Operating Manual

WE2107

Communication commands

I1820-1.0 en

Contents

Safety informations

See operating instructions Part 1

All the factory settings are stored at the factory so that they are safe from power failure and cannot be deleted or overwritten. They can be reset at any time by using the command TDD0.

For more information, see ”Individual Command Descriptions”.

The factory set production number must not be changed.

Residual risks are indicated in these mounting instructions by the following symbols:

Symbol:  **CAUTION**

Meaning: **Possible dangerous situation**

Warns of a potentially dangerous situation in which failure to comply with safety requirements **could** result in damage to property or some form of physical injury.

Symbols for operating instructions and useful information:

Symbol:  **NOTE**

Means that important information about the product or its handling is being given.

1 Introduction and appropriate use

The WE2107 digital weighing electronics are weighing electronics for non-automatic weighing instrument (NAWI). They include all the requisite weighing functions for this application:

- Digital filtering
- Adjusting the factory characteristic curve
- Adjusting the scale characteristic curve
- Linearization
- One, two or three -range display
- Output scaling of the measured values
- Range monitoring of the display values (OIML, NTEP)
- Zero setting (± 2 %)
- Tare
- Gross/net selection
- Standstill recognition
- Zero on start-up
- Automatic zero tracking
- Calibration switch with calibration counter
- Gravitational acceleration correction via a settable factor
- Nonvolatile parameter storage
- Parameter password protection

A command set for filling and dosing extend the field of applications.

The digital serial interface for remote control is a RS-232 interface or RS-485 (2wire) interface. With RS-485 up to 32 bus members can be connected to the bus system.
The abbreviation **WE** is also used for the WE2107 weighing electronics in the following text.

2 Command set for the WE2107

Commands can be roughly divided into: ODER
The WE commands can be split into the following groups:

- Interface commands
  (**ADR**, **BDR**, **COF**, **S...**)
- Factory characteristic curve and earth acceleration correction
  (**SZA**, **SFA**, **ACA**, **ACU**)
- Scale adjustment and output formatting
  (**CWT**, **LDW**, **LWT**, **NOV**, **RSN**, **MRA**, **MRB**, **MIV**, **MDT**, **ENU**, **DPT**)
- Settings for linearization
  (**LIN**, **LIM** **)**
- Settings for measuring mode
  (**ASF**, **FMD**, **ZSE**, **ZTR** **)**
- Commands for measuring mode
  (**MSV?**, **TAR**, **TAS**, **TAV**, **CDL)**
- Special functions
  (**TDD**, **RES**, **DPW**, **SPW**, **IDN?**, **ERR?**, **AOV?**, **SOV?**)
- Commands for legal for trade application
  (**LFT**, **TCR?**)
- Commands for the control of an external display
  (**FUB**, **EDP**, **EDS**, **ED1**, **ED2**, **EDC**)
- Commands for printing setup
  (**ESC**, **PES**, **PID**, **PLB**, **PLE**, **PRT**, **PST**, **SHC**)
- Commands for real time clock
  (**TDT**, **TME**, **TMM**)
  Commands for setup buttons, digital inputs
  (**BFL**, **BFS**, **FIN**, **MAL**, **TDL**)
- Commands for filling control, limit switches
  (**SFU**, **RUN**, **BRK**, **TAD**, **EPT**, **RFT**, **MFT**, **MDT**, **FRS**, **LIV**, **SUM**, **NDS**, **CSN**)

2.1 Complete menu structure and commands

This chapter describes the relationship between the parameter menu and the implemented commands (see also manual part 1).

Access level	Main menu level *1*	second menu level *2*	third menu level *1 2*	Command
0	***InFO***			
		VAL		
			CALC	**TCR?**
			tArE	**TAV?**
			ZEro	-
			totAL	**SUM?**
			FILL	**FRS?**
			Sv_nb	**IDN?**
			F_nb	**IDN?**
		Error		
			Adc	**AOV?**
			SEnS	**SOV?**
			Error	**ERR?**
1	***Print***			
		rESLt		
			Prt	**SHC(0...6)**
		PAr		
			ALL	**SHC7**

Access level	Main menu level 1	second menu level 2	third menu level 1 2	Command
2	***SEtPt***			
		LS_1		**LIV1**
			InPut	LIV1,(P2)
			LEvEL	LIV1,(P3)
			OFF_L	LIV1,(P5)
			On_L	LIV1,(P4)
		LS_2		**LIV2**
			InPut	LIV2,(P2)
			LEvEL	LIV2,(P3)
			OFF_L	LIV2,(P5)
			On_L	LIV2,(P4)
		LS_3		**LIV3**
			InPut	LIV3,(P2)
			LEvEL	LIV3,(P3)
			OFF_L	LIV3,(P5)
			On_L	LIV3,(P4)
		LS_4		**LIV4**
			InPut	LIV4,(P2)
			LEvEL	LIV4,(P3)
			OFF_L	LIV4,(P5)
			On_L	LIV4,(P4)
		FILL		
			doS_t	**MFT,**
			EtY_t	**EPT**
			rES_t	**RFT**
			tAr_t	**TAD**

Access level	Main menu level 1	second menu level 2	third menu level 1 2	Command
2	***SEtuP***			**-**
		FILt1		**FMD**
		FILt2		**ASF**
		PtArE		**TAV**
		Count		-
			nb	-
3	***UArt1***			**-**
		Addr		**ADR**
		bAUdr		**BDR**
		PArtY		**BDR**
3	***UArt2***			**-**
		Funct		**FUB**
		bAUdr		-
		PArtY		-
		EdSPL		-
			St_Ch	**EDS**
			Prot	**EDP**
			E_Ch1	**ED1**
			E_Ch2	**ED2**
			CrC	**EDC**

Access level	Main menu level *1*	second menu level *2*	third menu level *1 2*	command
3	***Prt_S***			**-**
		time		**TME**
		modE		**TMM**
		dAtE		**TDT**
			dAY	-
			nonth	-
			YEAr	-
		InIt		-
			ESC11	**ESC**
			ESC12	**ESC**
			ESC13	**ESC**
			ESC14	**ESC**
			ESC15	**ESC**
			ESC21	**ESC**
			ESC22	**ESC**
			ESC23	**ESC**
			ESC24	**ESC**
			ESC25	**ESC**
		IdEnt	*nbr*	**PID**
		Prot		-
			E_Ch	**PES**
			E_Ln1	**PLB**
			E_Ln2	**PLE**
3	***InPut***			**-**
		InP_1		**FIN**
		InP_2		**FIN**
		i_dLY		**TDL**

Access level	Main menu level *1*	second menu level *2*	third menu level *1 2*	Command
3	***Buttn***			**-**
		F1		**BFS**
		F1_L		**BFL**
		F2		**BFS**
		F2_L		**BFL**
3	***tESt***			**-**
		diSPL		-
		UArt		-
		d_IO		-
		EEPr		-
		buttn		-

Access level	Main menu level 1	second menu level 2	third menu level 1 2	Command
0	***SCALE***			**-**
		Funct		**SFU**
		AccES		**MAL**
		LEGAL		**LFT**
4	***AdJ***			**-**
		SEtUP		-
			Unit	**ENU**
			AZEro	**ZSE**
			ZtrAc	**ZTR**
			StiLL	**MDT**
			RES	**RSN**
			Point	**DPT**
			CAP	**NOV**
			rAnG1	**MRA**
			rAnG2	**MRB**
			CAL	**CWT**
			EA_CL	**ACA**
			EA_CU	**ACU**
		InPut		-
			Zero	**LDW**
			SPAn	**LWT**
		MEAS		-
			Zero	-
			SPAn	-

Access level	Main menu level *1*	second menu level *2*	third menu level *1 2*	Command
		Lin		-
			diSP1	**LIN**
			VAL1	**LIM**
			diSP2	**LIN**
			VAL2	**LIM**
4	***FAdJ***			**-**
		dEFLt		**TDD0**
0	***OFF***			**-**

2.2 Command format

General advice:
Commands can be entered in upper or lower case letters, they are not case-sensitive, so either format can be used for input.

Each command entry must be concluded by a delimiter. This can either be a line feed (**LF**) or a semi-colon (**;**).

If an end label is all that is sent to the WE2107, the WE2107 input buffer is cleared.

The data provided in round brackets () for the commands are mandatory and must be entered. Parameters in pointed brackets <> are optional and do not have to be provided. **The brackets themselves are not part of the input.**

Text must be enclosed in quotes **" "**.

Responses are given in ASCII characters and terminate with LF. Output in binary characters is the exception here (see command **MSV** or **COF**).

Each command comprises the command shortform, one or more parameters and the end mark.

Responses consist of ASCII characters and close with **CRLF**. An exception to this is binary character output (see **MSV** and **COF** commands).
Each command consists of the command shortform, one or more parameters and the delimiter.

	Command shortform	Parameter	End label
Input	ABC	X,Y	LF or ;
Output	ABC?	X,Y	LF or ;

LF: line feed (lf = 0a hex)

Example: MSV?;

After this command, a measured value is output.
All the ASCII characters ≤ 20_H (blank) can appear between the command short form, the parameters and the end mark.

For commands and parameters the following characters are allowed:

' ' '+' '-' '.' ',' '"' '0' ...'9' 'A'...'Z' 'a'...'z'

For a input string (command **PST**) the input range is : $0x1f_{hex}$ < char < $0x7f_{hex}$. In this case the string is enclosed with " ...string...".

NOTE

If the master has send a command string (query), than the master has to wait for the answer before it send the next query.

If the master has send a command string (input), than the master has to wait for at least 10 msec. before it send the next query or command.

2.3 Responses to commands

NOTE

Note on the reaction times of the WE:
The reaction times specified for the WE in the command description do not include the time taken to transfer the command to the WE and the time taken to transfer the response from the WE.

2.3.1 Responses to input

The WE works in an RS-485 2-wire bus configuration. No responses are given to input, regardless of whether the input is valid or invalid. **After making an entry, use a query to verify the input.**

Example:

ASF3; //Setting the filter to level 3

If the master has send a command string (input), than the master has to wait for at least 10 msec. before it send the next query or command.

ASF?; //query the last input command

If the master has send a command string (query), than the master has to wait for the answer before it send the next query or command.

NOTE

If the parameter is a legal for trade parameter, and the legal for trade mode is switched on, than this parameter will not be changed.

2.3.2 Responses to parameter queries

A parameter query is entered by using the command with a question mark attached.

A parameter query is always answered in ASCII format. The end label is a line feed (LF = 0A hex).

The output length of a query is always constant for every command.

Example:

Query: *ASF;*
Response: *03 crlf*

If the master has send a command string (query), than the master has to wait for the answer before it send the next query or command.

2.3.3 Responses to incorrect or unknown commands

The WE does not respond if a command is incorrect or unknown

2.4 Output types for measured values

The response to measurement queries (**MSV?**) depends on the output format (**COF**) that is set (binary or ASCII output). Data output works with fixed output lengths (see command **COF**):

Example:

Format command	WE2107 response	No. bytes
COF0; MSV?	Yy CR LF (y- binary)	4
COF2; MSV?	Yyyy CR LF (y-binary)	6

LF: line feed (lf = 0a hex), CR: carriage return (= 0d hex)

The end mark of the data output is always a line feed. However, this character must not be filtered out as an end mark during binary output, as these characters may also be included in the binary code of the measured value. Which is why only the byte count is helpful with binary output.

2.5 Password protection parameters

WE password protection includes the important settings for the scale curve and its identification. Commands with password protection are only activated after the password has been entered. Unless the password is entered via the command **SPW**, this command input will not be executed. A query is always possible.

2.6 Command overview (alphabetical order)

Command	PW	LFT	Function	Page
ACA	X	X	Earth acceleration factor (adjustment)	34
ACU	X	X	Earth acceleration factor (usage)	35
ADR			Device address	22
AOV?			ADC overflow counter	81
ASF			Filter selection	54
BDR			Baud rate and parity bit	23
BFL	X		Button function (long)	113
BFS	X		Button function (short)	111
BRK;			Stop dosing / filling	134
CDL;			Set to zero	66
COF			Output format for data output (**MSV?)**	24
CSN;			Clear total weight and counters	138
CWT	X	X	Calibration weight	41
DPT	X	X	Decimal point	46
DPW			Password definition	72
ED1	X		End character 1 (external display)	93
ED2	X		End character 2 (external display)	94
EDC	X		Check sum (external display)	95
EDP	X		Protocol external display	88
EDS	X		Start character external display	92
ENU	X	X	Unit of measurement	44
EPT			Emptying time (dosing function)	133
ERR?			Error memory	78
ESC	X		ESC sequences (printer)	98
FIN	X		Function digital inputs 1,2	115
FMD	X		Filter mode	56
FRS?			Filling result	135
FUB			Function UART2 (printer / external display)	87
IDN?	X		Electronics identification with serial number	75
LDW	X	X	Scale characteristic curve, zero point	38
LFT	X	X	Legal for trade	84
LIM	X	X	Linearization, measured values	51
LIN	X	X	Linearization, output values	52
LIV	X		Limit switches	127
LWT	X	X	Scale characteristic curve, full scale	39

LFT Legal for trade parameters

PW Password protection via commands DPW/SPW

Command	PW	LFT	Function	Page
MAL	X		Parameter menu access level	110
MFT	X		Maximum filling / dosing time	132
MRA	X	X	Multi-range switch point 1	48
MRB	X	X	Multi-range switch point 2	49
MIV?			Data output (internal resolution for adjustment)	64
MSV?			Data output	60
MDT	X	X	Motion detection	47
NDS?			Dosing counter	136
NOV	X	X	Nominal output value	43
PES	X		Number of empty spaces in each row (printing)	100
PID	X		Print identification (counter)	101
PLB	X		Number of empty lines before printing values	99
PLE	X		Number of empty lines after printing values	103
PRT	X		Print protocol	97
PST	X		Printer strings	102
RES;			Reset electronic	74
RFT			Residual flow time (filling)	131
RSN	X	X	Display resolution	45
RUN;			Start dosing	129
S...			Selecting electronic in bus mode (Select)	27
SFA	X	X	Factory default curve full scale (nominal (rated) value)	32
SFU	X		Scale function	126
SHC			Start hard copy	104
SOV?			Sensor overflow counter	82
SPW			Write enable for all password-protected parameters	73
SZA	X	X	Factory default curve zero point	31
SUM?			Total weight	137
TAD			Tare delay time (filling function)	130
TAR;			Taring	67
TAS			Gross / Net selection	70
TAV			Tare value	68
TCR?			Legal for trade counter	85
TDD			Read/Save setting in EEPROM	76
TDL			Delay time digital tilt input	117
TDT	X		Date (printing)	106
TME	X		Time (printing)	107
TMM	X		Time mode (printing)	108
ZSE	X	X	Zero on start-up	58
ZTR	X	X	Automatic zero tracking	57

LFT Legal for trade parameters

PW Password protection via commands DPW/SPW

3 Individual command descriptions

3.1 Interface commands (asynchronous, serial)

To establish communication between the WE and the computer, the interface has to be configured. The following commands are available in the WE to set up the interface and to select the transfer format:

- Communication address for bus mode **ADR**
- Baud rate setting **BDR**
- Output format for measurement data (ASCII / binary) **COF**
- Select command for a bus user via the communication address (Select) **S...**

Characteristic data of the serial interface:

Start bit: 1

Word length: 8 bits

Parity: none / even

Stop bit: 1

Baud rate: 1200 … 38400 baud

The asynchronous interface of the WE is a serial interface, i.e. there is serial transfer of data, bit by bit and asynchronously. Asynchronously means that transmission works without a clock signal.

