the measured value.

Characteristic setting:

The factory setting can be restored with tdd0. The factory characteristic is set to max. capacity of the FIT.

The user can adapt the FIT characteristic to his requirements with the command pair LDW, LWT. The user characteristic can also be set with part load with the command CWT.

Caution: *The characteristic commands LDW, LWT must be entered or executed in the order LDW then LWT. The input data are not evaluated until both parameters have been entered or measured pair-wise.*

The scaling must be switched off when determining the characteristic (NOV= 0).

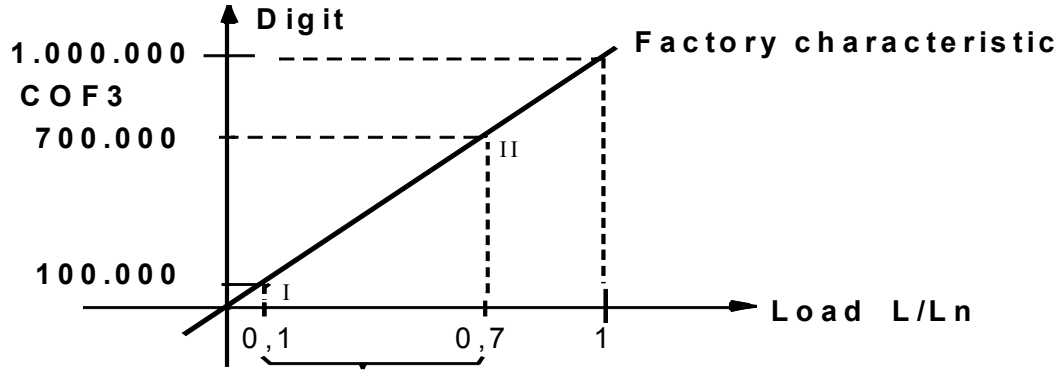
After the values for zero point and max. load of the user characteristic have been measured or input, the range LDW → LWT (at NOV=0) is assigned to the following numerical ranges:

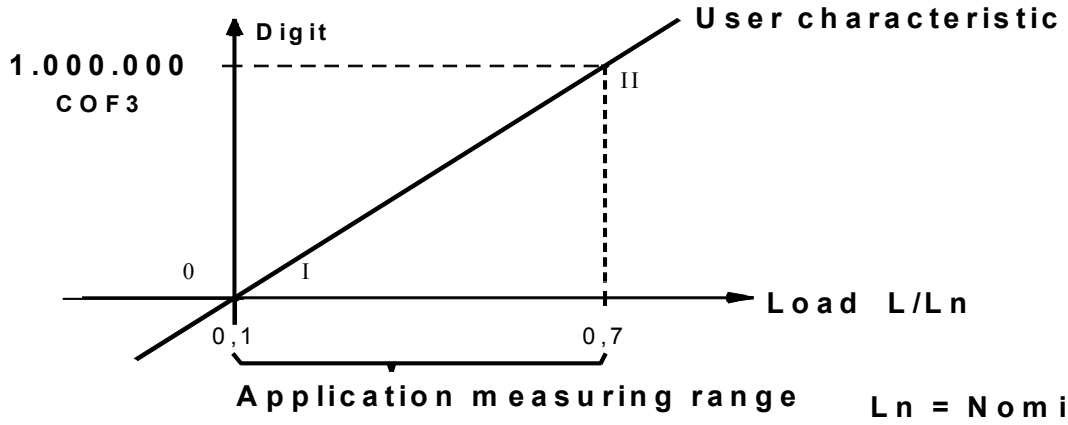
Output format	Output at nominal load	
(see following tables)	**NOV > 0**	**NOV = 0**
2 bytes binary	NOV value	20000
4 bytes binary	NOV value	5120000
ASCII	NOV value	1000000

In the 2-byte binary output, the NOV value must be $\leq$ 30000, otherwise the measured value is output with overflow or underflow ($7fff_H$ or 8000_H ; H: hexadecimal). For NOV30000 the overmodulation reserve is only approx. 2700 digits.

Set user characteristic with LDW, LWT

Action	Command string
Input password	SPW"AED";
Load = scale zero load	LDW;
Load = sc. nomin.load	LWT;





Ln = Nominal load

CWT

Calibration Weight
(Calibration weight)

Range:	200 000...1 200 000 (20...120%)
Factory setting:	1000000 (100%)
Response time:	<10msec
Parameters:	1(2)
Password protection:	yes
Data storage:	on input

Input: **CWT <Calibration weight in %x 10 000;**

If it is not possible to apply 100% of the nominal load when adjusting the user characteristic (LDW, LWT), then it is possible with the cwt command to adjust the FIT with a load in the range from 20% to 120% of the required nominal load (partial load calibration).

Output command: **CWT?; (**response time: <10msec)

Effect: **Value1,value2crlf**

Value1 and value2 are two 7-digit decimal numbers in the range 200 000 to 1 200 000.
Value1 is the percentage part of the nominal load with which the next ldw/lwt adjustment is made.
Value2 is the percentage part of the nominal load with which the last ldw/lwt adjustment was made. Value2 cannot be input.
The cwt value with which the ldw/lwt adjustment was made belongs to the ldw/lwt characteristic pair.

Example: On delivery the ldw value = 0, the lwt value = 1000000 and the cwt value = 1000000
The user characteristic ldw/lwt of a scale should be calibrated with 100kg = 1 million.
However, only a 50kg calibration weight is available for the calibration.
For the calibration set the CWT value to 500000 (50%) and then perform a LDW/LWT Calibration with 50 kg.
After calibration the FIT outputs 500000 digits at 50kg and 1 000 000 digits at 100kg as measured value.
After the calibration the response to CWT? is 500 000,500 000crlf.

Note:

Should the values for LDW and LWT be input once again later, the CWT value must firstly be input and then the value for ldw and subsequently the value for lwt.

LDW Load cell Dead Load Weight

(Zero point of the user characteristic = scale characteristic)

Range:	0...1.599999e6
Factory setting:	0
Response time:	<15msec...4.2s
Parameters:	1
Password protection:	yes
Data storage:	after input of **LWT**

Input: **LDW;** (response time: <4.2 sec)

With this command the output signal of the unloaded scale is measured and filed in the memory, but evaluated only after measuring the LWT value.

Input: **LDW<Zero point>;** (response time: <15msec)

Instead of causing the FIT to measure the output signal, the value is entered here. The entered value is stored, but evaluated only after input of the parameter for LWT.

Note: Should the LDW/LWT calibration not be performed with 100% nominal load, the CWT value must be set firstly. (See CWT Calibration Weight)

Output command: **LDW?; (**response time: <15msec)

Effect: The user zero value used in the FIT for calculating the user characteristic is output 7-digit with sign (e.g. -0000345 crlf). The value is not converted using **NOV**.

LWT

Load cell Weight

(Fullscale value of the user characteristic = scale characteristic)

Range:	0...1.599999e6
Factory setting:	1000000
Response time:	<15msec...4.2s
Parameters:	1 (0)
Password protection:	yes
Data storage:	on input

Input: **LWT;** (response time <4.2sec)

Effect: With this command the output signal of the scale loaded with nominal load is measured and filed in the memory. This measured value is evaluated with the previously input value for LDW to obtain a new characteristic. The values for SZA and SFA are not changed.

Input: **LWT< full scale value >;** (response time <1.5sec)

Instead of causing the FIT to measure the output signal, the value for the output of the scale for nominal load is entered directly here and evaluated with the previously value for LDW to obtain a new characteristic.