A start bit is set in front of each data byte. This is followed by the bits of the word (D0...D7), a parity bit for transfer checking and a stop bit.

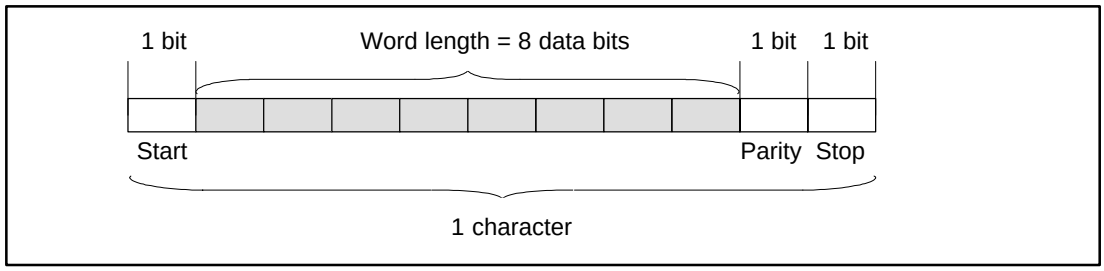

Fig. 1: Composition of a character

As data transmission is serial, the rate at which data is transmitted must match the rate at which it is received. The number of bits per second is called the baud rate.

The exact baud rate of the receiver is synchronized with the start bit for each character transferred. The data bits then follow, which all have the same length. On reaching the stop bit, the receiver moves to the wait state until it is reactivated by the next start bit.

The number of characters per measured value depends on the output format selected (**COF** command).

ADR

Address
(Device address)

Property	Content	Note
Command string	**ADR**	
No. of parameters	2	
Parameter range	P1=00 ... 31, P2= String	P2= 7 character
Factory default	31	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1;	
Input Master	**ADR**(P1),<“Fnumber“>;	No response
Query Master	**ADR**?;	
Response WE	P1crlf	P1=2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

You only need this command when the WE is communicating via the RS-485 bus. The command is used to prepare bus mode. Each WE connected in the bus must have a unique address (00 - 31).

Parameter description:

Input: ADR(new address), <”serial number”>;

The serial number (7 digits) can be included as an optional second parameter. The new device address will then only be entered for the WE with the specified serial number. When several WE’s have the same address (initializing bus mode), this allows the device addresses to be changed without addressing several WEs.

As with the command **IDN?**, the serial number has to be specified in quotation marks.

Example:	***S98;***	*Broadcast command*
	ADR25,”0000007”;	*allocates a new address, only the WE with serial number 0000007 changes the address*
Example:	***S31;***	*Selecting the ’old’ address (example)*
	ADR25;	*Allocates a new address*

BDR

Baud Rate
(Baud rate)

Property	Content	Note
Command string	BDR	
No. of parameters	2	
Parameter range	P1=0….5 , P2= 0/1	
	P1: 0= 1200 …. 5= 38400	
	P2: 0= none, 1= even parity	
Factory default	3, 1 (=9600 baud, even)	
Reaction time	<15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command TDD1;	
Input Master	BDR P1,<P2>	No response
Query Master	BDR?;	
Response WE	P1, P2crlf	P1=P2= 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command sets the baud rate for serial communication.

NOTE

When the baud rate is changed, communication is not possible at first. The computer also has to switch over to the new setting (baud rate). For the change in the baud rate to be permanent, it has to be saved in the EEPROM using the command **TDD1**. This procedure ensures that the baud rates set in the WE are all supported by the remote station. If the newly entered baud rate is not saved, when the system is reset or started up again, the WE will answer at the previous baud rate.

Example:	***BDR?;***	***3,1crlf***	*corresponds to 9600 baud, parity bit even*
Example:	***BDR4;***		*WE responds at 19200 baud*
Example:	***BDR3;***		*WE responds at 9600 baud, Parity is unchanged*

COF

Configurate Output Format

(Output format for data outputs)

Property	Content	Note
Command string	**COF**	
No. of parameters	1	
Parameter range	P1=0 ... 4	
Factory default	2	binary with status
Reaction time	<15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1;	
Input Master	**COF**(P1);	No response
Query Master	**COF**?;	
Response WE	P1crlf	P1=1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function

The command is used to set up the output formats for the command **MSV?**.

The possible formats and the decimal number to enter for them are listed in the tables below The following format groups are supported:

- COF 0 ... 3 binary data output
- COF 4 ASCII data output

Data output relates to the nominal (rated) value set for the WE (see the **NOV** command).

Output at max. capacity	**NOV ≥ 100**
2-byte binary	NOV value
4-byte binary	NOV value
ASCII	NOV value

With 2-byte binary output, the **NOV** value must be ≤ 30000, otherwise the measured value will be output with overflow or underflow ($7FFF_H$ or 8000_H). With **NOV30000**, the overload reserve is only about 2700 digits.

Binary measurement format:

- 2 or 3 byte measured value
- with or without measurement status (see **MSV?**)
- byte output sequence :
  choose MSB → LSB or LSB → MSB

	Parameter	Length	Sequence for data output
COF0	Measured value	2 bytes	MSB before LSB
COF1	Measured value	2 bytes	LSB before MSB
COF2	Measured value	4 bytes	MSB before LSB, LSB=measurement status
COF3	Measured value	4 bytes	LSB before MSB, LSB=measurement status

MSB=most significant digit, LSB=least significant digit

NOTE

Note on the evaluation of binary measured values

When measurement data is output in binary format, the binary code for CRLF may occur within the bytes representing the measured value. This is why the contents of the data output should not be tested for the CRLF character when checking for the possible end of measurement transmission. With binary output, it is far better to record the number of characters received. The CRLF control characters are also appended to the measured value during binary output.

ASCII measurement format (COF4):
ASCII output always contains 16 characters.

Character 1	Characters 2-10	Character 11	Characters 12-14	Character 15,16
G N	Measured value (sign, measured value with decimal point)	Blank	g kg t lbs pcs	crlf
G = gross, N = net	9 x '-' , when out-side display range for LT > 0		For standstill only, otherwise 3 blanks	End label

The display range is defined as follows:

LFT=0:	-160 % .... + 160 %	(cannot be verified, industrial mode)
LFT=1:	-2 % ... + NOV + 9 d	(legal for trade, OIML, R76)
LFT=2:	-2 % ... + 105 % (NOV)	(legal for trade, NTEP)

NOV is the output scaling (NOV ≥ 100). The percentage figures relate to the NOV.
The d information relates to increment that is set (**RSN**):
RSN = 2 -> 9 d = 18 digits

S..

Select

(Selecting of WE2107 in bus mode)

Property	Content	Note
Command string	**S**	
No. of parameters	1	
Parameter range	P1= 00, 01, ... 30, 31, 98	98= broadcast
	P1 is always a 2-digit entry	
Factory default	-	
Reaction time	<10 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	No data to back up	
Input Master	**S**(P1);	No response
Query Master	Not permitted	
Response WE		

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

With this, the WEs connected to a bus can be addressed individually or jointly. A maximum of 32 addresses (00...31) are assigned using the command **ADR**.

The Select command does not generate a response.

A WE is always active after reset or power-up and must be addressed in bus mode by using the Select command, so that none of the other bus users respond. If there is only one WE, you do not need the **S...** command.

Parameter description:

Selection	Effect for the WE	Effect for the PC
S00; to **S31;**	Only the WE with the given address executes all the commands and responds.	1:1 communication with a selected WE.
S98;	All WEs execute all commands	

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

Command **S98;** is intended for special functions (broadcast). All the WEs connected to the bus are addressed here. All the WEs execute the subsequent commands. No WE responds. This goes on until a single WE is once again addressed using **S00**...**S31**.

NOTE

The **S...** command on its own does not generate a response. The selected WE only responds when it is combined with another command.

For a measurement query on the bus, proceed as follows:

Master	WE	Note
S00;MSV?;	Xxcrlf	Query WE with address 00, response at COF0
S01;MSV?;	Yycrlf	Query WE with address 01, response at COF0
S02;MSV?;	Zzcrlf	Query WE with address 02, response at COF0
etc.		

3.2 Factory default curve

The commands described in this section are used to set up the factory default curve:

- Adjusting the default curve: **SZA**, **SFA**
- Gravitational acceleration correction: **ACA**, **ACU**

Setting the characteristic curve

The WE works initially with a factory default curve **SZA**, **SFA**. This factory default calibration is made with a calibration standard for 0mV/V and 2mV/V (=200000 internal digits). This factory default curve should not be modified.

A second characteristic curve (**LDW**, **LWT**) is available for the scale adjustment.

The gravitational acceleration correction is then activated via command **ACA** and **ACU**, if the place where the scale was adjusted is not the same as the place of installation and the gravitational acceleration factors are different.

Setting the factory default curve with SZA, SFA (absolute value calibration in mV/V)

Action	**Command sequence**
Enter password, e.g.	**SPW00000;**
Measure input at 0 mV/V	**SZA(P1);**
Measure input at 2mV/V	**SFA(P2);**

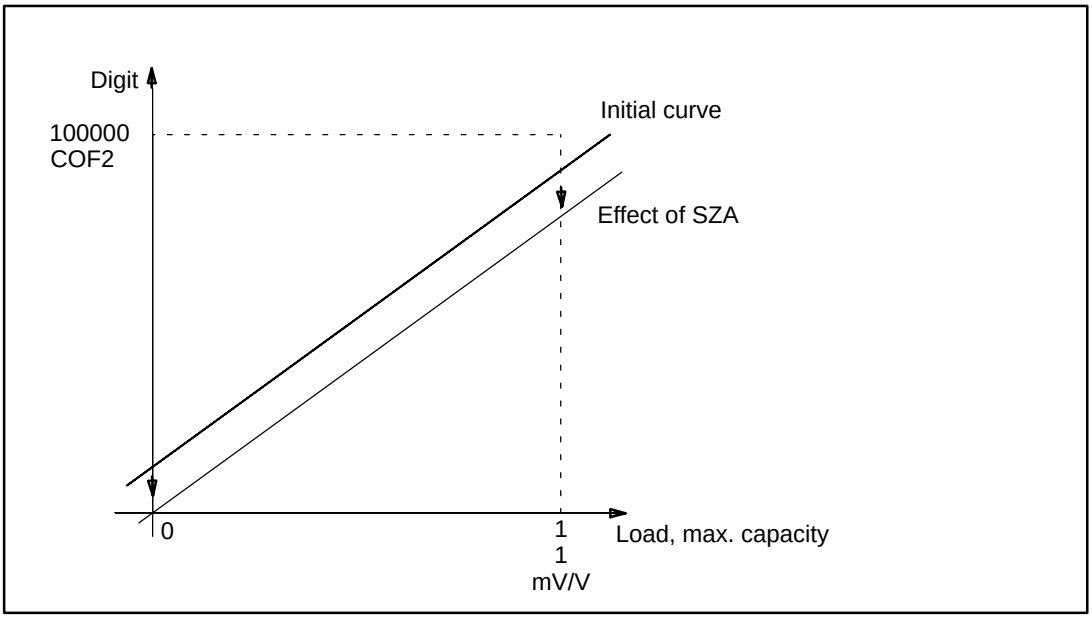

Fig. 2: Effect of the SZ command on the factory default curve

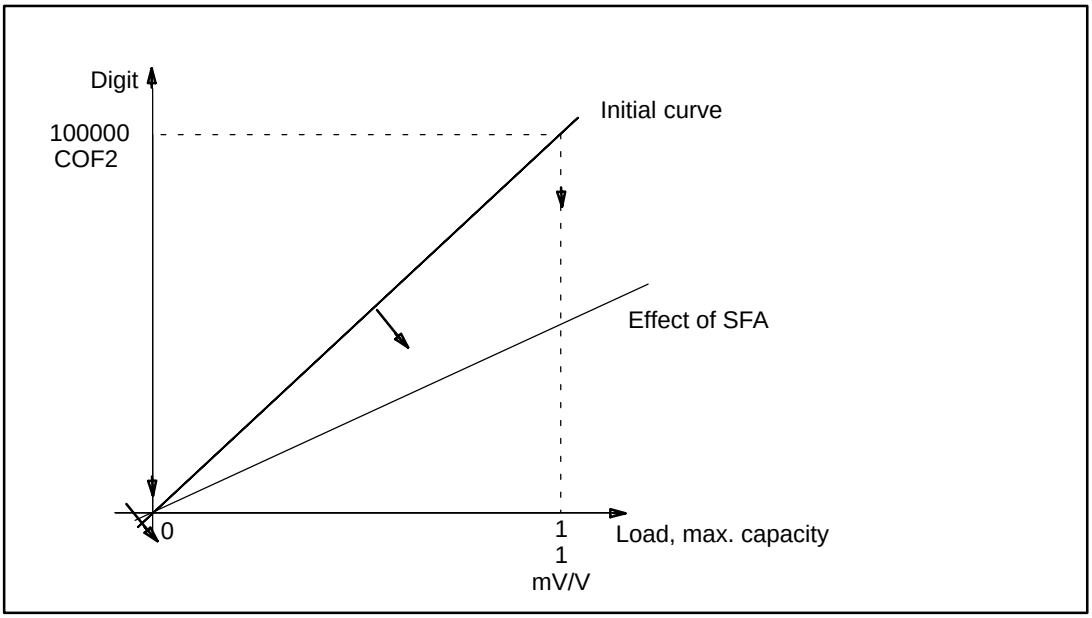

Fig. 3: Effect of the SFA command on the factory default curve

SZA

Sensor Zero Adjust
(factory default curve zero point)

Property	Content	Note
Command string	**SZA**	
No. of parameters	1	
Parameter range	P1=0...±399999	
Factory default	Adjustment to 0 mV/V	
Reaction time	<15 ms on input or query	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1; after input of **SFA**	
Input Master	**SZA**(P1);	No response
Query Master	**SZA**?;	
Response WE	P1crlf	P1=
	(P1= 6-digit plus sign)	7 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

For an input signal of 0mV/V, the output value 0 digits is assigned to the internal measured value.

Parameter description:

For a query, the value is output ±6-digit (e.g. -000246 CRLF).

The curve is disabled at SZA=0 and SFA=200000.

To perform the electronic adjustment see command **SFA**.

SFA

Sensor Fullscale Adjust

(factory default curve full scale)

Property	Content	Note
Command string	SFA	
No. of parameters	1	
Parameter range	P1=0...±399999	
Factory default	Adjustment to 2mV/V (200000d)	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**SFA**(P1);	No response
Query Master	**SFA**?;	
Response WE	P1crlf (P1= 6-digit plus sign)	P1 = 7 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

For an input signal of 2 mV/V, the output value 200000 digits is assigned to the internal measured value for ASCII output.

Parameter description:

For a query, the value is output ±6-digit (e.g. -350246 LF).

The curve is disabled at SZA=0 and SFA=200000.

Manual input of the nominal (rated) value via SZA/SFA:

1. Connect the transducer electronics to a calibration standard.
2. Use the **SPW** command to enter your password.
3. Set legal for trade switch to **LFT**= 0
4. Reset the correction factor: **ACU**:= **ACU**
5. Reset the factory characteristic: SZA=0, SFA=200000,
6. Reset the user characteristic: **CWT**=100000, **LDW**=0, **LWT**=200000,
7. NOV=0, RSN=1, switch the linearization OFF (**LIN**, **LIM**).
8. Set the **ASF** filter in such a way that the display is as smooth as possible.
9. Set the calibration standard to 0mV/V misalignment.
10. Use the command **MSV?;** to determine the measured value. Note value1 for **SZA**.
11. Set the calibration standard to 2mV/V misalignment.
12. Use the command **MSV?;** to determine the measured value. Note value2 for **SFA**.
13. Enter the new user curve with **SZA<value1>;** followed by **SFA<value2>;**.
14. Save the new curve with **TDD**1;.

NOTE

The characteristic curve commands **SZA** and **SFA** should be entered or executed in the following order: **SZA** followed by **SFA**. The input data is only offset if these two parameters have been entered in pairs.

When the factory default curve is entered with **SZA**/**SFA**, this resets the user curve to the default values **LDW**=0, **LWT**=200000, **CWT**=100000 and **ACU:=ACA**.

Numbers 1 - 10 do not apply if the factory default curve can be re-entered using parameters that are already known.

With the command TDD0; the factory default settings will be activated.

ACA

G-Correction Factor

(G-factor correction, calibration location)

Property	Content	Note
Command string	**ACA**	
No. of parameters	1	
Parameter range	P1 = 97000 ... 99000	
Factory default	98102	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**ACA**(P1);	No response
Query Master	**ACA**?;	
Response WE	P1crlf	P1 = 5 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command is used to correct the effect of gravitational acceleration when the place where the scale is adjusted is not the same as the place of installation and the gravitational acceleration factors (g) are different.

Parameter description:

For a query, the value is output 6-digit (e.g. 098102 CRLF).

Correction is disabled at ACA = ACU.

Calculating the internal correction factor:

$$GF = \frac{(g - \textit{factor at place of adjustment } (ACA))}{(g - \textit{factor at place of installation } (ACU))}$$

The internal GF parameter is reset automatically (ACU: = ACA) when

- curve **SZA / SFA** is re-measured
- curve **LDW / LWT** is re-measured

Input example:

Place of adjustment (ACA) = Darmstadt → g = 9.81029

Place of installation (ACU) = Tokyo → g = 9.7977

GF = 1.001285

ACU

Acceleration Correction User

(G-factor correction, destination location)

Property	Content	Note
Command string	**ACU**	
No. of parameters	1	
Parameter range	P1 = 97000 ... 99000	
Factory default	98102	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**ACU**(P1);	No response
Query Master	**ACU**?;	
Response WE	P1crlf	P1 = 5 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

For a query, the value is output 6-digit (e.g. 098102 CRLF).

Correction is disabled at ACA = ACU.

See command ACA.

3.3 Scale characteristic curve and output scaling

- Scale characteristic curve adjustment: **LDW**, **LWT**
- Partial load parameter for LDW, LWT: **CWT**
- Measured value scaling: **NOV**
- Unit of measurement: **ENU**
- Increment: **RSN**
- Decimal point: **DPT**
- Motion detection: **MDT**
- 2-range display: **MRA**
- 3-range display: **MRB**

You can adapt the WE characteristic curve to your particular requirements with the command pair **LDW/LWT**.

With the **CWT** command, the user curve can also be set with a partial load.

NOTE

The characteristic curve commands **LDW** and **LWT** should be entered or executed in the following order: **LDW** followed by **LWT**. The input data is only offset if these two parameters have been entered or measured in pairs.

After the scale adjustment the range **LDW** → **LWT** is assigned to the following number ranges:

Output at max. capacity (COF)	**NOV ≥ 100**
2-byte binary	NOV value
4-byte binary	NOV value
ASCII	NOV value

Calculating the internal correction factor:

Setting the scale characteristic curve with LDW, LWT (for max. capacity adjustment)

Action	Command sequence
Enter password, e.g.	**SPW00000;**
Loading at scale zero load	**LDW(P1);**
Loading at scale max. capacity	**LWT(P2);**

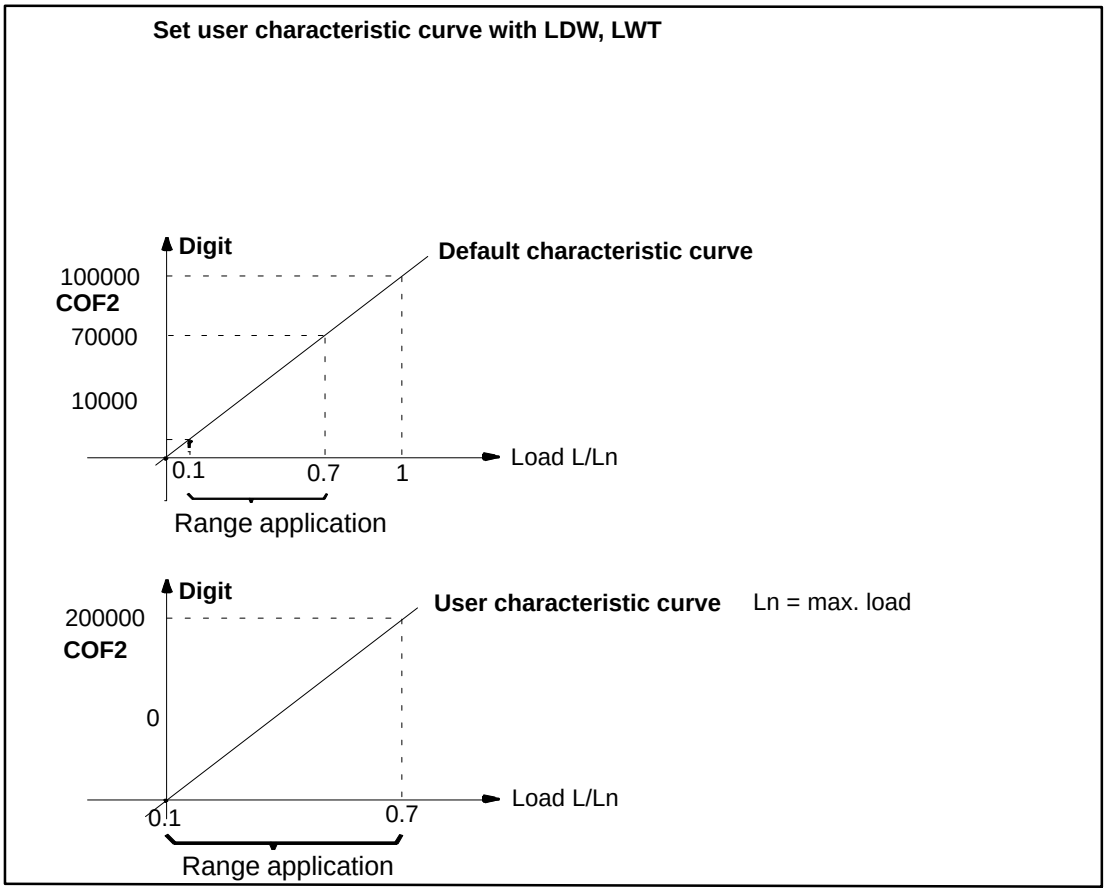

Fig. 4: Setting the user characteristic curve

LDW

Load Cell Dead Weight

(Scale curve zero point)

Property	Content	Note
Command string	**LDW**	
No. of parameters	1	
Parameter range	P1=0...±399999	
Factory default	0	
Reaction time	<15 ms on input or query	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	after input of **LWT with TDD1;**	
Input Master	**LDW**(P1);	on response
Query Master	**LDW**?;	
Response WE	P1crlf (P1= 6-digit plus sign)	P1 = 7 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

When measuring, the current input signal (e.g. scale not loaded, but with dead load) assigns the output value 0 digits to the internal measured value.

Parameter description:

For a query, the value is output ±6-digit (e.g. -000246 CRLF).

The user curve is disabled at LDW=0 and LWT=200000.

The **LDW** value is not converted via **NOV**.

To perform the scale adjustment see command **LWT.**

LWT

Load Weight

(Scale characteristic curve full scale)

Property	Content	Note
Command string	**LWT**	
No. of parameters	1	
Parameter range	P1=0...±399999	
Factory default	200000	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**LWT**(P1);	No response
Query Master	**LWT**?;	
Response WE	P1crlf (P1= 6-digit plus sign)	P1 = 7 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

When measuring, the current input signal (e.g. scale loaded= max. capacity) assigns the output value 200000 digits to the internal measured value.

Parameter description:

For a query, the value is output ±6-digit (e.g. -950246 CRLF).

The user curve is disabled at **LDW**=0 and LWT=200000.

The LWT value is not converted via **NOV**.

Manual input of the nominal (rated) value via LWT:

1. Use the **SPW** command to enter your password.
2. Set legal for trade switch to **LFT**=0
3. Reset the correction factor: **ACA**==**ACU**
4. the scale is unloaded.
5. Query the measurement output (**MIV?**)
6. Enter the **LDW** value.
7. Load the scale with max. capacity.
8. Query the measurement output (**MIV?**)
9. Use the command **LWT<nominal (rated) value>** to enter the measured value for nominal load.
   The value entered is stored and offset with the **LDW** value previously measured or entered.
10. Save the new curve with **TDD**1;.

NOTE

The characteristic curve commands **LDW** and **LWT** should be entered or executed in the following order: **LDW** followed by **LWT**. The input data is only offset if these two parameters have been entered or measured in pairs.

When the factory default curve is measured with **LDW**/**LWT**, this resets the user curve to the default values **LDW**=0, **LWT**=200000, **CWT**=100000 and **ACU:=ACA**

With partial load adjustment (measurement):

The LWT value is converted to 100 % in accordance with the CWT value entered and the CWT value is then reset to its 100 % value (=100000).

CWT

Calibration Weight
(Calibration weight)

Property	Content	Note
Command string	**CWT**	
No. of parameters	1	
Parameter range	P1=10000...120000 (10%...120%)	100000 = 100%
Factory default	100000	=100%
Reaction time	<15 ms	
Password protection	YES	
Relevant to legal for trade	YES	
Parameter backup	With command **TDD**1;	
Input Master	**CWT**(P1);	No response
Query Master	**CWT**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

If, when adjusting the user curve, you cannot apply 100 % of the input signal, then the **CWT** command also gives you the opportunity to adjust the WE with an input signal in the range 10 % to 120 % of the required nominal (rated) value (partial load calibration).

Parameter description:

P1 is a 6−digit decimal number in the range 10000 to 120000 (=10 % ... 120 %). With P1=100000 (=100 %) this part load calibration is switched off.

P1 is a 6-digit decimal number in the range 10000 to 99999 (=10 % ... 120 %) for none legal for trade applications.

P1 is a 6-digit decimal number in the range 20000 to 99999 (=20 % ... 120 %) for legal for trade applications.

P1 is the percentage of the max. capacity with which the next **LDW** / **LWT** adjustment is to be carried out.

P1:= 100000 * adjustment weight / max. capacity

Example:

*The scale curve **LDW/LWT** of a scale is adjusted with 15 kg=15000 d. But the only adjustment weight available for the adjustment is a 10 kg weight. Proceed as follows:*

*1. For the adjustment, set the **CWT** value to 66667 (corresponds to 66 %).*

*2. For the adjustment, set the **NOV** value to 15000.*

*3. Then carry out an **LDW/LWT** adjustment.*
After the adjustment, the WE outputs 10000 digits as the measured value at 10 kg and 15000 digits at 15 kg.

*4. Set the increment to **RSN**5 and the decimal point to **DPT**3. This gives the number of divisions as 3000 d=e and a display of 15,000 at 15 kg max. capacity.*

NOTE

After an adjustment, the LDW and LWT values can be read out. They correspond to parameters, as if the adjustment had been carried out at max. capacity (and not at partial load). Should you want to enter the values for **LDW** and **LWT** again later, you must first enter **CWT=0**, then the **LDW** value that has been read out and finally the value read out for **LWT**.

When the factory default curve is entered with **SZA**/**SFA**, this resets the user curve to the default values **LDW**=0, **LWT**=200000 and **CWT**=100000.

NOV

Nominal Output Value

(Resolution of the scale characteristic curve)

Property	Content	Note
Command string	**NOV**	
No. of parameters	1	
Parameter range	P1=100...99999	
Factory default	6000	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**NOV**(P1);	No response
Query Master	**NOV**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The **N0V** value is used to scale the output value during data output. ASCII data output is scaled at the factory to 6000. If you require a data output of 2000 digits at max. capacity, for example, then use this command to set the nominal (rated) value **NOV2000;**. This scaling does not change the input parameters.

The tare value is on the NOV curve and is output in this scaling.