Note: Should the LDW/LWT calibration not be performed with 100% of the nominal load, the CWT value must firstly be set. (See CWT Calibration Weight)

Output command: **LWT?;** (response time <15msec)

Effect: The output value for nominal load used in the FIT for calculating the user characteristic is output 7-digit with sign (e.g. 0000345 crlf). The value is not converted using NOV.

There are 2 possibilities of setting a user characteristic

1. Measuring the user characteristic (CWT,LDW ,LWT)

1.1 Enter password with command SPW;

1.2 Enter CWT<part load>, if a part load is used.

1.3 Scale unloaded, input LDW; (The output signal of the unloaded scale is measured)

1.4 Load scale, input LWT; (The output signal of the loaded scale is measured and the user characteristic calculated)

The new characteristic is determined. Set NOV corresponding to application.

2. Input of the user characteristic (CWT,LDW,LWT)

2.1 Enter password with command SPW

2.2 Input NOV 0; (scaling off)

2.3 Input CWT 1000000 (partial load calibration off)

2.4 Switch user characteristic off with LDW0; and LWT1000000;

2.5 Set filter ASF so that the quietest possible display occurs

2.6 Scale unloaded, wait for standstill

2.7 Determine measured value with MSV?; note value1 for LDW

2.8 Load scale with nominal load, wait for standstill

2.9 Determine measured value with MSV?; note value2 for LWT

2.10 Input CWT if the LWT value does not correspond to 100% nominal load

2.11 Input new characteristic with LDW <value1>; then LWT<value2>;

2.12 Set ASF and NOV corresponding to the application, power failure-protected storage of the parameters NOV, ASF with command TDD1

Nominal Value

NOV

(Fullscale value of the user characteristic)

Range: 0...1.599999e6

Factory setting: 0 (= switched off)

Response time: <10msec

Parameters: 1

Password protection: yes

Data storage: with command TDD1

Input: **NOV<value>;**

Output command: **NOV?;** (response time <10msec)

Effect: The value stored in the FIT is output 7-digit with sign (e.g. 0001000 crlf).

The NOV value is used for scaling the output value in the measured value output. This output scaling is switched off with NOV=0. The ASCII measured value output is scaled in the factory to 1000000. If a measured value output of 2000 digits at nominal load is required, then the nominal value NOV2000; must be set with this command. The input parameters or the tare value are not changed by this scaling.

Measured value output format at nominal load	NOV = 0	NOV > 0
2 bytes binary	20000	NOV value
4 bytes binary	5120000	NOV value
ASCII	1000000	NOV value

In the 2-byte binary output the NOV value must be $\leq$ 30000, otherwise the measured value is output with overflow or underflow ($7fff_H$ or 8000_H ; H: hexadecimal). With NOV30000 the overmodulation reserve is only still approx. 2700 digits.

RSN

Resolution

(Numerical increment)

Range:	1, 2, 5, 10, 50, 100 d
Factory setting:	1
Response time:	<10msec
Parameters:	1
Password protection:	no
Data storage:	with command TDD1

Input: **RSN<value>;**

Output command: **RSN?;** (response time <10msec)

Effect: The value stored in the FIT is output 3-digit (e.g. 001 crlf).

The numerical increment limits the resolution of the measured value.

Example: NOV = 10000 und RSN = 5 → Measured values : 0, 5, 10 ... 9990, 9995, 10000

LIC

Linearization Coefficients
(Compensation of a linearity error)

The factory set characteristic is determined in 2 points. The linearity error of a scale can be compensated for with the FIT. The FIT contains a 3rd order polynomial for linearization:

Calculation: $mw := LIC0 + LIC1 * x + LIC2 * x^2 + LIC3 * x^3$
x = input value

A linearity error with an infliction point can also be corrected with the aid of a 3rd order polynomial. Increased measuring errors must be expected outside the linearization interval.

The coefficients **LIC0,...,LIC3** are input as ASCII numbers with the command **LIC**.

The coefficients are determined with the calibration of the scale, the calculation of the factors is not performed in the FIT but must be done with the aid of the HBM program AED_Panel32 and loaded into the FIT. The exact procedure is described in the AED_Panel32 program.

Linearization Coefficient, Compensation of a linearity error

Range:	±0...1999990	
Factory setting:	0,1000000,0,0	(= LIC off)
Response time:	output: <15msec	input: <35msec
Parameters:	2(4)	
Password protection:	yes	
Data storage:	on input	

Input: LIC(0...3),(coefficient);
Example of an input:

LIC(0),(+10);	input coefficient 0
LIC(1),(+1000345);	input coefficient 1
LIC(2),(-345);	input coefficient 2
LIC(3),(+45);	input coefficient 3

Output command: LIC?; response: LIC0,1000000,0,0;

Effect: Output of the linearization coefficients in the order:
coefficient 0, coefficient 1,coefficient 2, coefficient 3 CRLF

3.3 Measuring

All commands acting directly on a measured value belong to measuring, these are:

- **MSV** Measured signal value
- **STP** Stop measured value output
- **ASF** Amplifier signal filter
- **FMD** Filter mode
- **ICR** Internal conversion rate
- **TAR** Tare
- **TAV** Tare value
- **TAS** Tare set
- **MTD** Motion detection
- **ZSE** Zero setting
- **ZTR** Zero tracking

MSV — Measured Signal Value

(Output measured values)

Range:	Integer ± 32767	
	Long Integer ± 8388607	
	ASCII ±1000000	
Factory setting:	ASCII	
Response time:	with fmd0:	$< 2^{ICR}$ x 1.67msec + 1.67 msec
	with fmd1:	$<2^{ICR}$ x asf(1..9)*1.67msec+1.67msec
Parameters:	1	
Password protection:	no	
Data storage:	no data to be stored	

Output command: **MSV?(0);**

Effect: Outputs measured values constantly until the output is ended with the command STP.

Output command: **MSV?(1...65535);**

Effect: Outputs the stated number of measured values.

The measured value is output in ASCII or binary format (see command COF).

Example: ASCII format

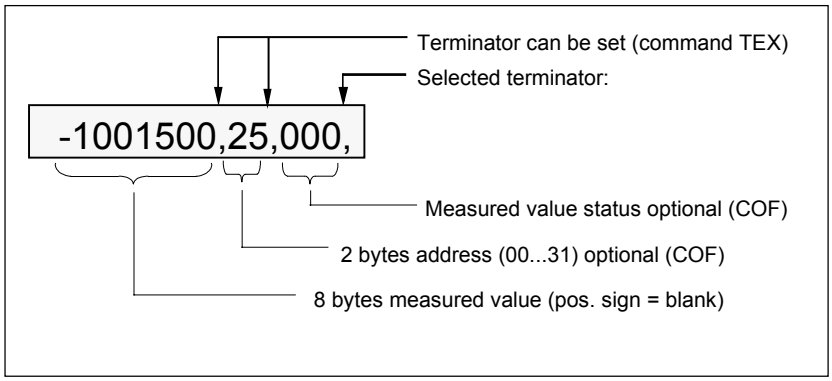
The output format for the measured value must be set **previously** using the command **COF**.

The measured value is output related to the relevant measuring range. The measured value can be a gross or net measured value (command TAS). This command generates responses of constant length.

The **output length** for the command **MSV?;** depends here upon the output format (see COF command):

Output format	FIT response	Number of characters
Binary 4 bytes	yyyy CR LF (y binary)	6
Binary 2 bytes	yy CR LF (y binary)	4
ASCII (COF3;)	Xxxxxxxx CR LF (x- ASCII)	10
ASCII (COF9;)	xxxxxxxx,xx,xxx CR LF (x- ASCII)	17

CR: Carriage Return, LF: Line Feed



The **output scaling** depends upon the parameter of the command NOV.

Measured value output format at nominal load	NOV = 0	NOV > 0
2 bytes binary	20000	NOV value
4 bytes binary	5120000	NOV value
ASCII	1000000	NOV value

In the 2-byte binary output the NOV value must be $\leq$ 30000 otherwise the measured value is output with overflow or underflow ($7fff_H$ or 8000_H ; H: hexadecimal). With NOV30000 the overmodulation reserve is only still approx. 2700 digits.

The **response time** for the measured value enquiry (MSV?;)is determined by the integration time (command ICR) and the filter mode (fmd) and at fmd=1 also the filter level asf:

Filter mode (fmd) = 0

ICR	Max. response time approx. [msec] for MSV?;
0	3.3
1	5
2	8.3
3	15
4	28.3
5	55
6	108.3
7	215

Filter mode (fmd) = 1

ICR	Response time approx. [ms] for MSV?;									
	asf0	**Asf1**	**asf2**	**asf3**	**asf4**	**asf5**	**asf6**	**asf7**	**asf8**	**asf9**
0	3.3	3.3	5	6.7	8.3	10	11.7	13.3	15	16.7
1	5	5	8.3	11.7	15	16.3	21.7	25	28.3	31.7
2	8.3	8.3	15	21.7	28.3	35	41.7	48.3	55	61.7
3	15	15	28.3	41.7	55	68.3	81.7	95	108.3	121.7
4	28.3	28.3	55	81.7	108.3	135	161.7	188.3	215	241.7
5	55	55	108.3	135	188.3	241.7	321.7	375	428.3	481.7
6	108.3	108.3	188.3	321.7	428.3	535	641.7	748.3	855	961.7
7	215	215	428.3	641.7	855	1068.3	1281.7	1495	1708	1921.7

The possible output rates depending upon fmd, asf and icr are shown in the description of the ICR command.

A predefined number of measured values can be output using a command MSV? (number);. The measuring time lies between the output of two measured values. The total time for the acquisition for the selected number of measured values depends upon the set filter mode (fmd) and is calculated:

with fmd=0 and fmd=1 with asf 0 from:

$$\textbf{Measuring time [ms]} = \textbf{number} \cdot 2^{ICR} \cdot \textbf{1.666 ms + 1.666 ms}$$

with fmd=1 and asf 1 to 9 from:

$$\textbf{Measuring time [ms]} = \textbf{number} \cdot \textbf{asf} \cdot 2^{ICR} \cdot \textbf{1.666 ms + 1.666 ms}$$

Measured values are output continuously with MSV?0;. This output can be stopped only by the commands STP, RES or voltage switch-off. No other parameters can be input or enquired during the continuous output.

In the 4-byte binary output or in the ASCII output the measured value status can be transferred with the measured value (see command COF).

Messages in the measured values status with IMD0	
Contents of the status byte in the measured value output	**Possible cause**
1 = Net overflow	Tare value too large
2 = Gross overflow	Scaling too sensitive
4 = ADU overflow	ADU overmodulated (input > ±2.5mV/V)
8 = Standstill	Measured values are within the standstill range in d/s set with the command **mtd**
16 = Limit1	Status of limit1 if switched on (see **LIV**)
32 = Limit2	Status of limit2 if switched on (see **LIV**)
192 = Measured values not coherent	Values cannot be transmitted conforming to the requested measuring rate. Some values may be omitted. Occurs only with msv?x command if icr, cof and bdr setting do not fit together. **

** The values are not equidistant and must not be used for external frequency analysis (FFT).

Messages in the measured values status with IMD1	
Contents of the status byte in the measured value output	**Possible cause**
1 = Net overflow	Tare value too large
2 = Gross overflow	Scaling too sensitive
4 = ADU overflow	ADU overmodulated (input > ±2.5mV/V)
8 = Standstill	Measured values are within the standstill range in d/s set with the command **mtd**
16 = Limit1	Status of limit1 if switched on (see **LIV**)
32 = Limit2	Status of limit2 if switched on (see **LIV**)
64 = Trigger	Triggering was made. Active until trigger output value is determined.
192* = Measured values not coherent	Values cannot be transmitted conforming to the requested measuring rate. Some values may be omitted. Occurs only with msv?x command if icr, cof and bdr setting do not fit together. **

* 192 means that the highest bits of the status (bit6 + bit7) are set to 1. The trigger status (64 = bit6) then cannot be read.
** The values are not equidistant and must not be used for external frequency analysis (FFT).

Messages in the measured values status with IMD2 (Dosing function, D-version only)	
Contents of the status byte in the measured value output	**Possible cause**
1 = Net overflow	Tare value too large
2 = Gross overflow	Scaling too sensitive
4 = ADU overflow	ADU overmodulated (input > ±2.5mV/V)
8 = Standstill	Measured values are within the standstill range in d/s set with the command **mtd**
16 = coarse flow	Coarse flow–output active
32 = fine flow	Fine flow–output active
64 = ready	Ready-signal or emptying activ
128 = alarm	Active at bag rupture or tolerance fault

STP Stop

(Stopping the measured value output)

The measured value output is stopped with this command. **STP** acts only on the command **MSV**. A started measured value is output completely.

ASF Amplifier Signal Filter

(Digital filter setting)

Range:	0...9
Factory setting:	5
Response time:	< 10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **ASF(0...9);**

There are 2 filter ranges depending upon the filter mode.

FMD 0 (standard filter)	selectable filter levels 0...8
FMD 1 (fast recovering digital filter)	selectable filter levels 0...9

Output command: **ASF?;**

Effect: Output of the set filter level (0...9)

The FIT has a multistage filter chain.

- Mean value formation using 2 measured values (at 1200Hz sampling, fixed setting)
- Standard filter (FMD0) or a fast filter (FMD=1); cut-off frequencies selectable through ASF, sampling rate fixed = 600Hz
- Mean value formation for sampling rate reduction (selectable through ICR, sampling rate <=600Hz)

Thus the required filter effect and output rate can be set using the commands (ASF, ICR, FMD). Apart from the standard filter properties, further new powerful digital filters have been implemented. You switch over between the two types of filter with the command FMD:

FMD 0; Standard filter

FMD 1; Fast recovering filter

Filter characteristic of the standard filter (FMD0):

ASF	Transient recovery time in [ms] to 1%o	Cut-off frequency [Hz] at -3dB	Max. attenuation [dB] at 300 Hz
1	22	40	-20
2	53	18	-34
3	115	8	-48
4	238	4	-60
5	485	2	-72
6	970	1	-82
7	1897	0.5	-90
8	3800	0.25	-96

The filter is switched off with ASF0. The cut-off frequency of the filter determines the transient recovery time. The higher the filter index, the better is the filter effect but the longer is the transient recovery time on changing the weight. The filter setting should be selected as small as possible, and measured value quietness (standstill) must be guaranteed when the weight does not change.

The FIR filters (**FMD1**) can be described with the following table:

ASF	Transient recovery time in [ms]	Cut-off frequency at -3 dB [Hz]	20 dB attenuation at frequency [Hz]	40 dB attenuation at frequency [Hz]	Attenuation in the cut-off range [dB]	Cut-off range [Hz]
1	62	18	47	63	>90	>90
2	90	11	32	45	>90	>70
3	119	9	24	31	>90	>60
4	147	7	18	24	>90	>60
5	208	5	12	17	>90	>40
6	240	4	10.5	13	>90	>34
7	295	3.5	8	10	>90	>34
8	330	3	7	9	>90	>30
9	365	2.5	6.2	8	>90	>30

The filter is switched off with ASF0.