Output format measured value at max. capacity	**NOV ≥ 100**
2-byte binary	**NOV** value
4-byte binary	**NOV** value
ASCII	**NOV** value

NOTE

For 2-byte binary output, the **NOV** value must be ≤ 30000. Otherwise the measured value will be output with overflow or underflow ($7FFF_H$ or 8000_H; H: hexadecimal). With **NOV30000**, the overload reserve is only about 2700 digits.

ENU

Engineering Unit
(Unit of measurement)

Property	Content	Note
Command string	**ENU**	
No. of parameters	1	
Parameter range	P1= 0...4	
Factory default	0	No unit
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**ENU(P1)**;	No response
Query Master	**ENU**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command implements input of a unit of measurement.

P1	Unit of measurement
0	none
1	g
2	kg
3	t
4	lbs

RSN

Resolution

(Display resolution, Increment)

Property	Content	Note
Command string	**RSN**	
No. of parameters	1	
Parameter range	P1 = 1,2,5,10, 20, 50 [d]	
Factory default	1 [d]	
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**RSN(P1)**;	No response
Query Master	**RSN**?;	
Response WE	P1crlf	P1 = 2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command implements the increment of data output. The following functions are affected by the increment:

- standstill recognition (**MDT**)
- zero tracking (**ZTR**)
- measuring range monitoring
- initial zero setting (**ZSE**)
- measured value resolution

DPT

Decimal Point

(Decimal point position)

Property	Content	Note
Command string	**DPT**	
No. of parameters	1	
Parameter range	P1= 0…4	
Factory default	0	
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**DPT(P1)**;	No response
Query Master	**DPT**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command implements the input of data output decimal places:

DPT0: xxxxx.
DPT1: xxxx.x
DPT2: xxx.xx
DPT3: xx.xxx
DPT4: x.xxxx

MDT

Motion detection
(Motion detection)

Property	Content	Note
Command string	**MDT**	
No. of parameters	1	
Parameter range	P1= 0…4	
Factory default	0	
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**MDT(P1)**;	No response
Query Master	**MDT**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

MDT0: OFF (motion detection is switched off, unit is always displayed)

MDT1: 0.5 d / sec.

MDT2: 1.0 d / sec. (to be set if legal for trade application)

MDT3: 2.0 d / sec.

MDT4: 5.0 d / sec.

If the stand still conditions are fulfilled than the selected unit (**ENU**) will be displayed.

The digit unit (d) relates to the nominal (rated) value (**NOV**) and the selected increment (**RSN**).

Example:

RSN=5, NOV=15000, weighing range = 15000 g

With MDT2 the stand still condition occurs if the deviation of the weight is less than 5 g/sec.

With MDT3 the stand still condition occurs if the deviation of the weight is less than 10 g/sec.

MRA

Multi Range Mode 1

(2-range weighing display)

Property	Content	Note
Command string	**MRA**	
No. of parameters	1	
Parameter range	P1=0...NOV (99999)	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**MRA**(P1);	No response
Query Master	**MRA**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command is used to set up the scale as a one or two-range scale. At **MRA0;** 2-range mode is deactivated. With **MRA**>0 ... **NOV**, it is possible to specify the changeover point between ranges 1 and 2. If 2-range mode is enabled, the set **RSN** increment is valid for range 1. The increment for range 2 is then automatically the next increment:

Examples:

RSN=2: Range 1 with increment 2, range 2 with increment 5

RSN=5: Range 1 with increment 5, range 2 with increment 10

The display switches back to the increment of range 1 if the scale is unloaded.

MRB

Multi Range Mode 2

(3-range weighing display)

Property	Content	Note
Command string	**MRB**	
No. of parameters	1	
Parameter range	P1=0...NOV (99999)	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**MRB**(P1);	No response
Query Master	**MRB**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command is used to set up the scale as a one, two or three -range scale. At **MRA0;** 2-range mode is deactivated. With **MRA< MRB** ... **NOV**, it is possible to specify the changeover point between ranges 2 and 3. If 3-range mode is enabled, the set **RSN** increment is valid for range 2. The increment for range 3 is then automatically the next increment:

Examples (0 < MRA < MRB < NOV):

RSN=2: Range 1 with increment 2, range 2 with increment 5, range 3 with increment 10,

RSN=5: Range 1with increment 5, range 2 with increment 10, range 3 with increment 20

The display switches back to the increment of range 1 if the scale is unloaded.

3.4 Settings for linearization

The WE has the possibility to reduce the non linearity of the scale. The WE use a polynomial third order. Therefore two additional points between deadload (LDW) and max. capacity (LWT) has to be used for this correction.
These commands should be set after the adjustment of the scale (LDW, LWT, NOV).

- Input values for the correction **LIM**
- Output values of the correction **LIN**

To calculate the coefficients for the polynomial third order there are 4 pairs of values necessary:

Output values	Input values	Comment
0	0	Dead load removed
LIN1	LIM1	First point
LIN2	LIM2	Second point
NOV	NOV	max. capacity

So these two additional points have to be in the range 0…NOV. And the following conditions have to be valid:

0 < LIM1 < LIM2 < NOV

0 < LIN1 < LIN2 < NOV

LIM

Linearization Measured values
(Input values linearization curve)

Property	Content	Note
Command string	**LIM**	
No. of parameters	2	
Parameter range	P1=1,2	Value 1 or 2
	P2=0... NOV (99999)	Parameter
Factory default	P2=0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**LIM**(P1),(P2);	No response
Query Master	**LIM**(P1)?;	
Response WE	P2 crlf	P2 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The values LIM are the input values of the linearization curve.

Conditions: 0 < LIM1 < LIM2 < NOV

For more information see command **LIN.**

LIN

Linearization Nominal values

(Output values linearization curve)

Property	Content	Note
Command string	**LIN**	
No. of parameters	2	
Parameter range	P1=1,2	Value 1 or 2
	P2=0... NOV (99999)	Parameter
Factory default	P2=0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1;	
Input Master	**LIM**(P1),(P2);	No response
Query Master	**LIM**(P1)?;	
Response WE	P2 crlf	P2 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The values LIN are the wanted output values of the linearization curve.

Conditions: 0 < LIN1 < LIN2 < NOV

Setup of the linearization :

- Use the **SPW** command to enter your password.
- Set legal for trade switch to **LFT**=0
- The scale is adjusted (**LDW**, **LWT**, **NOV**, …)
- Switch off the old linearization: LIN1=0, LIN2=0, LIM1=0 LIM2=0,
- The scale is loaded with the first known weight (point1).
- Enter the **LIN1** value (weight without comma).
- Query the measurement output (**MSV?**)
- Enter the **LIM1** value (without comma).
- The scale is loaded with the second known weight (point2).
- Enter the **LIN2** value (weight without comma).
- Query the measurement output (**MSV?**)
- Enter the **LIM2** value (without comma).
  With the input of LIM2 value the WE activates the new linearization curve.
- Store the new values in the EEPROM with **TDD**1.

Switch OFF the linearization:

Enter the default values:

Enter the password (**DPW**)

Switch off legal for trade (**LFT**0; if necessary)

LIN1,0;

LIN2,0;

LIM1,0;

LIM2,0;

TDD1;

3.5 Settings for measuring mode

These commands should be set before data output.

- Filter selection, cut−off frequencies **ASF**
- Filter mode **FMD**
- Automatic zero tracking **ZTR**
- Initial zero setting **ZSE**

ASF

Amplifier Filter

(Filter selection cut−off frequencies)

Property	Content	Note
Command string	**ASF**	
No. of parameters	1	
Parameter range	P1=0...8	
Factory default	3	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**ASF**(P1);	No response
Query Master	**ASF**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command selects a digital filter. This influences the filter behavior of the WE (measurement signal bandwidth).

The limit frequency of the filter determines the settling time. The higher the filter index, the better the filter effect, but also the longer the settling time when the weight changes. Choose as low a filter setting as possible, but one that ensures measured value rest (standstill) when the weight does not change.

The mean-value calculation influences the overall settling time of the WE. The overall settling time also depends on the mechanical construction of the transducer, the dead load of the scale and the weight to be weighed.

Parameter description:

At ASF0, the filter is disabled.

Filter characteristics FMD0:

ASF	Settling time in ms to 0.01 %	Cut-off frequency in Hz at –3dB
0	80	25
1	125	8
2	250	4
3	500	2
4	1000	1
5	2000	0.5
6	4000	0.25
7	8000	0.125
8	16000	0.0625

The settling time of the scale is also influenced by the settings of **FMD**.

Filter characteristics FMD1:

ASF	Settling time in ms to 0.01 %	Cut-off frequency in Hz at –3 dB
0	140	10
1	150	8
2	160	7
3	170	6
4	240	5
5	310	4
6	380	3
7	450	2.5
8	566	2

FMD

Filter mode
(Filter mode selection)

Property	Content	Note
Command string	**FMD**	
No. of parameters	1	
Parameter range	P1=0,1	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**FMD**(P1);	No response
Query Master	**FMD**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

FMD0: normal behavior (as described with **ASF**)
FMD1: fast settling mode

ZTR

Zero Tracking
(Automatic zero tracking)

Property	Content	Note
Command string	**ZTR**	
No. of parameters	1	
Parameter range	P1=0/1 (0= Off, 1= On)	
Factory default	0	disabled
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	Yes	
Parameter backup	With command **TDD**1	
Input Master	**ZTR**(P1);	No response
Query Master	**ZTR**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

Automatic zero tracking occurs with gross or net measured values < 0.5 d in the range ±2 % of the nominal (rated) value of the scale (**NOV**). The maximum adjustment speed is 0.5d/s at scale standstill. The unit d (digit) relates to the nominal (rated) value (**NOV**) and the increment **RSN**.

ZSE

Zero Setting

(Initial zero setting on start-up)

Property	Content	Note
Command string	**ZSE**	
No. of parameters	1	
Parameter range	P1=0 ... 4	
Factory default	0	disabled
Reaction time	< 15 ms	
Password protection	Yes	
Relevant to legal for trade	YES	
Parameter backup	With command **TDD**1	
Input Master	**ZSE**(P1);	No response
Query Master	**ZSE**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

When switching on the voltage, during a RESET or after an **RES** command, zero setting is executed in the selected range at standstill after about 2.5 s. Any change to the zero on start-up setting range only takes effect after switching on the voltage or after the **RES** command.

If there is no standstill or if the gross value is outside the selected limits, zero setting does not occur. The internal zero memory is always cleared before automatic zeroing. If the gross value at standstill is within the selected range, the gross value is accepted into the zero memory. It is not possible to read out the zero memory. The standstill condition will be set with **MDT**. The digit unit (d) relates to the nominal (rated) value (**NOV**) and the increment (**RES**).

Parameter description:

ZSE0: zeroing disabled

ZSE1: zeroing range ±2 % of **NOV** value

ZSE2: zeroing range ±5 % of **NOV** value

ZSE3: zeroing range ±10 % of **NOV** value

ZSE4: zeroing range ±20 % of **NOV** value

3.6 Commands for measuring mode

Before taking up measuring mode, the scale should be adjusted (section 3.3) and the requisite settings for measuring mode should be stored (section 3.4).

- Data output **MSV?**
- Data output (internal resolution) **MIV**?
- Zero setting gross value (±2 %) **CDL**
- Tare mode **TAR**
- Tare value **TAV**
- Gross/net selection **TAS**

Tare is subtractive tare.

MSV

Measured Signal Value

(Measurement query)

Property	Content	Note
Command string	**MSV?**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	No data to back up	
Query Master	**MSV?**;	
Response WE	See description	

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

As previously defined, the measured value is output in ASCII or binary format (see commands **COF**, **NOV** and **RSN**). The maximum extent of the measured values is:

For 2-byte data output:	integer	±32767
For 4-byte data output:	long integer	±399999
For ASCII data output:	ASCII	±399999

The length of output depends on the output format (see **COF** command).

The output format for a measured value must be defined before the measurement run. The measured value is output in relation to the particular measuring range (**NOV**). The measured value can be a net or a gross measured value (**TAS**).

Preparing for data output

1. Use the **COF** command to define the **output format**
2. Use the **NOV** command to define **output scaling**
3. Use the **RSN** command to define **display resolution**
4. Use the **DPT** command to define the **decimal point position**
5. Use the **MRA** command to define the **mode of operation**
6. Use the **FMD** command to define the **digital filter mode**
7. Use the **ASF** command to define the **digital filter**

The output scaling is defined by the parameter of the **NOV** command.

Output format measured value at max. capacity	**NOV ≥ 100**
2-byte binary	NOV value
4-byte binary	NOV value
ASCII	NOV value

With 2-byte binary output, the **NOV** value must be ≤ 30000, otherwise the measured value will be output with overflow or underflow ($7FFF_H$ or 8000_H, H: hexadecimal). With **NOV30000**, the overload reserve is only about 2700 digit.

The measured value is stored in the output buffer independently of the measurement query.

Binary output:

The length specification includes the end label (CR, LF).

With 4-byte output, the measured value is a 3-byte value. The fourth byte is the measurement status

COF	**Length**	**Sequence for data output**
COF0	4 bytes	MSB before LSB
COF1	4 bytes	LSB before MSB
COF2	6 bytes	MSB before LSB (LSB = status)
COF3	6 bytes	LSB before MSB (LSB = status)

MSB=most significant digit, LSB=least significant digit

ASCII output (COF4):
The ASCII output length is 16 bytes, whatever the content (incl. CRLF):

1 character 1	9 characters 2-10	1 character 11	3 characters 12-14	1 character 15,16
G N	Measured value (sign, measured value with decimal point)	Blank	g kg t lbs pcs	crlf
G=gross, N=net	9 x '-' , when outside display range for LFT>0		For standstill only, otherwise 3 blanks	End label

The display range is defined as follows:

LFT=0:	-160 x NOV .... + 160 x NOV	(cannot be verified, industrial mode)
LFT=1:	-2 % ... + NOV + 9 d	(legal for trade, OIML, R76)
LFT=2:	-2 % ... + NOV + 5 %	(legal for trade, NTEP)

NOV is the output scaling (NOV>100). The percentage figures relate to the NOV.
The decimal point **DPT** only takes effect for ASCII output.
The d information relates to increment that is set (**RSN**):
RN=2 -> 9 d = 18 digits (d).

Measurement status

In 4-byte binary output, the measurement status can be transferred with the measured value (see command **COF**). The measurement status is coded bit by bit.