→ The mean value formation (ICR) does not influence the transient recovery time of the filter.

The stated transient recovery times refer to the unloaded FIT. The total transient recovery time depends in addition upon the mechanical construction of the scale, the dead load and the weight to be weighed.

FMD — Filter Mode

(Filter type for command ASF)

Range:	0/1
Factory setting:	0
Response time:	< 10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **FMD(0/1);**

Input of the filter type as decimal number 0 or 1.

0 = Standard filter

1 = Fast recovering digital filter

Output command: **FMD?;**

Effect: Output of the set filter type (0 or 1)

Refer to the ASF command description for the description of the filter type.

ICR

Internal Conversion Rate

(Measuring rate)

Range:	0...7
Factory setting:	0
Response time:	< 10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **ICR(0...7);**

Input of the measuring rate as decimal number from 0...7

The integration time determines the output data rate of the measured values and thus also the response time to the measured value enquiry with the command MSV?;.

ICRx = Mean value formation over 2^x measured values with x = 0...7 for FMD = 0

The following setting possibilities result:

Filter mode (fmd) = 0

ICR	Output rate Mv / sec.
0	600
1	300
2	150
3	75
4	37.5
5	18.75
6	9.38
7	4.69

Filter mode (fmd) = 1

ICR	Output rate Mv / sec.									
	asf0	**asf1**	**asf2**	**asf3**	**asf4**	**Asf5**	**asf6**	**asf7**	**asf8**	**asf9**
0	600	600	300	200	150	120	100	85.71	75	66.67
1	300	300	150	100	75	60	50	42.86	37.5	33.33
2	150	150	75	50	37.5	30	25	21.43	18.75	16.67
3	75	75	37.5	25	18.75	15	12.5	10.71	9.38	8.33
4	37.5	37.5	18.75	12.5	9.38	7.5	6.25	5.36	4.69	4.17
5	18.75	18.75	9.38	6.25	4.69	3.75	3.13	2.68	2.34	2.08
6	9.38	9.38	4.69	3.13	2.34	1.88	1.56	1.34	1.17	1.04
7	4.69	4.69	2.34	1.56	1.17	0.94	0.78	0.67	0.59	0.52

Observe the baud rate setting when setting the measured value rate. A high baud rate must also be set at high measured value rates to avoid measured data losses (see command COF).

Output command: ICR?;

Effect: Output of the set measuring rate (0...7)

Note:

With ICR>=1 there is specially good suppression of a possibly parasitic line frequency of 50 Hz .

TAR

Tare

(Performance of taring)

Range:	---	
Factory setting:	---	
Response time:	with fmd0:	< 2^{ICR} x 1.67msec + 1.67 msec
	with fmd1 and asf0	< 2^{ICR} x 1.67msec + 1.67 msec
	with fmd1:	<2^{ICR} x asf(1..9)*1.67msec+1.67msec
Parameters:	0	
Password protection:	no	
Data storage:	no data to be stored	

The current measured value is tared with the **TAR** command. After taring the system switches over to "Net value" (**TAS0**). The current value is filed in the tare memory (see also **TAV** command) and subtracted from the measured value and all following measured values.

The FIT also offers the possibility of triggering taring through an external contact (IMD).

TAV Tare Value

(Set/read tare memory)

Range: 0...±8388607
Factory setting: 0
Response time: < 20msec
Parameters: 1
Password protection: no
Data storage: with command **TDD1**

Input: TAV(±tare value);

Enter tare value 7-digit with sign (max. ±8 388 607). This value lies on the LDW/LWT characteristic (0...NOV) scaled with the parameter NOV. The tare memory is deleted (contents = 0) after characteristic inputs with the commands SZA, SFA or LDW, LWT.

Output command: TAV?;

Effect: Contents of the tare memory are output. The tare value is converted to the NOV value.

Measured value output format at nominal load	Nominal taring range with NOV>0	Maximum taring range with NOV>0	Nominal taring range at NOV=0	Maximum taring range at NOV=0
2 bytes binary	+/- NOV value	+/- 150% NOV value	+/- 1000000	±8 388 607
4 bytes binary	+/- NOV value	+/- 150% NOV value	+/- 1000000	±8 388 607
ASCII	+/- NOV value	+/- 150% NOV value	+/- 1000000	±1 599 999

Example:

NOV3000;		*(Scaling the scale)*
TAS1;		*(Gross output switched on)*
MSV?;	*1500crlf*	*(Measured value is at 50% = nominal load of the scale)*
TAR;		*(Taring and switching over to net output)*
TAV?;	*1500crlf*	*(Enquire tare value)*
MSV?;	*0crlf*	*(Net measured value)*
TAS?;	*0crlf*	*(Net is switched on)*
TAS1;	*0rrlf*	*(Switching over to gross)*
MSV?;	*3000crlf*	*(Measured value is at 100% = nominal load of the scale)*
TAV?;	*1500crlf*	*(Enquire tare value, unchanged)*

TAS

Tare Set

(Gross/net switch-over)

Range:	0...1
Factory setting:	1 (gross)
Response time:	< 10msec
Parameters:	1
Password protection:	no
Data storage:	with command **TDD1**

Input: **TAS(0...1);**

0 = Net measured value, the value in the tare memory is subtracted from the current measured value.

1 = Gross measured value, the value in the tare memory is not subtracted.

The tare value remains unchanged in the gross/net switch-over.

Output command: **TAS?;**

Effect: Current setting is output.

MTD Motion Detection

(Standstill monitoring)

Range:	0...5
Factory setting:	0
Response time:	< 10 msec
Parameters:	1
Password protection:	no
Data storage:	with TDD1

Input: MTD(0...5);

0 – Motion detection switched off
1 – Motion detection ± 0.25d/sec of the NOV value
2 – Motion detection ± 0.5d/sec of the NOV value
3 - Motion detection ± 1 d /sec of the NOV value
4 - Motion detection ± 2 d /sec of the NOV value
5 - Motion detection ± 3 d /sec of the NOV value

Output command: MTD?;

Effect: Output of the set standstill step width 0...5

If motion detection is switched off (MTD0;) no motion detection is performed in the FIT and it is set to standstill in the measured value status. The standstill bit 3 in the measured value status is then always = 1.
If motion detection is switched on (MTD1...5) it refers to the nominal value set with the NOV command. If the user scaling is switched off (NOV =0) or if scaling > 100 000 is selected with NOV, the motion detection is performed with 1d/sec for 100 000d scaling.
The information whether the measured values lie within the selected standstill range during a second is transferred into the measured value status information BIT3.

ZTR

Zero Tracking

(Automatic zero tracking)

Range:	0/1
Factory setting:	0
Response time:	< 10 msec
Parameters:	1
Password protection:	no
Data storage:	with TDD1

Input: **ZTR(0/1);**

0- Zero tracking switched off
1- Zero tracking switched on

Output command: **ZTR?;** response 0/1

Function:

Automatic zero tracking takes place with gross or net measured value < 0.5d in the range of ± 2% of the nominal value of the scale (NOV). The maximum tracking speed is 0.5 d / second at standstill of the scale. Motion detection can be set using the command **MTD**. The unit ‘d’ (digit) refers to the nominal value (NOV). If the NOV value is switched off (NOV=0) or if the NOV value is >100 000d, then motion detection is related to a nominal value of 100 000d.