Content of the status byte	Possible cause
Bit 0 1= counting scale	1= counting scale is activated
Bit1 1= outside the display range	-160 % ... +160 % of NOV (industrial, LFT=0) , -2 % ... MAX+9 d (OIML, LFT=1) , -2 % ... MAX+5 % (NTEP, LFT=2)
Bit2 1= Gross value	0= net value, 1 = gross value (see also **TAS**)
Bit3 1= standstill	1 = standstill (see **MDT**)
Bit4 1= range 2 / 3	0 = range 1, 1= range 2 / 3 (multi-range display)
Bit5 1= Out1 active	1 = Output 1 is active
Bit6 1= Out2 active	1 = Output 2 is active
Bit7 1= Error	An error occurs, read the error status with the command ERR?

Example:

If standstill is active and a gross value is involved, then the content of the status byte = (8+4) = 12 decimal (0C hex).

MIV

Measured Internal Signal Value

(Measurement query)

Property	Content	Note
Command string	**MIV?**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	No data to back up	
Query Master	**MIV?**;	
Response WE	Xxxs crlf	4 byte binary

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command should be only used for the scale adjustment (**LDW, LWT**)

The output format for a measured value is fixed (**COF2**). The maximum extent of the measured values is:

For 4-byte data output: long integer ±399999

The measured value is output in not in relation to the particular measuring range (NOV).

Output format measured value at max. capacity	0 mV/V	2 mV/V
4-byte binary	0	200000

Binary output:

The length specification includes the end label (CR, LF).
With 4-byte output, the measured value is a 3−byte value. The fourth byte is the measurement status

COF	Length	Sequence for data output
COF2	6 bytes	MSB before LSB (LSB=status)

MSB=most significant digit, LSB=least significant digit

Measurement status

In 4-byte binary output, the measurement status can be transferred with the measured value (see command COF). The measurement status is coded bit by bit.

Content of the status byte	Possible cause
Bit 0 1= counting scale	1= counting scale is activated
Bit1 1= outside the display range	−160 % ... +160 % of NOV (industrial, LFT=0), −2 % ... MAX+9 d (OIML, LFT=1), −2 % ... MAX+5 % (NTEP, LFT=2)
Bit2 1= Gross value	0= net value, 1 = gross value (see also TAS)
Bit3 1= standstill	1 = standstill (see **MDT**)
Bit4 1= range 2 / 3	0 = range 1, 1= range 2 / 3 (multi−range display)
Bit5 1= Out1 active	1 = Output 1 is active
Bit6 1= Out2 active	1 = Output 2 is active
Bit7 1= Error	An error occurs, read the error status with the command ERR?

Example:

If standstill is active and a gross value is involved, then the content of the status byte = (8+4) = 12 decimal (0C hex).

CDL

Clear Dead Load

(Set to zero)

Property	Content	Note
Command string	**CDL**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	1/ output rate	
Password protection	No	
Relevant to legal for trade	no	
Parameter backup	No data to back up	
Input Master	**CDL**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command **CDL;** undertakes a zero balance of the gross value if this is in the range ±2 % of the weighing range (**NOV**) and there is standstill. Set to zero is not executed if one of the two conditions is violated.

Once set to zero is successfully completed, the display is switched to gross output (**TAS**=1).

A CDL?; query is not permitted.

TAR

Tare

(Tare with the actual gross value)

Property	Content	Note
Command string	**TAR**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	no	
Parameter backup	No data to back up	
Input Master	**TAR**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command **TAR;** tares the current measured value. After tare, it switches back to the net measured value (**TAS0;**). The current value is stored in tare memory (also see the **TAV** command) and subtracted from the measured value and all subsequent measured values.

With legal for trade applications (LFT>0) tare is only allowed when standstill conditions occurs.

Permissible tare range:

LFT=0: ± 100 % of NOV

LFT>0: 0… NOV

A TAR?; query is not permitted.

The stored tare value can be read out with **TAV?**. At Power OFF, the tare value is lost unless it is saved with TDD1;.

TAV

Tare Value

(Tare value)

Property	Content	Note
Command string	**TAV**	
No. of parameters	1	
Parameter range	P1= 0...±99999	
Factory default	0	disabled
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**TAV**(P1);	No response
Query Master	**TAV**?;	
Response WE	X crlf (X= current 7-digit tare value with sign)	X = 6 chars.

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The tare value can be pre-assigned, or a tare value saved by the tare function (**TAR**) is output.

The value is on the **LDW**/**LWT** curve (0...**NOV**) scaled with the **NOV** parameter. After making the curve inputs with the commands **SZA**, **SFA** or **LDW**, **LWT**, the tare memory is cleared (content=0).

When the tare value is entered, the display switch to NET display weight.

When the tare value is input, the net value is identified in the displayas a pretare value (PT).

Query: TAV?;
The content of the tare memory is output. The tare value is converted to the **NOV** value.

With legal for trade applications (**LFT**>0), the tare range is restricted to 0...100 % of **NOV**.
permissible tare range :

LFT=0:	± 100 % of **NOV**
LFT>0:	0… **NOV**

Example:

NOV3000; *(scale*		*scaling)*
TAS1;		*(gross output enabled)*
MSV?;	*1500 LF*	*(measured value at 50% = max. capacity of the scale)*
TAR;		*(tare and select net output*
TAV?;	*1500 LF*	*(query tare value)*
MSV?;	*0 LF*	*(net measured value)*
TAS?;	*0 LF*	*(net is enabled)*
TAS1;		*(select gross)*
MSV?;	*3000 LF*	*(measured value at 100 % = nominal (rated) load of the scale)*
TAV?;	*1500 LF*	*(query tare value, unchanged)*

TAS

Tare Set

(Gross/net selection)

Property	Content	Note
Command string	**TAS**	
No. of parameters	1	
Parameter range	P1= 0/1 (0=net, 1=gross)	
Factory default	1	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	no	
Parameter backup	With command **TDD**1	
Input Master	**TAS**(P1);	No response
Query Master	**TAS**?;	
Response WE	P1 crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command changes data output over (**MSV?**).

TAS0: net measured value

The value in tare memory is subtracted from the current measured value.

TAS1: gross measured value

The value in tare memory is not offset. The tare value is unchanged during the gross/net changeover.

3.7 Special functions

- Pass word commands **DPW**, **SPW**
- Amplifier reset **RES**
- Amplifier identification **IDN**
- Save/ restore all parameters **TDD**
- Error memory **ERR?**
- ADC overflow counter **AOV?**
- Sensor overflow counter **SOV?**

The WE has password protection for parameters Relevant to legal for trade.

If the password is **not** activated with **SPW**, although the parameters of a protected function can be read out, they cannot be modified. A new password is entered with the command **DPW**.

DPW

Define Password

(Define password)

Property	Content	Note
Command string	**DPW**	
No. of parameters	1	
Parameter range	P1= 00000 .... 99999 (5 digits)	
Factory default	00000	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	YES	
Parameter backup	With command **TDD**1	
Input Master	**DPW(P1)**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command saves the new password. No query is possible. The new password has to be activated after input with the **SPW** command.

A DPW? query is not permitted.

SPW

Set Password

(Write enable for all password protected parameters)

Property	Content	Note
Command string	**SPW**	
No. of parameters	1	
Parameter range	P1= 00000 ... 99999 (5 digits)	Must match P1 of **DPW**
Factory default	00000	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	Yes	
Parameter backup	-	
Input Master	**SPW(P1)**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command **SPW** with a correctly entered password (using the command **DPW**) gives authorization for data input with all commands. The command **SPW** with an incorrect password stops data input for protected commands. A password is not necessary for query.

After an **RES** or a power-up, you are again prevented from using the protected commands.

A SPW? query is not permitted.

In the chapter 2.6 there is an overview of the protected commands.

RES

Restart
(Reset electronic)

Property	Content	Note
Command string	**RES**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 4 s	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Input Master	**RES**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The **RES** command initiates device start-up (warm start). This command does not generate a response. All the parameters are set in the same way as they were saved with the last **TDD**1 command, that is to say, the EEPROM values are transferred to the RAM.

A RES? query is not permitted.

IDN

Identification

(Identification of electronic type and serial number)

Property	Content	Note
Command string	**IDN?**	
No. of parameters	-	
Parameter range	-	
Factory default	WE2107,xxxxxxx,P7y crlf	Response to IDN?;
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Input Master	Not possible	
Query Master	**IDN?**;	
Response WE	WE2107,xxxxxxx,P7y crlf Pyy is the program version number Xxxxxxx is the serial number	18 chars. + end label

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

An identification string is output (18 characters + end label).

Sequence: electronics type, serial number, software version

A fixed number of characters are output. 6 characters are always output for the electronics type, the serial number always has 7 characters and the version number always has three characters (each separated by a comma).

Only the manufacturer can enter the serial number (any ASCII characters).

TDD

Transmit Device Data

(Back up device parameters)

Property	Content	Note
Command string	**TDD**	
No. of parameters	1	
Parameter range	P1 = 1 to store the parameter	
	P1 = 0 to restore the factory default	
Factory default	-	
Reaction time	< 0.2 s	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	No data to back up	
Input Master	**TDD(P1)**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command is used to save all the parameters. The WE has two EEPROM. In the first EEPROM, customer-specific parameters are stored power fail safe. The second EEPROM contains the legal for trade parameters.

Content of the first EEPROM:

ADR, BDR, COF, SFU, ASF,, FMD, TAV, TAS,

ED1, ED2, EDC, ESC, PES, PID, PLB, PLE, PRT, PST, TAD, TDL, EPT, RFT,

MDT, FRS, LIV, BFL, BFS, FIN, MAL, DPW

Content of the second EEPROM (legal for trade parameters)

SZA, SFA, ACA, ACU, CWT, LDW, LWT, NOV, RSN, MRA, MRB, MDT, ENU, DPT,LIN, LIM, ZSE, ZTR, LFT, TCR.

If LFT>0 only the parameters of the first EEPROM will be stored.

If LFT=0 the parameters of both EEPROM will be stored.

A TDD? query is not permitted.

With parameter input, the changed settings are initially only saved in working memory (RAM), so they are not stored power fail safe. Use the command **TDD1** to store the settings that you have changed in working memory power fail safe in the EEPROM.

TDD0, restore the factory default:

This command restore the factory default parameters:

- **SZA**, **SFA** (0…2 mV/V factory characteristic curve)

Unchanged parameters:

- Commands for the communication: **BDR**, **ADR**, **COF**,
- Commands for the real time clock : **TDT**,**TME**,**TMM**,
- Commands for the external display: **EDP**, **EDS**, **ED1**, **ED2**, **EDC**
- Commands for the print setup: **ESC**,**PES**, **PID**,**PLB**,**PLE**,**PRT**,**PST**

Commands for setup buttons, digital inputs:

- **BFL**, **BFS**, **FIN**, **MAL**, **TDL**

All other parameters are set to the factory default values as we described in this manual.

NOTE

After TDD0 the scale has to be adjusted again. The legal for trade switch is set to OFF. The calibration counter is incremented by one.

ERR

Error status

(Error status)

Property	Content	Note
Command string	**ERR?**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	no	
Parameter backup	-	
Query Master	**ERR**?;	
Response WE	P1 crlf	P1 = 3 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The Error code has a range of 0…255 (decimal, ERR=0 == no Error). After reading the error status the error memory is set to zero.

An error can be detected by the status of the measured value (Bit7=1).

The error status is coded bit by bit. If several errors occurs at the same time than the individual error bits (3…0) are set to error with the highest priority.

Error	Error bit
Hardware	Bit 7 = 1 (priority high)
Load cell / sensor	Bit 6 = 1
Parameter	Bit 5 = 1
Communication	Bit 4 = 1 (priority low)
Individual error bits	Bit 3…0

Error bits 3…0	**Error hardware (Bit 7 = 1)**
0	- (no or several errors)
1	Internal EEPROM (checksum)
2	External EEPROM (checksum)
3	ADC overflow (AOV)
4	ADC underflow (AOV)
5	External power supply voltage to low
6	Short cut digital OUT1…4
7	Internal voltage too low < 7.0 V

Error bits 3…0	**Error load cell (Bit 6 = 1)**
0	- (no or several errors)
1	Sensor overflow (SOV)
2	Sensor underflow (SOV)
3	Sensor excitation voltage too low (< 3 V)
4	Floating bridge input signal
5 … 7	Tbd

Error bits 3…0	**Error parameter (Bit 5 = 1)**
0	- (no or several errors)
1	Factory characteristic to sensitive (SFA – SZA < 2000)
2	Scale characteristic to sensitive (LWT – LDW < 2000)
3	Linearization parameter LIN1> LIN2 or LIM1> LIM2
4	Gross value overflow[1)]
5	Linearization curve, no solution
6	Gross value underflow 1)
7	Initial zero setting value out of range (ZSE)
8	zeroing failed
9	tare failed
10	dosing time overflow
11	weight in the bin/tank is larger than the start limit
12	weight in the tank is too small to dosing
13	dosing: sum is out of range
14	Printing: not standstill over 5 sec. When LFT>0

1) out of display range

Error bits 3…0	**Error communication (Bit 4 = 1)**
0	- (no or several errors)
1	Parameter input out of range
2	Unknown command
3	Password (DPW) failed
4	Parameter write protected (LFT>0, or/and password)
5	Printing time out
6	Calibration counter overflow (TCR>65535)
7	COM1 : framing, parity, break
8	Total weight (sum) overflow

AOV

ADC Overflow

(ADC overflow / underflow counter)

Property	Content	Note
Command string	**AOV?**	
No. of parameters	-	
Parameter range	0...99999	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Query Master	**AOV**?;	
Response WE	P1 crlf	P1= 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

If an ADC overflow or underflow occurs (to large input signals), each 10 minutes the overflow counter will be increment by 1. The Error memory is set to (1100 0010 binary = 0C2 hex, see command **ERR**).

The maximum count is 99999.

SOV

Sensor Overflow

(Sensor overflow / underflow counter)

Property	Content	Note
Command string	**SOV?**	
No. of parameters	-	
Parameter range	0...99999	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Query Master	**SOV**?;	
Response WE	P1 crlf	P1= 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

If an sensor overflow / underflow occurs, each 10 minutes the overflow counter will be increment by 1. The Error memory is set to (1100 0010 binary = 0C2 hex, see command **ERR**).

The maximum count is 99999.

Overflow range: > + 3.4 mV/V or < - 3.4mV/V

3.8 Commands for legal for trade applications

The commands are used to monitor parameter changes made to parameters Relevant to legal for trade via the standard counter:

- Calibration switch **LFT**
- Calibration counter **TCR?**

The parameters Relevant to legal for trade are:

SZA, SFA, ACA, ACU, CWT, LDW, LWT, NOV, RSN, MRA, MRB, MDT, ENU, DPT, LIN, LIM, ZSE, ZTR, LFT, TCR

If the calibration switch is set to LFT>0, it is not possible to make changes to parameters Relevant to legal for trade. **Before changing parameters relevant to legal for trade, activate the password (DPW, SPW) and set LFT to zero.** Every LFT change increases the calibration counter (TCR) that cannot be reset by 1.

After calibration, set LFT to a value greater than zero. Then read out the calibration counter and make a note on the identification label of the scale.

LFT

Legal for Trade

(Legal for trade switch)

Property	Content	Note
Command string	**LFT**	
No. of parameters	1	
Parameter range	P1 = 0, 1, 2 0=industrial use (not legal for trade), 1= legal for trade application OIML (R76) enabled 2= legal for trade application NTEP enabled	
Factory default	0	disabled
Reaction time	< 15 ms	
Password protection	YES	
Relevant to legal for trade	YES	
Parameter backup	With command **TDD**1	
Input Master	**LFT**(P1);	
Query Master	**LFT?**;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

With each **LFT** command change, the calibration counter (**TCR**) is increased by 1.

With **LFT>0** (legal for trade applications), parameter input of the following commands is blocked:

SZA, SFA, ACA, ACU, CWT, LDW, LWT, NOV, RSN, MRA, MRB, MDT, ENU, DPT, LIN, LIM, ZSE, ZTR

This means that each change to these parameters relevant to legal for trade applications is detected by the standard counter **TCR** that cannot be reset.

The display range is defined as follows:

LFT=0:	-160 x NOV .... + 160 x NOV	(cannot be verified)
LFT=1:	-2 % ... + NOV + 9 d	(legal for trade, OIML, R76)
LFT=2:	-2 % ... + NOV + 5 %	(legal for trade, NTEP)

Permissible tare range:

LFT=0:	±100 % of NOV
LFT>0:	0… NOV

TCR

Trade Counter

(Legal for trade (calibration) counter)

Property	Content	Note
Command string	**TCR?**	
No. of parameters	-	
Parameter range	-	
Factory default	< 00100	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	YES	
Parameter backup	-	
Query Master	**TCR?**;	
Response WE	Xxxxx crlf	6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This counter cannot be reset and marks the parameter changes of commands relevant to legal for trade applications (see command **LFT**). The maximum count is 65535. When this count is reached, the counter stops data output **MSV?;** then only outputs overflow values. This status can only be removed at the factory.

It is only possible to read out the calibration counter.

3.9 Commands for setup the control of an external display

The commands are used to setup the communication with the external display via the second serial link.

- Protocol UART2 **FUB**
- Protocol external display **EDP**
- Start character **EDS**
- CRC character **EDC**
- End character 1 **ED1**
- End character 2 **ED2**

Via the second serial link an external display can be connected.

Baud rate:	1200...9600
Parity bit:	non / even
Type:	RS232
Update rate:	5 / sec.
Protocol:	no protocol (just send out)
	Hardware – protocol (DTR)
	Software – protocol (DC1/DC3/DC4)

The protocol has to be defined in the parameter menu (UART2/FUNCT) or with the command **FUB.** The baudrate can only be selected in the parameter menu (there is no command available)

FUB

Function UART2 (printer / external display protocol)

(Protocol UART2)

Property	Content	Note
Command string	**FUB**	
No. of parameters	1	
Parameter range	0 … 5	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**FUB**(P1);	No response
Query Master	**FUB?**;	
Response WE	X crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the function of the COM-port 2.

Definition of the parameter:

P1=0: Function OFF,

P1=1; printer : hardware protocol (DTR),

P1=2; printer: software protocol (DC1/DC3/DC4),

P1=3; external display: no protocol (only transmit),

P1=4; external display: hardware protocol (DTR),

P1=5; external display: software protocol (DC1/DC3/DC4)

EDP

External display protocol

(Protocol external display via second serial link)

Property	Content	Note
Command string	**EDP**	
No. of parameters	1	
Parameter range	0 … 5	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**EDP**(P1);	No response
Query Master	**EDP?**;	
Response WE	X crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

Definition of the output string:

P1 = 0: no external display (if printer is connected)

P1 = 1; output of the actual Gross- or Net value

P1 = 2; output of the actual Gross- or Net value and the tare value

P1 = 3; output of the actual filling result

P1 = 4; output of the actual Gross- or Net value with decimal point (6 char.)

P1 = 5; output of the actual Gross- or Net value without decimal point (5 char.)

The length of the output string depends on the start character (**EDS**), the both end characters (**ED1, ED2**) and the check sum character (**EDC**).

P1=1 / 3, actual Gross or Net value :

Byte	Content
1	Start character (**EDS**), if EDS=0 no start char. will send out
2	Sign of the measured value
3 - 9	P1=1: Gross or net value (with decimal point) P1=3: Filling result (with decimal point)[1)]
10	Empty space
11 - 14	Unit (‘kg ‘ ; ‘t ‘ ; ‘g ‘ ; ‘lbs ‘ ; ‘pcs ‘), if standstill otherwise empty spaces
15	Empty space
16 – 19	‘G ‘ =Gross value; ‘Net ‘ = Net value or ‘N PT’ = Net value with usage of pre tare value
20	End character 1 (**ED1**), if ED1=0 no char. will send out
21	End character 2 (**ED2**), if ED2=0 no char. will send out
22	Check sum character (**EDC**), if EDC=0 no char. will send out

[1)] if an error occurs than the value is ‘Err xx’

P1=2, actual Gross or Net value and the tare value :

Byte	Content
1	Start character (**EDS**), if EDS=0 no start char. will send out
2	Sign of the measured value
3 - 9	Gross or net value (with decimal point)[1)]
10	Empty space
11 - 14	Unit (‘kg ‘ ; ‘t ‘ ; ‘g ‘ ; ‘lbs ‘ ; ‘pcs ‘),if standstill otherwise empty spaces
15	Empty space
16 – 19	‘G ‘ =Gross value; ‘Net ‘ = Net value or ‘N PT’ = Net value with usage of pre tare value
20	Empty space
21 – 27	Tare value (with decimal point)
28	End character 1 (**ED1**), if ED1=0 no char. will send out
29	End character 2 (**ED2**), if ED2=0 no char. will send out
30	Check sum character (**EDC**), if EDC=0 no char. will send out

[1)] if an error occurs than the value is ‘Err xx’

P1=4, actual Gross or Net value :

Byte	Content
1	Start character (**EDS**) , if EDS=0 no start char. will send out
2 – 7	G/N value, 6 characters with decimal point
8	End character 1 (**ED1**) , if ED1=0 no char. will send out
9	End character 2 (**ED2**) , if ED2=0 no char. will send out
10	Check sum character (**EDC**) , if EDC=0 no char. will send out

P1=5, actual Gross or Net value :

Byte	Content
1	Start character (**EDS**) , if EDS=0 no start char. will send out
2 – 6	G/N value, 5 characters without decimal point
7	End character 1 (**ED1**) , if ED1=0 no char. will send out
8	End character 2 (**ED2**) , if ED2=0 no char. will send out
9	Check sum character (**EDC**) , if EDC=0 no char. will send out

EDS

External display start character

(External display, definition of the start character)

Property	Content	Note
Command string	**EDS**	
No. of parameters	1	
Parameter range	0 … 99	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**EDS**(P1);	No response
Query Master	**EDS?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the start character in the output string.

EDS=0: no start character is defined (the telegram is 1 byte shorter)

EDS=1…99 an start character is defined (reference ASCII-chart PC437)

Examples:

EDS=2: start character is STX (=02hex)

EDS=27: start character is an ESC (=1B hex)

ED1

External display end character 1

(Protocol external display definition of the end character 1)

Property	Content	Note
Command string	**ED1**	
No. of parameters	1	
Parameter range	0 … 31	
Factory default	13	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**ED1**(P1);	No response
Query Master	**ED1?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the first end character in the output string.

ED1=0: no end character is defined (the telegram is 1 byte shorter)

ED1=1…31 an end character is defined (reference ASCII-chart PC437)

Examples:

ED1=3: end character is ETX (=03hex)

ED1=13: end character is an CR (=0d hex)

ED2

External display end character 2

(Protocol external display definition of the end character 2)

Property	Content	Note
Command string	**ED2**	
No. of parameters	1	
Parameter range	0 … 31	
Factory default	10	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**ED2**(P1);	No response
Query Master	**ED2?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the second end character in the output string.

ED2=0: no end character is defined (the telegram is 1 byte shorter)

ED2=1…31 an end character is defined (reference ASCII-chart PC437)

Examples:

ED1=3: end character is ETX (=03hex)

ED1=10: end character is an LF (=0a hex)

EDC

External display check sum

(Protocol external display definition of the check sum)

Property	Content	Note
Command string	**EDC**	
No. of parameters	1	
Parameter range	0,1	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**EDC**(P1);	No response
Query Master	**EDC?**;	
Response WE	x crlf	1 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the checksum in the output string.

EDC = 0: no check sum is defined (the telegram is 1 byte shorter)

EDC = 1 an check sum will be calculated

The check sum is the XOR function (first byte is the start character (**EDS**) and

The last byte is the end character 2 (**ED2**).

3.10 Commands for setup the print function

- Print protocol **PRT**
- Escape sequence **ESC**
- Number of empty lines before printing **PLB**
- Number of empty spaces in each row **PES**
- Print identification counter **PID**
- Printer strings **PST**
- Number of empty lines after printing **PLE**
- Start a hard copy **SHC**

To start a hard copy a function button (F1/F2) or a digital input has to be set (**BUS, BUL, FIN**).

Via the second serial link a printer can be connected.

Baud rate:	1200...9600
Parity bit:	non / even
Type:	RS-232
Protocol:	Hardware – protocol (DTR) Software – protocol (DC1/DC3/DC4)

The protocol has to be defined in the parameter menu (UART2/FUNCT) or with the command **FUB.**

The parity bit and the communication protocol has to be defined in the menu of the WE. The different hard copies are described in the part 1 of the manual. **.** The baud rate can only be selected in the parameter menu (there is no command available).

PRT

Print protocol

(Print protocol via second serial link)

Property	Content	Note
Command string	**PRT**	
No. of parameters	1	
Parameter range	0 … 7	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PRT**(P1);	No response
Query Master	**PRT?**;	
Response WE	X crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

P1 = 0: print function is switched off

P1 = 1: gross or net weight (tare value if net weight printed)

P1 = 2: gross or net weight and the quantity (if counting scale)

P1 = 3: gross or net weight, quantity, total weight

P1 = 4: gross or net weight, quantity, total weight, after printing the total weight is cleared

P1 = 5: result portion weighing (gross or net weight),

P1 = 6: result portion weighing (gross or net weight), total weight, after printing the total weight is cleared

P1 = 7: print all parameters of the WE,

ESC

Escape sequences

(Escape sequences for the print protocol)

Property	Content	Note
Command string	**ESC**	
No. of parameters	2	
Parameter range	P1: 0 … 9	
	P2: 0 … 255	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**ESC**(P1),(P2);	No response
Query Master	**ESC(P1)?**;	
Response WE	xxx crlf	3 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The escape sequences are used to setup the printer (see manual of the printer).
The WE has two Escape sequences:
Sequence 1:ESC, ESC0, ESC1, ESC2, ESC3, ESC4
Sequence 2:ESC, ESC5, ESC6, ESC7, ESC8, ESC9
If the ESC character is set to zero (ESCx,0) this character will not be transmitted.
To switch off the sequence 1 the command ESC0,0 has to be send.
To switch off the sequence 2 the command ESC5,0 has to be send.

PLB

Print empty lines before printing
(Print empty lines before printing)

Property	Content	Note
Command string	**PLB**	
No. of parameters	1	
Parameter range	0…99	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PLB**(P1);	No response
Query Master	**PLB?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

P1 defines the number of empty lines at the start of printing.

PES

Print empty spaces

(Print empty spaces in each line)

Property	Content	Note
Command string	**PES**	
No. of parameters	1	
Parameter range	0…99	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PES**(P1);	No response
Query Master	**PES?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

P1 defines the number of empty spaces (blanks) on the start of each new line.

PID

Print identification counter

(Identification counter for the print protocol)

Property	Content	Note
Command string	**PID**	
No. of parameters	1	
Parameter range	0…99999	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PID**(P1);	No response
Query Master	**PID?**;	
Response WE	xxxxx crlf	6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

P1 defines the identification counter. With each hard copy this counter will be incremented by one. The print counter will be cleared by the command **CSN**.

PST

Print strings

(Print strings for the print protocol)

Property	Content	Note
Command string	**PST**	
No. of parameters	2	
Parameter range	P1:= 0…2	
	P2:= string with 30 characters	
Factory default	empty string	””
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PST**(P1),” P2 “;	No response
Query Master	**PST(P1)?**;	
Response WE	P2 crlf	Max. 30 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The WE has three print strings (P1=0…2). All ASCII characters are allowed (20hex…7f hex) for P2.

PLE

Print empty lines at the end of printing

(Print empty lines at the end of printing)

Property	Content	Note
Command string	**PLE**	
No. of parameters	1	
Parameter range	0…99	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**PLE**(P1);	No response
Query Master	**PLE?**;	
Response WE	xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

P1 defines the number of empty lines at the end of printing.

SHC

Start hard copy

(Start hard copy via second serial link)

Property	Content	Note
Command string	**SHC**	
No. of parameters		
Parameter range		
Factory default		
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	No	
Input Master	**SHC;**	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

If a printer is connected to the second serial link and the UART2 is activated for the print function in the parameter menu than this command can start a hard copy of the different print protocols (see command **PRT**).

If legal for trade is set (**LFT**>0) than the hard copy will only perform if stand still condition occurs. If no stand still condition occurs during 5 sec. ,than the SHC demand will be deleted.

If it is a non legal for trade application is set (LFT=0) the stand still condition is not necessary.

3.11 Commands for set up the real time clock

- Date **TDT**
- Time **TME**
- Time mode **TMM**

The real time clock is only used by the print function.

TDT

Time date

(Real time clock date)

Property	Content	Note
Command string	**TDT**	
No. of parameters	3	
Parameter range	P1: 01…31 (day)	
	P2: 01…12 (month)	
	P3: 00…99 (year)	
Factory default	01,01,05	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**TDT**(P1),(P2),P3);	No response
Query Master	**TDT?**;	
Response WE	dd,mm,yy crlf	8 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The hard copy of the year is 20yy.