ZSE

Zero Setting

(Switch-on zero setting)

Range:	0...4
Factory setting:	0
Response time:	< 10 msec
Parameters:	1
Password protection:	no
Data storage:	on input

Input: ZSE(0...4);

0 – Zero setting switched off,
1 – Zero setting range ± 2% of the NOV value
2 - Zero setting range ± 5% of the NOV value
3 - Zero setting range ± 10% of the NOV value
4 - Zero setting range ± 20% of the NOV value

Output command: ZSE?; response 0...4

Function:

After switching on the power or on RESET or after the RES command, zero setting is performed after approx. 2.5s in the selected range at standstill. A change of the zero setting is effective **only** after switching on the power or after the RES command.

If there is no standstill or if the gross value is outside the selected limits, then there is no zero setting. The internal zero memory is always deleted before automatic zero setting. If the gross value at standstill is within the selected range, then the gross value is transferred into the zero memory. The zero memory cannot be read. Standstill of the scale is set permanently to 1d/second. The unit ‘d’ (digit) refers to the nominal value (NOV). If the NOV value is switched off (NOV=0) or the NOV value is >100 000d, then the motion detection is related to a nominal value of 100 000d.

3.4 Limit values and inputs, outputs (available only in L- or D-version)

The following commands belong to this group:

- **LIV** Limit values
- **POR** Read/set inputs/outputs
- **IMD** Select mode of the inputs

LIV

Limit Values

(Limit values)

Range:	1/2,0...2, 0...2, ±0...1599999 , ±0...1599999
Factory setting:	1,0,0,0,0 for limit value 1
	2,0,0,0,0 for limit value 2
Response time:	< 10 msec
Parameters:	5
Password protection:	no
Data storage:	with TDD1

The FIT (L- or D- version) contains 2 limit value switches with selectable hysteresis. These can monitor gross or net measured values. Additionally the MAV value, which is generated by the trigger function, can be monitored.
Limit value 1 controls the OUT1-line (see data sheet) if enabled. Limit value 2 controls the OUT2-line if enabled. P4 should be greater than P5 as a rule. The switch is then set by values greater than P4 and reset by values less than P5. See also notes below.
With a FIT D-Version, both limit switches are disabled if IMD is set to 2 (refer to description of IMD command).

Input: LIV (P1),<P2>,<P3>,<P4>,<P5>;

P1 Number of the limit value switch (1 or 2)
P2 Limit value monitoring on/off
0=off
1=a limit value bit is set in the measured value status only.
OUT1 or OUT2 remains unchanged.
2=a limit value bit is set in the measured value status, and
a signal is output on OUT1 or OUT2, respectively.
P3 Input signal of the limit value switch (0..2)
0=Net measured value
1=Gross measured value
2=MAV value, see trigger function

P4 Switch-on level

When the measured value exceeds P4, the limit value bit in the measured value status is set (with P2 > 0 as a prerequisite). If P2 = 2, the output OUT1 or OUT2 goes into "high" state.

P4=0...NOV (with NOV>0)

P4=0...1599999 (with NOV=0)

P5 Switch-off level

When the measured value falls below P5, the limit value bit in the measured value status is reset to 0 (with P2 > 0 as a prerequisite). If P2 = 2, the output OUT1 or OUT2 goes into "low" state.

P5=0...NOV (with NOV>0)

P5=0...1599999 (with NOV=0)

The measured value status byte is part of the measured value in some output formats (see command COF).

Example: LIV **1,1,0,120000,110000;**

meaning of the parameters:

1	set up limit switch 1.
1	state of limit 1 controls the measured value status only.
0	limit value 1 corresponds to the net measured value.
120000	switch on when the net value exceeds 120000.
110000	switch off when the net value falls below 110000.

Output command: LIV?1;

Effect Reading of the limit value switch 1 setting in the order P1,P2,P3,P4,P5

Output command: LIV?2;

Effect Reading of the limit value switch 2 setting in the order P1,P2,P3,P4,P5

Notes:

The characteristic of the limit switches is inverted if P4 value is lower than P5 value. With P4 < P5, the status bit is set and the output is high for all measured values lower than P4. If P4 > P5, the status bit is set and the output is high for all measured values greater than P4 (as shown in example above). The switching hysteresis is determined by the difference of P4 and P5.

POR

Port Set and Read

(Setting outputs and reading inputs)

Range:	0/1,
Factory setting:	0,0 (outputs are "LOW" = 0V)
Response time:	< 10 msec
Parameters:	2(4)
Password protection:	no
Data storage:	with TDD1

The FIT (L- and D- Version) offers two digital inputs and outputs which can be set or read using the **POR** command**.**
The outputs OUT1 and OUT2 can be changed with the port command if they are not used for the limit value function (LIV parameter P2 = 0) or dosing function (IMD must not be 2).
In the standard version of FIT, digital inputs and outputs are not available.

Input: **POR <P1>,<P2>;**
The parameters P1 and P2 can be 0 or 1, which results in a low-level (0) or high-level (1) on the related output OUT1 or OUT2, respectively. See data sheet for electrical values.

Note: After switching off the limit value function (LIV command) or after power up, a POR command must be sent to bring the port into the required state.
If the outputs are used by the limit value function (LIV) the FIT responds with ?.

Example 1: Both limit values are switched off:
por 0,0; OUT1 and OUT2 are set to low
por ,1; OUT2 is set to high and OUT1 remains unchanged
por 1; OUT1 is set to high and OUT2 remains unchanged

Example 2: OUT1 used for limit value 1, limit value2 not used:
por 0,0; not allowed, is responded to with ?
por ,1; OUT2 is set to high level, OUT1 is controlled by limit value 1

Example 3: limit value1 not used, OUT2 used for limit value 2:
por 0,0; not allowed, is responded to with ?
por 1; OUT1 is set to high level, OUT2 is controlled by limit value 2

Output command: POR?;
Effect: Output of the switching states of 2 outputs and signal levels at 2 inputs.
The response contains 4 parameters.

Note:

There is a separate trigger line in cable / connector 1, which initiates the same action as the **In1** input of cable / connector 2. There is no difference concerning the software processing, so a logical „1“ in the response to POR? (third parameter) may indicate a high level on one or both of these inputs. For technical data see manual, part 1, or the data sheet.

If limit values are switched on (LIV) the limit value states are output as the first and second parameter.

Example: Response to **por?** is 0,1,1,0

that means:

OUT1	low
OUT2	high
IN1 (or trigger line)	high
IN2	low

IMD

INPUT MODE

(Set function of the inputs)

Range:	0...2
Factory setting:	0 (S and L-version), 2 (D-version)
Response time:	< 10 msec
Parameters:	1
Password protection:	no
Data storage:	with TDD1

With this command the function of the digital inputs IN1 and IN2 of the FIT can be selected.

Input: **IMD (0...2);**

IMD 0; A change of the level at IN1 or IN2 has no effect on the FIT.
The logical states at the inputs IN1 and IN2 can be enquired with the POR command.

IMD 1; The external trigger input of the FIT is enabled.
A high to low transition at the input IN1 (cable/connector2) or the trigger line (cable/connector 1) activates the measuring process (see also MAV command and TRC Trigger setting).
The input IN2 is an input for an external taring command.
A high signal which is applied for at least 25ms at the input IN2 initiates a taring process. The delay time until the taring command is executed depends on the selected measuring rate and filter. (Refer also to the descriptions of the commands TAR,ICR,ASF,FMD). The tare command through the input IN2 has the same effect as the command TAR.

IMD 2; All inputs and outputs are used by the dosing function (D-version only, see manual part 3).

Note:
With IMD 0 or IMD 1, the outputs are controlled by the limit switches (refer to LIV description) or set by POR command.
It is always possible to read the logical state at the inputs IN1 and IN2 with the POR? command.

Output command: **IMD?;**

Effect: The set function is output as single-digit decimal number (0...2)

3.5 Special Functions

DPW

Define Password

(Determining a password)

Range:	1...7 letters or numbers (ASCII characters)
Factory setting:	AED
Response time:	< 70ms
Parameters:	1
Password protection:	no
Data storage:	on input

Input: **DPW("password")**

With this command the user can input any max. 7-digit password. All ASCII characters are permitted. The input must be made in inverted commas ("...").

SPW

Set Password

(Write enable for all password protected parameters)

Range:	the password defined with **DPW**
Factory setting:	AED
Response time:	< 10msec
Parameters:	1
Password protection:	no
Data storage:	no data to be stored

Input: **SPW("Passwd");**

The command SPW with the correctly input password entitles data input with all commands. The command SPW with an incorrect password blocks the data input for protected commands. No password is required for outputs. A distinction is made between uppercase and lowercase letters in the password input.

Use of the protected commands is also blocked after **RES** or power on.

The following commands are protected by a password:

CWT, LDW, LWT, LIC, NOV, SFA, SZA, TCC, TCZ, TDD0

RES

Restart

(Device start)

Range:	-----
Factory setting:	-----
Response time:	<3s
Parameters:	-----
Password protection:	no
Data storage:	no data to be stored

The command **RES** causes a device start (warm start). This command generates no response. All parameters are set as they were stored with the last **TDD** command, i.e. EEPROM values are transferred into the RAM.

ENU

Engineering Unit

(User unit)

Range:	4 letter or numbers (ASCII characters)
Factory setting:	none
Response time:	output: < 15msec input: < 40msec
Parameters:	1
Password protection:	no
Data storage:	on input

Input: **ENU("abcd");**

Input of a unit. Any unit with max. 4 characters can be input. If less then 4 characters are input, then the input is supplemented with blanks. The input unit is not appended to the measured value. The characters must be entered in inverted commas ("...").

Output command: **ENU?;**

Effect: Output of the unit with 4 characters.

IDN

Identification

(Identification of transducer type and production number)

Range:	15 or 7 letters or numbers (ASCII characters)
Factory setting:	according to transducer
Response time:	output: < 15msec input: <180msec
Parameters:	1
Password protection:	no
Data storage:	on input

Input: **IDN<"transducer type">,<"production number">;**

Input of the transducer type and production number.

The type and production number of the transducer are filed in the EEPROM of the transducer electronics. The type designation may have a maximum of 15 characters, it must be entered as string in inverted commas ("..."). Should only the production number be changed, a comma is input for the transducer type parameter, e.g. IDN,"4711";

The production number is input by the factory and may have a maximum of 7 characters, it is input like the type designation. The production number may not be changed. If less than the maximum allowed number of characters is input for the type designation or production number, the entry is filled up automatically with blanks up to the maximum allowed number. The manufacturer and the software version cannot be input.

Output command: IDN?;

Effect: An identification string is output
(33 characters)

Order: Manufacturer, transducer type, production number, softwareversion,

e.g. HBM, "PW18I","1234", P20crlf

The number of output characters is fixed. The transducer type is always output with 15 characters, the serial number always with 7 characters.

TDD

Transmit Device Data

(Saving device parameters)

Range: 0...2

Factory setting: -----

Response time: **TDD0** < 0.5sec

TDD1 < 0.5sec

TDD2 < 0.1sec

Parameters: 1

Password protection: **TDD0** yes , **TDD1** no, **TDD2** no

Data storage: no data to be stored

Input: **TDD(0);** Cold start, the parameters are reset to the following values

After factory calibration the settings are filed in a 2nd write protected EEPROM. The command tdd0 copies the actual factory setting into the working EEPROM. Write protected EEPROM → working EEPROM → RAM
Settings for the communication such as the address (ADR) and the baud rate (BDR) as well as the trade counter (TCR) are not reset.

If there are no valid data in the write protected EEPROM, the default parameter set is copied from the ROM → EEPROM → RAM. With this command parameters are overwritten with default values from the ROM.

Command	Factory setting	Remarks
ADR	31	Address 31
ASF	5	Filter 1 Hz
BDR	9600.1	9600 baud, even parity
COF	9	Measured value output, decimal format, address, error status
*CRC	0	External checksum
CSM	0	Checksum also in the measured value status
*DPW	"AED"	Password
FMD	0	Standard filter mode
ICR	2	Measuring rate 150 measurements/s
*IDN	HBM, ..., ..., ..	Device type 15 characters, production number 7 characters, program version
IMD	0	IN1 and IN2 are only inputs
*LDW	0	User characteristic zero point
*LWT	1000000	User characteristic fullscale value
*LFT	0	Legal for trade switched off
*LIC	0,1000000,0,0	Linearization switched off
LIV	0,0,0,0	Limit value 1 and 2 switched off
MTD	0	Motion detection off
NOV	0	User scaling off
POR	0,0	Outputs=0 (low)
STR	0	Terminating resistors switched off
TAS	1	Gross measured value

TAV	0	Tare memory cleared
TCR	xxx 1)	Trade counter (starts with 0)
TCZ	xxx	Internal command of the manufacturer
TEX	172	Terminator, output in columns with crlf
TRC	0,0,0,0,0	Trigger function off, all parameters=0
ZSE	0	Switch-on zeroing switched off
ZTR	0	Zero tracking switched off

The parameters marked with * are stored immediately on input (EEPROM). TDD1; or TDD2; does not apply for these parameters.

The commands MSV, MAV, STP, S.., RES cannot be stored.

Output command: TDD?

Effect: An output is not possible.

Command: TDD(1);

Effect: With the following parameters the changed settings are stored initially only in the main memory (RAM), therefore not power failure-protected. With the command TDD1 the settings you have changed in the main memory are stored power failure-protected in the EEPROM.

ADR Address

ASF Filter setting

BDR Baud rate

COF Configuration of the data output

CSM Checksum in the measured value status

FMD Filter mode

ICR Measuring rate

IMD Function of the inputs IN1 and IN2

LIV Limit value setting for limit value 1 and 2

MTD Motion detection

NOV User scaling

POR Setting the digital outputs OUT1 and OUT2

STR Bus terminating resistors on/off

TAS Gross/net switch position

TAV Tare memory contents

TEX Terminator output

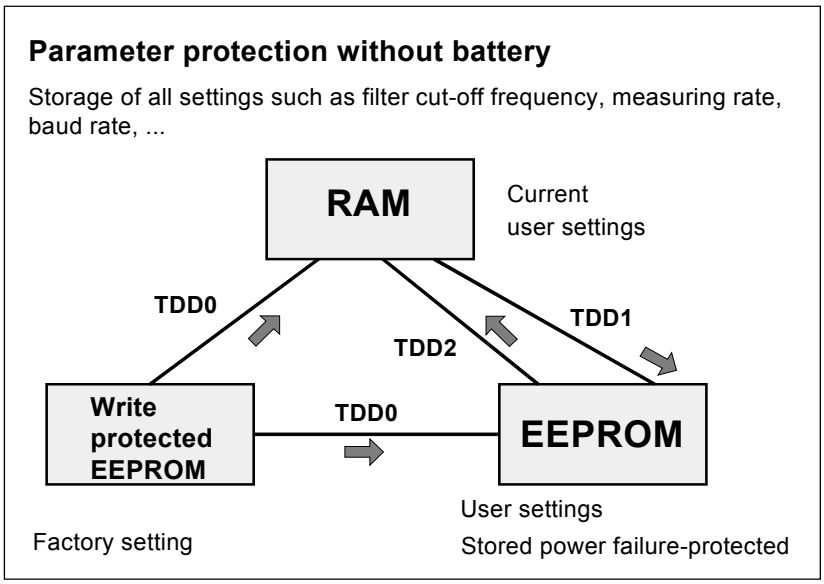
TRC Trigger function

ZSE Zero setting

ZTR Automatic zero tracking

Command: **TDD(2);**

Effect: Transfer of the parameters from the EEPROM into the RAM. The parameters listed under TDD1 are copied from the EEPROM into the RAM. This is done automatically after reset and power on.