Set up the time:

- −Set up the clock mode with the parameter ’modE’ (command TMM)
- − Set up the clock with the parameter ’timE’ (command TME)
- −Set up the date with the parameter ’dAtE’ (command TDT)

TME

Time
(Real time clock)

Property	Content	Note
Command string	**TME**	
No. of parameters	2	
Parameter range	P1: 00…24 (hour)	
	P2: 00…59 (minutes)	
Factory default	00,00	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**TME**(P1),(P2);	No response
Query Master	**TME?**;	
Response WE	hh,mm crlf	5 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:
The hard copy of the time depends on **TMM**.

Setup the time:
- −Setup the clock mode with the parameter ’modE’ (command TMM)
- − Setup the clock with the parameter ’timE’ (command TME)
- −Setup the date with the parameter ’dAtE’ (command TDT)

TMM

Time mode
(Real time clock mode)

Property	Content	Note
Command string	**TMM**	
No. of parameters	1	
Parameter range	P1: 0= 24 hour	
	P1: 1= 12 hour am	
	P2: 2 = 12 hour pm	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**TMM**(P1);	No response
Query Master	**TMM?**;	
Response WE	x crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Set up the time:

- −Set up the clock mode with the parameter ’modE’ (command TMM)
- − Set up the clock with the parameter ’timE’ (command TME)
- −Set up the date with the parameter ’dAtE’ (command TDT)

The difference in the parameter ’modE’ for 12h mode is only to set up the clock at am or pm.

3.12 Commands for setup the buttons, digital inputs

MAL

Menu access level

(Access level for the parameter menu)

Property	Content	Note
Command string	**MAL**	
No. of parameters	1	
Parameter range	0 … 4	
Factory default	4	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**MAL**(P1);	No response
Query Master	**MAL?**;	
Response WE	X crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the access in the parameter menu of the WE:

P1	Access to menu level
0	Information, Scale, OFF
1	Like level 0 and Print
2	Like level 1 and SetPoints, Setup
3	Like level 2 and UART1, UART2, Print Setup, Input Setup, Button setup, Test
4	Like level 3 and Adjust, Factory Adjust

BFS

Button function short

(Button function short push)

Property	Content	Note
Command string	**BFS**	
No. of parameters	2	
Parameter range	P1: 1/2	
	P2: 0 … 15	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**BFS**(P1),(P2);	No response
Query Master	**BFS(P1)?**;	
Response WE	P2 crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the function of the buttons F1 and F2.

P1=1: button F1

P1=2: button F2

Parameter P2 defines the function.

P2 code	Description (BFS)
0	No function
1	display sum of actual measured value (Gross, Net, Count, filling result) for 5 sec.
2	counting scale ON / OFF
3	counting scale : input number of reference peaces and measure refereence peaces
4	Print protocol PRT01…PRT06, defined in the parameter menu Print\rsult\PRT[1)]
5	display 10-time resolution gross value, for 5 sec.[2)]
6	Input pretare value
7	Hold display value ON/OFF
8	display / enter target filling weight (portion weighing)
9	display filling result (portion weighing)
10	Start / Stop dosing (portion weighing)
11	Display / input on level of limit switch LIV1
12	Calculate total weight: SUM := SUM + Gross−value
13	Calculate total weight: SUM := SUM + NET−value
14	Calculate total weight: SUM := SUM + counting result
15	-

[1)] before the use of this function, the print protocol has to be selected in the parameter menu or by the comm. **PRT**.

[2)] to display the 10-times resolution the NOV < 10000 d, the DPT should be less than 4.

BFL

Button function long

(Button function long push (>5 sec))

Property	Content	Note
Command string	**BFL**	
No. of parameters	2	
Parameter range	P1: 1/2	
	P2: 0 … 15	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**BFL**(P1),(P2);	No response
Query Master	**BFL(P1)?**;	
Response WE	P2 crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command defines the function of the buttons F1 and F2.

P1=1: button F1

P1=2: button F2

Parameter P2 defines the function. To activate this button function a long push (>5 sec.) is necessary.

P2 code	Description (BFL)
0	No function
1	display sum of actual measured value (Gross, Net, Count) for 5 sec.
2	counting scale ON / OFF
3	counting scale : input number of reference peaces and measure reference peaces
4	Print protocol PRT01…PRT06, defined in the parameter menu Print\result\PRT[1)]
5	display 10-time resolution gross value, for 5 sec.[2)]
6	Input pretare value
7	Hold display value ON/OFF
8	Display / enter target filling weight (portion weighing)
9	display filling result (portion weighing)
10	Start / Stop dosing (portion weighing)
11	Start / Stop filling tank
12	Start / Stop emptying tank
13	Clear total weight (SUM)
14	-
15	-

1) before the use of this function, the print protocol has to be selected in the parameter menu or by the comm. **PRT**.
2) to display the 10-times resolution the NOV < 10000 d, the DPT should be less than 4..

FIN

Function digital inputs
(Function digital inputs)

Property	Content	Note
Command string	**FIN**	
No. of parameters	2	
Parameter range	P1: 1/2 P2: 0 … 3	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**FIN**(P1),(P2);	No response
Query Master	**FIN(P1)?**;	
Response WE	X crlf	1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The WE has two digital inputs. This command defines the function of both inputs:

P1=1: digital input 1 (IN1)
P1=2: digital input 2 (IN2)

Parameter P2 defines the function.

Parameter P2 defines the function:

Digital input 1:

P2 code	function with SFU = 0
0	No function
1	Tare
2	Hard copy (selected with command PRT)[1)]
3	Scale tilted (→ display tilt instead of measured values)[2)]

P2 code	function with SFU>0 (filling / dosing)
0	No function
1	Stop filling/dosing (**BRK**)
2	Hard copy (selected with command PRT)[1)]
3	Scale tilted (→ display tilt instead of measured values)[2)]

Digital input 2:

P2 code	Function with SFU = 0
0	No function
1	Tare
2	Hard copy (selected with command PRT)[1)]
3	Lock parameters (only display of parameters in the parameter menu, a change is not possible)

P2 code	Function with SFU>0 (filling / dosing)
0	No function
1	Start portion weighing (**RUN**)
2	Hard copy (selected with command PRT)[1)]
3	Lock parameters (only display of parameters in the parameter menu, a change is not possible)

[1)] before the use of this function, the print protocol has to be selected in the parameter menu Print\Result\PR T or by the command **PRT**.

[2)] the reaction time for the input TILT can be defined by the command TDL.

TDL

Tilt delay time

(Tilt delay time for digital input IN1)

Property	Content	Note
Command string	**TDL**	
No. of parameters	1	
Parameter range	0...99 (0=OFF) x 100 msec.	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	With command **TDD**1	
Input Master	**TDL**(P1);	No response
Query Master	**TDL?**;	
Response WE	Xx crlf	2 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The WE has one digital input (IN1) which can defined as an tilt sensor input. This command defines the monitoring cycle time with a resolution of 0.1 sec.

3.13 Commands for setup the filling control / limit switches

For different applications the WE has implemented different functions:

- Application: platform scale (non automatic weighing indicator = NAWI)
- Application: process control (NAWI + 4 limit switches)
- Application: dosing control (portion weighing)
- Application: tank weighing (tank filling, portion weighing from the tank, emptying the tank)

The command **SFU** select the different functions for the different applications.

- Scale function **SFU**
- Limit switches **LIV**

For the dosing process control and tank weighing control there are the additional commands:

- Start filling / dosing / emptying **RUN**
- Tare delay time **TAD**
- Residual flow time **RFT**
- Maximum filling / dosing time **MFT**
- Emptying time **EPT**
- Break filling / dosing / emptying **BRK**
- Dosing result **FRS?**
- Total weight (dosing) **SUM?**
- Dosing counter **NDS?**
- Clear total weight and counters **CSN**

Remarks:

Filling – fill a tank to a defined limit (max. filling level)

Dosing – fill a bin / vessel / bag from a tank (portion weighing)

Emptying – deflate the bin / tank (for service purposes)

Short description of the application platform scale / process control with limit switches (SFU0):

Digital I/O	Function with SFU0
IN1	defined by command **FIN**
IN2	defined by command **FIN**
OUT1	Limit switch 1
OUT2	Limit switch 2
OUT3	Limit switch 3
OUT4	Limit switch 4

LIV parameters	Function with SFU0
LIV1_ON	Limit switch 1, switch−on level
LIV1_OFF	Limit switch 1, switch−off level
LIV2_ON	Limit switch 2, switch−on level
LIV2_OFF	Limit switch 2, switch−off level
LIV3_ON	Limit switch 3, switch−on level
LIV3_OFF	Limit switch 3, switch−off level
LIV4_ON	Limit switch 4, switch−on level
LIV4_OFF	Limit switch 4, switch−off level

Short description of the application dosing control (SFU1):

The goal is to fill a portion into a bin / vessel / bag. This bin / vessel / bag is connected with the scale. A tank contains the material. But the tank is not on the scale.

Digital I/O	Function with SFU1
IN1	Stop process (like command **BRK**), see **FIN**
IN2	Start process (like command **RUN**), see **FIN**
OUT1	Ready signal
OUT2	Coarse flow control (one speed dosing control)
OUT3	Emptying
OUT4	Error

LIV parameters	Function with SFU1
LIV1_ON	Not used
LIV1_OFF	Not used
LIV2_ON	Target weight
LIV2_OFF	Coarse flow disconnection point
LIV3_ON	Tolerance weight +
LIV3_OFF	Tolerance weight -
LIV4_ON	Not used
LIV4_OFF	Maximum start weight

If LIV2_ON is changed than LIV2_OFF:= LIV2_ON x 0.9

Cycles of dosing:

- Start dosing (external input/button/command **RUN**), if the bin is empty, start the time monitoring (**MFT**), deactivate the ready signal (OUT1)
- Tare (if activated with **TAD**>0, switch to NET)
- Start coarse flow (activate OUT2)
- If the weight is equal or above the coarse flow disconnection point then stop the coarse flow (deactivate OUT2)
- Wait for the residual flow time (**RFT**)
- Final measurement: If standstill occurs the filling result will be stored (**FRS**), the total weight (**SUM**) will be calculated and the dosing counter (**NDS**) will be incremented
- If the parameter EPT>0 the output OUT3 will be activated for the emptying time
- Stop the time monitoring (**MFT**), activate the ready signal (OUT1)
- Short message in the display ‘READY’ (for 3 sec.)

The target weight of the dosing process is in the parameter **LIV**2_ON_level

The coarse flow disconnection point is the parameter **LIV**2_OFF_level.

If the dosing result is out of the tolerance (**LIV**3_ON/OFF_level) then the alarm output (OUT4) will be activated. The result is OK if the equation is valid:

LIV3_OFF < = **FRS** < = **LIV**3_ON

If the dosing result (**FRS**) is out of the tolerance the optimization function will change the parameter of the disconnection point (LIV2_OFF_level)

Diff:= LIV2_ON_level – FRS (target weight – dosing result)

Diff1 := Diff * correction factor

LIV2_OFF_Level := LIV2_OFF_Level + Diff1

The correction factor depends:

|Target weight / FRS| * 100	< 2 %	2…4 %	>4 %
Correction factor	0.25	0.5	1.0

If the dosing time exceeds the maximum filling/dosing time (**MFT**) the process stops immediately and the alarm output (OUT4) becomes active.

During the dosing process the **BRK** stops the process immediatly.

The start will not be done if the actual gross weight is above a limit (**LIV**4_OFF_level)

Short description of the application tank weighing control (SFU2):
The goal is to fill a portion into a bin / vessel / bag. This bin / vessel / bag is not connected with the scale. The tank is mounted on the scale.

Digital I/O	Function with SFU2
IN1	Stop process (like command **BRK**), see **FIN**
IN2	Start process (like command **RUN**), see **FIN**
OUT1	Ready
OUT2	Coarse flow control (dosing) / emptying tank
OUT3	Tank filling
OUT4	Error

LIV parameters	Function with SFU2
LIV1_ON	Target filling weight tank
LIV1_OFF	Filling flow disconnection point
LIV2_ON	Target weight dosing (portion weighing)
LIV2_OFF	Coarse flow disconnection point dosing
LIV3_ON	Tolerance weight + dosing
LIV3_OFF	Tolerance weight - dosing
LIV4_ON	Maximum filling weight of the tank
LIV4_OFF	Minimum filling weight of the tank

If LIV2_ON is changed than LIV2_OFF:= LIV2_ON x 0.9

There are three main tasks:
- Filling the tank
- Portion weighing (dosing) from the tank into a bin
- Emptying the tank (for service)

Task filling the tank:

- Deactivate the ready signal (OUT1)
- Start the filling process with the button (see command **BFL**)
  start the time monitoring (**MFT**), switch to gross value monitoring
- Activate the output OUT3
- If the weight is equal or above the target filling weight then stop the filling process (deactivate OUT3)
- Wait for the residual flow time (**RFT**)
- stop the time monitoring (**MFT**),
- Short message in the display ‘READY’ (for 3 sec.) , activate the Ready signal (OUT1)

The target weight of the filling process is in the parameter **LIV1**_ON_level

If the filling time exceeds the maximum filling/dosing time (**MFT**) the process stops immediately and the alarm output (OUT4) becomes active.

During the filling process the **BRK** stops the process immediately.

The start will not be done if the actual gross weight is above a limit (**LIV**4_ON_level = max. tank filling weight)

Task portion weighing (dosing):

- Deactivate the ready signal (OUT1)
- Start dosing (external input/button/command **RUN**),
  start the time monitoring (**MFT**)
- Tare (has to be activated with **TAD**>0), switch to NET value monitoring
- Start coarse flow (activate OUT2)
- If the NET weight is equal or above the coarse flow disconnection point then stop the coarse flow (deactivate OUT2)
- Wait for the residual flow time (**RFT**)
- Final measurement: If standstill occurs the filling result will be stored (**FRS**) the total weight (**SUM**) will be calculated and the dosing counter (**NDS**) will be incremented
- Stop the time monitoring (**MFT**)
- Short message in the display ‘READY’ (for 3 sec.), activate the ready signal (OUT1)

The target weight of the dosing process is in the parameter **LIV**2_ON_level

The coarse flow disconnection point is the parameter **LIV**2_OFF_level.

If the dosing result is out of the tolerance (**LIV**3_ON/OFF_level) then the alarm output (OUT4) will be activated. The result is OK if the equation is valid:

LIV3_OFF < = **FRS** < = **LIV**3_ON

If the dosing result (**FRS**) is out of the tolerance the optimization function will change the parameter of the disconnection point (LIV2_OFF_level)

Diff:= LIV2_ON_level – FRS (target weight – dosing result)

Diff1 := Diff * correction factor

LIV2_OFF_Level := LIV2_OFF_Level + Diff1

The correction factor depends:

|Target weight / FRS| * 100	< 2 %	2…4 %	>4 %
Correction factor	0.25	0.5	1.0

If the dosing time exceeds the maximum filling/dosing time the process stops immediately and the alarm output (OUT4) becomes active.