Protecting the setting parameters

MAV — Measured Alternative Value

(Output alternative measured value, see trigger function)

Range:	Integer ± 32767
	Long Integer ± 8388607
	ASCII ±1638399
Factory setting:	ASCII
Response time:	<25 msec
Parameters:	-
Password protection:	no
Data storage:	no data to be stored

Output command: MAV?;

Effect: If a new trigger measured value is formed, then the measured value is output once. If no new measured value has been formed yet, the output value is the overflow value (binary = 800000h or ASCII = -1638400). This value is also output after reading the measured value and the renewed output command.

The measured value is output in ASCII or binary format (see command COF). This command delivers measured values only with the trigger function switched on (see command TRC).

TRC — Trigger Command

(Trigger setting)

Range:	0/1, 0/1, 0...1599999, 0..99, 0...99
Factory setting:	0,0,0,0,0
Response time:	< 10msec
Parameters:	5
Password protection:	no
Data storage:	with TDD1

Input: TRC P1,P2,P3,P4,P5;

P1= 0	Trigger function off
P1=1	Trigger function on
P2=0	Level triggering
P2=1	External trigger input (IN1)
	(Trigger input IN1 is active with IMD=1 only!)
	P3=0...NOV Trigger level (with P2=0 and NOV>0))
P3=0...1599999	Trigger level (with P2=0 and NOV=0)
P4=0...99	Delay time: = P4 x 1.66ms x 2^{ICR} (with FMD=0)
	Delay time: = P4 x 1.66ms x 2^{ICR} x ASF (with FMD=1 and ASF>0)
P5=0...99	Measuring time: = P5 x 1.66ms x 2^{ICR}
	Measuring time: = P5 x 1.66ms x 2^{ICR} x ASF (with FMD=1 and ASF>0)

Output command: TRC?; response: P1,P2,P3,P4,P5 CRLF

Function:

The general function is described in Section 4.2.

The position of the trigger level depends upon the output scaling (NOV). With NOV=0 (scaling off) the trigger level lies on the characteristic 0...1000000. With NOV>0 the trigger level is in the range 0...NOV

The external trigger is not enabled again until the output value has been formed (no re-trigger function).

Note:

If the automatic output was selected using the COF command (128..140) and the trigger function is switched on, then the FIT outputs the measured value once after triggering and subsequent measurement. Thus no measured value enquiry with the aid of the command MAV? is necessary. The connected computer must only receive these measured values.

Setting of this operating mode see command COF:

COF128 to COF 140 continuous output after power on:

Caution: Not for bus mode

Example (external triggering with automatical read out):

....	*setting of the FIT parameters (ASF,ICR,...)*
TRC1,1,0,20,5;	*set external trigger*
COF128+i;	*i depending on binäry read out/ASCII read out, see command COF, no parameter setting possible,,*
...	*after each trigger occurrence the result is read out automatically (without command MAV?)*
STP;	*stops automatical read out*
TDD1;	*power failure safed storage of automatical read out in EEPROM*
RES;	*starts again the automatical read out*
...	*after each trigger occurrence the result is read out automatically (without command MAV?)*
STP;	*stops the automatical read out*
....	*parameter setting possible*
COF3	*automatical read out off*
TDD1;	*power failure storage (if wanted))*
MSV?; or MAV?;	*single measured values read out or single trigger read out (if wanted)*

3.6 Error messages

ESR

Event Status Register

(Output of error messages)

Output command: ESR?;

Effect: This function outputs the error messages defined according to the IEC standard as 3-digit decimal number. The occurring errors are linked by "or".

Error message	Error
000	No error
004	Not used
008	Device dependent error (hardware error, e.g. EEPROM error)
016	Execution error (error on parameter input)
032	Command error (command error, command not present)

Example: 024 = Hardware and parameter error

The register contents are deleted after **RES**, power on and reading the error status.

3.7 Commands for legal for trade applications

LFT

Legal for Trade

(Legal for trade application)

Range:	0/1
Factory setting:	0 (off)
Response time:	<50msec
Parameters:	1
Password protection:	no
Data storage:	on input

Output command: LFT? Effect: 0/1 crlf

Command: LFT0/1;

Effect: 0 = legal for trade application switched off,
1 = legal for trade application switched on

At every change of the command LFT the trade counter (TCR) is incremented by 1. With LFT1 (legal for trade application) the trade counter is incremented by one at every parameter input of the following commands:

CRC, DPW, IDN, LDW, LWT, LIC, NOV, SZA, SFA, ZSE, ZTR

Thus any change of these legal for trade parameters can be detected by the not resettable trade counter TCR.

TCR

Trade Counter

(Legal for trade counter)

Range:	no input possible
Response time:	<10msec
Parameters:	none
Password protection:	no
Data storage:	not applicable

Output command: LFT? Effect: xxxxxxxx crlf (8 characters + crlf)

This not resettable counter marks parameter changes of the legal for trade commands (see command LFT). The maximum counter reading is 8388607 (7F FF FF hex). If this counter reading is reached, the counter remains at rest there and only overflow values are output for the measured value output msv?;. This state can be changed only in the factory.

CRC

Cyclic Redundancy Check

(Checksum)

Range:	+/- 8 388 607
Response time:	< 50msec
Parameters:	1
Password protection:	no
Data storage:	on input

Output command: CRC? Effect: xxxxxxxx crlf (8 characters + crlf)

Input: CRCxxxxx; Effect: 0crlf

With this command the user can form a checksum externally over all parameters of the FIT and file it in the FIT. The user can decide how this checksum is formed.

If the legal for trade application is activated using the command LFT1, then the change of the CRC results additionally in incrementing the trade counter (TCR).

Thus any attempt to manipulate the parameters of the FIT can be detected.

3.8 Further commands

The commands SZA, SFA, TCZ, TCC and TMP are commands used internally in HBM. The settings for SZA, SFA, TCZ, TCC, TMP are made by HBM in the factory and may not be changed under any circumstances.

The complete factory setting is stored nonvolatilely and protected against overwriting. The factory settings can be restored with the TDD0 command at any time, if necessary.

The commands listed following are contained in the FITonly for compatibility reasons. **They have no function in the FIT.**

COR? Output command COR, response FIT: 0/1

The responses are output fixed independently of possible inputs.

3.9 Communication examples

Settings for the bus mode (only RS 485 interface):

The FIT is able to work in a bus with up to 90 modules. A prerequisite for this is that each FIT is connected to the bus through an interface driver RS-485. Here every FIT works as slave, i.e. without request by the bus master (e.g. PC or PLC) the FIT remains inactive on its transmission line. An FIT is selected by the master using the SELECT command (S00...89). Therefore it is absolutely necessary before the bus coupling to input a communication address for each FIT. Naturally each address in the bus may be allocated only once.

Connecting FIT consecutively to the bus:

1. Connect first FIT to the bus line (the factory setting is ADR31, baud rate 9600)
2. Initialize interface of the master with 9600 bd, 8, e,1
3. Output command ;S31;
4. Set required address with the ADR command (e.g. ADR01;)
5. Select FIT with the new address: ;S01;
6. Store the address power failure-protected with the command TDD1;
7. Connect next FIT to the bus, output ;S31;, set ADR02, etc.

or

all FIT are connected to the bus:

1. Read production number of the FIT (5-digit) (→ 1.FIT: xxxxx, 2.FIT: yyyyy, ...)
2. Initialize interface of the master with 9600 bd, 8, e,1
3. Output broadcast command ;S98;
4. Set required address with the ADR command (e.g. ADR01,"xxxxx";)
5. Set required address with the ADR command (e.g. ADR02,"yyyyy";), etc.
6. Store addresses power failure-protected with the command TDD1;

Caution: With S98; no FIT responds, but each FIT executes the command.

If there is no communication, then the address or the baud rate may be incorrect.

After successful setting of all addresses and with uniform baud rate the bus is ready. Now it must be determined how the measured values are read.

With measured value output using the command MSV?; the output format must be set previously in all modules:

1. Output broadcast command S98; (all FIT execute the command but send no response)
2. Output command for the output format (e.g. COF3; for ASCII output)
3. Command TDD1; if this setting should be stored power failure-protected

Changing the baud rate:

The FIT can work with different baud rates. The setting can be changed in this case only through the serial interface with the aid of the command BDR.

Naturally the baud rate of all connected subscribers should be the same in the bus mode. To set the FITs in a bus always safely to the required baud rate (in the example 9600) on initializing (switching on) the system, the following procedure can be helpful:

1. Set baud rate of the master interface to 2400 bd, 8 data bits,
   1 parity bit even, 1 stop bit
2. Output of the command string:
   ; (clears the input puffer of the FIT)
   S98; (selects all FIT on the bus)
   BDR9600; (output of the required baud rate)
   (wait approx. 150ms)
3. Set baud rate of the master interface to 4800 bd, 8 data bits,
   1 parity bit even, 1 stop bit
4. Output of the command string:
   ; (clears the input puffer of the FIT)
   S98; (selects all FIT on the bus)
   BDR9600; (output of the required baud rate)
   (wait approx. 150ms)
5. Set baud rate of the master interface to 19200 bd, 8 data bits,
   1 parity bit even, 1 stop bit
6. Output of the command string:
   ; (clears the input puffer of the FIT)
   S98; (selects all FIT on the bus)
   BDR9600; (output of the required baud rate)
   (wait approx. 150ms)
7. Set baud rate of the master interface to 38400 bd, 8 data bits,
   1 parity bit even, 1 stop bit
8. Output of the command string:
   ; (clears the input puffer of the FIT)
   S98; (selects all FIT on the bus)
   BDR9600; (output of the required baud rate)
9. Set baud rate of the master interface to 9600 bd, 8 date bits,
   1 parity bit even, 1 stop bit
10. Output of the blank command:
    ; (clears the input puffer of the FIT)
11. Command TDD1; if this setting should be stored power failure-protected

The output of the semicolon before the S98; command is absolutely necessary, since due to the actuation of the FIT with different baud rates undefined characters can be in the reception buffer of the FIT but these are rejected by receiving the semicolon.

Caution: *With S98; no FIT responds, but executes the command.*

With the example listed above all FIT on this bus are set to the baud rate of 9600, independently of how they were set previously.

Naturally a different baud rate can also be set. Then the required baud rate must be provided in the BDR command and the initialization of the master interface changed correspondingly.

The baud rate is the transmission speed of the interface. This does not change anything concerning the number of measured values which the FIT determines per second.

A high baud rate solely enables a larger number of FIT to be enquired per time unit in the bus mode.

Baud rate	Transmission time for one ASCII character
2400	4.4 ms
4800	2.2 ms
9600	1.1 ms
19200	0.6 ms

The transmission time for a command string can be calculated roughly with this information. For this purpose determine the number of characters in the command and multiply it with the transmission time. Moreover the FIT has a processing time for each command. Refer to the command description for these times (total time = transmission time and processing times).

Determining the bus occupancy (Bus Scan):

Frequently it is expedient to determine the bus configuration each time the bus is switched on or if responses of the FIT do not occur. Thus the address occupancy of the bus can be determined with the aid of the bus scan. A prerequisite for this is that all modules are set to the same baud rate.

1. Initializing the master interface with the set baud rate of the FITs
2. Scanning an address with
   the command string: ;S00; (select address)
   X; (output of an invalid command)

   The FIT addressed with the address answers with '?CRLF' since it does not know the command. If no response comes after a time of approx. 100ms, then there is no FIT at this address. If undefined characters or no ? characters are received by the master, there can be a bus fault or multiple occupancy of the address. The bus master then has to react correspondingly.
3. Repetition of Item 2 with the following addresses 01...89.

If only a few FIT are connected and the addresses are known, the bus scan can naturally only refer to these addresses. If all FIT are determined successfully as bus subscribers, then the identification string of the FIT can be read possibly (measuring point identification and production number).

The timeout setting for the interface driver of the master is decisive for the speed of the bus scan. The Select command requires max. 20...30ms for the output (at 2400 bd). The FIT does not respond to this Select command.

Measured value enquiry in the bus mode:

With the aid of the preceding chapter all FIT have been prepared for a bus mode and the bus scan has found all connected FIT.

For the **simple measured value enquiry** with the command **MSV?** the output format was set with the command COF. The command sequence is now:

S00; MSV?; the FIT with the address 00 responds with the measured value

S01; MSV?; the FIT with the address 01 responds with the measured value etc.

Thus the following enquiry times result approximately:

Master transmission: **S00; MSV?;** (9 characters + 1 character break)

FIT response time: **approx. 6.7ms** (with ICR2,FMD0)

FIT transmissions: **xxCRLF**
(4 characters with COF2) (10 characters with COF3)

Baud rate	Output format	Measured value enquiry time for one FIT with ICR2,FMD0
9600	COF2	23 ms
19200	COF2	15 ms
9600	COF3	30 ms
19200	COF3	18 ms

These times should be used only as orientation values.

For the faster **measured value enquiry** with the command **MSV?** the command sequence is:

S98; MSV?; all FIT form a measured value but do not respond

S01; the FIT with the address 01 responds with the measured value

S02; the FIT with the address 02 responds with the measured value

S03; the FIT with the address 03 responds with the measured value etc.

Here the following enquiry times apply roughly for 9600 baud (ICR0, FMD0):

Master transmission: **;S98; MSV?; S01; S02; S03;**

FIT response time (ICR0): **approx. 1.67ms**

FIT transmissions: **xxCRLF yyCRLF zzCRLF**

Here the master can send a new Select command if the measured value was received.

Enquiry time = number of all characters · time for one character + FIT response time

Baud rate	Output format	Measured value enquiry time for three FIT with ICR0, FMD0
9600	COF2	42 ms
19200	COF2	22 ms
38400	COF2	12 ms
9600	COF4	49 ms
19200	COF4	25 ms
38400	COF4	13 ms

These times should be used only as orientation values.

Setting of a parameter at all connected FITs:

Now that the measured value enquiry no longer presents any problems, setting a parameter in all FITs connected to the bus is also no longer a problem:

1. Output broadcast command S98; (all FIT execute the command but send not response)
2. Output parameter command (e.g. ICR3;)
3. Output command TDD1; if this setting should be stored power failure-protected
4. (Sii; select next FIT in order to read parameters as a check)

This sequence can also be used, for example, when taring with the aid of the command TAR or when switching over between gross and net output (TAS).

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