During the dosing process the **BRK** stops the process immediatly.

The start will not be done if the actual gross weight is below a limit (**LIV**4_OFF_level = minimum filling level tank)

Task emptying the tank (only for service purposes):

- Start the emptying process with the button (see command **BFL**)
  start the time monitoring (**MFT**), switch to gross value monitoring
- Activate the output OUT2
- If the gross weight is equal or below zero or the emptying time (EPT) is expired then stop the process (deactivate OUT2)
- Wait for the residual flow time (**RFT**)
- Stop the time monitoring (**MFT**)
- Short message in the display ‘READY’ (for 3 sec.)

Short description of the application tank weighing control (SFU3):
The goal is to fill a portion into a bin / vessel / bag. This bin / vessel / bag is not connected with the scale. The tank is mounted on the scale.

Digital I/O	Function with SFU3
IN1	Stop process (like command **BRK**), see **FIN**
IN2	Start process (like command **RUN**), see **FIN**
OUT1	Ready
OUT2	Coarse flow control (dosing)
OUT3	Tank filling
OUT4	Emptying the tank

NOTE

The Functions with SFU3 are the same as SFU2. The difference is that the function SFU3 controls the emptying of the tank with a separate output OUT4.

SFU

Scale Function

(Activate filling / dosing function)

Property	Content	Note
Command string	**SFU**	
No. of parameters	1	
Parameter range	P1=0,1,2, 3	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	NO	
Parameter backup	With command **TDD**1	
Input Master	**SFU**(P1);	No response
Query Master	**SFU**?;	
Response WE	P1crlf	P1 = 1 character

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The command activate the filling function:

- SFU0: normal operation (none automatic weighing instrument) for the applications platform scale and process control.
- SFU1: filling function with additive weighing (only filling process)
- SFU2: filling function with subtractive weighing (tank weighing)
- SFU3: filling function with subtractive weighing (tank weighing)

LIV

Limit values
(Limit values switches)

Property	Content	Comment
Command string	**LIV**	
No. of parameters	1	
Parameter range	P1= 1…4, P2=0,1,2, P3=0/1 P4=P5= 0...±99999	
Factory setting	x, 0, 0, 0, 0 for all limit values	deactivated
Response time	< 15 ms	
Password protection	No	
Relevant for legal for trade	No	
Parameter backup	With command **TDD**1	
Master input	**LIV**(P1),<P2>,<P3>,<P4>,<P5>;	No response
Master query	**LIV**(P1)?;	
WE response	P2,P3,P4,P5 crlf	P2,P3= 1 character, P4,5 = each 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The WE contains four limit value switches with selectable hysteresis. These can monitor gross or net measured values. The monitoring speed depends on the set output rate. Monitoring is always implemented, even when there is no communication via the serial interface.

Parameter description:

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

P1: number of the limit value switch (1 …4)

P2: Limit value switch input signal (0,1,2)
0= OFF
1= net measured value
2= gross measured value

P3: logic level (0,1)
0= true (active → terminal signal =low, inactive → terminal signal =high)
1= false (active → terminal signal =high, inactive → terminal signal =low) inverted logic of the output level

P4: Activation level (= ON_Level):
P3=0...±99999

P5: The deactivation level (= OFF_Level)
P4=0...±99999

If the filling / dosing functions are activated (**SFU**>0) than the parameters P2 and P3 will be ignored.

Example: LIV1,2,0,9000,1000;

The command in the example sets limit value 1 (P1=1).

Limit value 1 switches to the gross measured value (P2=2).

Limit value 1 logic is true (P3=0).

Limit value 1 activates at a gross measured value >9000 (P4=9000) and deactivates at a gross measured value <1000 (P5=1000).

RUN

Start dosing

(Start dosing / portion weighing)

Property	Content	Note
Command string	**RUN**	
No. of parameters	1	
Parameter range	0, 1, 2	
Factory default	0	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Input Master	**RUN**(P1);	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command starts the filling or dosing processes:

P1=0 Start portion weighing
P1=1 Start filling the tank (only if **SFU**=2/3)
P1=2 Start emptying the tank (only if **SFU**=2/3)

See description above.

TAD

Tare delay time

(Tare delay time portion weighing / dosing process)

Property	Content	Note
Command string	**TAD**	
No. of parameters	1	
Parameter range	P1=0…99999 [x 100 msec.]	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	NO	
Parameter backup	With command **TDD**1	
Input Master	**TAD**(P1);	No response
Query Master	**TAD**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The resolution of this time parameter is 100 ms. After this delay time the WE perform a tare and switch to NET value display/output.

RFT

Residual flow time

(Residual flow time, filling / dosing process)

Property	Content	Note
Command string	**RFT**	
No. of parameters	1	
Parameter range	P1=0…99999 [x 100 msec.]	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	NO	
Parameter backup	With command **TDD**1	
Input Master	**RFT**(P1);	No response
Query Master	**RFT**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The resolution of this time parameter is 100 ms. If the valve is closed then residual material flows into the tank/bin. So the WE waits this time before the next step will be performed.

MFT

Maximum filling time

(Maximum filling time, filling / dosing process)

Property	Content	Note
Command string	**MFT**	
No. of parameters	1	
Parameter range	P1=0…99999 [x 100 msec.]	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	NO	
Parameter backup	With command **TDD**1	
Input Master	**MFT**(P1);	No response
Query Master	**MFT**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The resolution of this time parameter is 100 ms. If actual process time exceeds this maximum filling time then all outputs (OUT1..3) will be deactivated (stops the process) and the alarm / error will be activated.

EPT

Emptying time

(Emptying time, filling / dosing process)

Property	Content	Note
Command string	**EPT**	
No. of parameters	1	
Parameter range	P1=0…99999 [x 100 msec.]	0=disabled
Factory default	0	
Reaction time	<15 ms	
Password protection	Yes	
Relevant to legal for trade	NO	
Parameter backup	With command **TDD**1	
Input Master	**EPT**(P1);	No response
Query Master	**EPT**?;	
Response WE	P1crlf	P1 = 6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The resolution of this time parameter is 100 ms. If actual time exceeds this maximum emptying time then all outputs will be deactivated (stops the emptying process).

BRK

Break dosing / filling

(Break dosing / filling / emptying processes)

Property	Content	Note
Command string	**BRK**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Reaction time	< 15 ms	
Password protection	No	
Relevant to legal for trade	No	
Parameter backup	-	
Input Master	**BRK**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command stops all processes immediately (deactivate OUT1..4).

FRS

Dosing result

(Dosing result portion weighing)

Property	Content	Comment
Command string	**FRS**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Response time	<15 ms	
Password protection	No	
Relevant for legal for trade	No	
Parameter backup	No data to back up	
Master input	Not possible	
Master query	**FRS?;**	
WE response	X crlf	6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The query **FRS?;** outputs the last dosing result (6 characters without decimal point). The dosing result will be cleared by the command **CSN**. The dosing result is valid until the next final measurement.

NDS

Number of dosing results
(Dosing counter)

Property	Content	Comment
Command string	**NDS**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Response time	<15 ms	
Password protection	No	
Relevant for legal for trade	No	
Parameter backup	No data to back up	
Master input	Not possible	
Master query	**NDS?;**	
WE response	Xxxxxx crlf	6 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The query **NDS?;** outputs the last dosing result (6 characters). The dosing counter will be cleared by the command **CSN**.

SUM

Total weight of dosing results

(Total weight of dosing results)

Property	Content	Comment
Command string	**SUM**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Response time	<15 ms	
Password protection	No	
Relevant for legal for trade	No	
Parameter backup	No data to back up	
Master input	Not possible	
Master query	**SUM?;**	
WE response	Xxxxxxxxx crlf	10 characters

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

The query **SUM?;** outputs the last total weight (9 characters without decimal point). The total weight will be cleared by the command **CSN**.

The total weight will be calculated after the measurement of the dosing result:

SUM := SUM + FRS

CSN

Clear total weight and counters

(Clear total weight and counters)

Property	Content	Comment
Command string	**CSN**	
No. of parameters	-	
Parameter range	-	
Factory default	-	
Response time	<15 ms	
Password protection	No	
Relevant for legal for trade	No	
Parameter backup	No data to back up	
Master input	**CSN**;	No response

Note: ( ) required parameters, < > optional parameters for parameter input

Function:

This command clears the total weight, the dosing counter, the dosing result and the print counter:

SUM: = 0

NDS: = 0

FRS: = 0

PID: = 0

4 Communication examples

4.1 Making settings for bus mode

The WE is able to work with up to 32 modules in a bus. The prerequisite for this is that each WE is connected to the bus by an RS-485 interface driver. Each WE operates as a slave, that is to say, without being prompted by the bus master (e.g. PC or PLC) the WE will remain inactive on its transmission line. The master selects a WE by using the select command, **S...** (**S00...31;**). This is why it is essential, before the bus coupling, to enter a communication address for each WE. Of course, each address in the bus must only be assigned once.

4.2 Connecting WE’s to the bus

There are two possible ways to connect the WEs to the bus:

Connecting WEs to the bus consecutively

1. Connect the first WE to the bus line (factory default:: **ADR31**, baud rate=9600Bd, even)
2. Initialize the master interface at 9600 Bd, 8, e, 1.
3. Use the command **;S31;** to select the WE.
4. Use the **ADR** command to set the required address (e.g. **ADR01;**)
5. Use **;S01;** to select the WE with the new address.
6. Use the command **TDD1;** to store the address power fail safe in the EEPROM.
7. Connect the next WE to the bus, call it with **;S31;**, set **ADR02;**,
8. etc.

All the WE’s are connected to the bus

1. Read off the production numbers of the WEs (7-digit)
   (1^{st} WE: xxxxx, 2^{nd} WE: yyyyy, etc.).
2. Initialize the master interface at 9600Bd, 8, e, 1.
3. Select all the WEs by using the broadcast command **;S98;** .
4. Use the **ADR** command to set the required addresses one after the other
   (e.g. **ADR01**,”xxxxx”; **ADR02**,”yyyyy”; etc.).
5. Use the command **TDD1;** to store the addresses power fail safe in the EEPROM.

NOTE

With **S98;** none of the WEs respond; but each WE executes the command. If there is no communication, either the address or the baud rate are wrong.

Once all the addresses have been set and the baud rate is unified, the bus is ready for operation. Now you must specify how the measured values are to be read out.

4.3 Setting the data output

For data output using the command **MSV?;** the output format must previously have been set in all the modules. To do this, proceed as follows:

1. Enter the broadcast command **;S98;**
   All the WEs execute the command, but do not send a response.
2. Use the **COF** command to specify the output format
   (e.g. COF4; for ASCII output)
3. Use the command **TDD1**; to save the setting power fail safe in the EEPROM.

4.4 Setting the baud rate

The WE can work at different baud rates. The setting can only be changed via the serial interface by using the **BDR** command.
Of course in bus mode, the baud rate of all the connected users must be the same. To make sure that the WEs in a bus are always safely set to the required baud rate on initialization (power-up) of the hardware (in this example 9600 = BR0), proceed as follows:

1. Set the baud rate of the master interface to 9600Bd, 8 data bits, 1 parity bit (even) and 1 stop bit.
2. Output the following commands in the sequence in which they appear below:

   ; Clear the WE input buffer
   S98; Select all the WEs on the bus
   BDR0; Set the required baud rate

   Then wait about 150 ms.
3. Set the baud rate of the master interface to 19200Bd, 8 data bits, 1 parity bit (even) and 1 stop bit.
4. Output the following commands in the sequence in which they appear below:

   ; Clear the WE input buffer
   S98; Select all the WEs on the bus
   BDR0; Set the required baud rate

   Then wait about 150 ms.
5. Set the baud rate of the master interface to 9600Bd, 8 data bits,

   1 parity bit (even) and 1 stop bit.
6. Enter the blank command to clear the input buffer:
   ; Clear the WE input buffer
7. Use the command **TDD1**; to save the settings power fail safe in the EEPROM. .... etc.

NOTE

It is essential to output the semicolon before the command **S98;**, as controlling the WE at different baud rates may result in undefined characters in the WE input buffer. These characters are rejected when the semicolon is received.

With **S98;** none of the WEs respond; but each WE executes the command.

In the example given above, all the WEs on this bus are set to the baud rate 9600Bd, whatever their previous settings.

Of course, it is also possible to set a different baud rate. To do this, provide the required baud rate in the command **BDR** and modify the initialization of the master interface accordingly.

Transfer time at the interface

The baud rate is the speed of transfer of the interface. This does not change the number of measured values that the WE determines every second.

A high baud rate merely allows a greater number of WEs to be queried per time unit in bus mode.

Baud rate	Transfer time for one character
9600	1.1 ms
19200	0.57 ms

With this information, it is possible to roughly estimate the transfer time for a command sequence. To do this, establish the number of characters in the command and multiply it by the transfer time. In addition to this, the WE has a processing time (reaction time) for each command. You will find these times in the individual command descriptions (total time = transfer time + processing time).

4.5 Determining bus occupation (Bus Scan)

It is often useful, each time the bus is enabled or if WE responses are missing, to determine the bus configuration. Use Bus Scan to determine bus address occupation. The prerequisite here is for all the modules to be set to the same baud rate. Carry out the bus scan as follows:

1. Initialize the master interface with the set WE baud rate
2. Scan an address with the following command sequence:
   ;S00; Select address
   ADR?; Query address

   The WE addressed by this address responds with an 00LF If there is no response after about 100ms, there is no WE at this address. If the master receives undefined characters or does nor receive an ?-character, there may be a bus malfunction or multiple address occupation. The bus master must respond accordingly.
3. Repeat Number 2 with the following addresses 01...31.

If there are only a few WEs connected with known addresses, the bus scan can naturally relate to these addresses only. If all the WEs are successfully established as bus users, the WE identification string may be read in (identification = production number).

The time-out setting for the master interface driver is crucial for the speed of the bus scan. The select command needs a maximum 20ms to output at 9600 baud. The WE does not respond to this select command.

4.6 Measurement query in bus mode

In the previous sections of this example, all the WEs have been prepared for bus mode and bus scan has found all the connected WEs. For simple measurement query with the **MSV?;** command, the output format has been set with the **COF** command. Now start the measurement query with the following command sequence:

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

S01; MSV?; the WE with address 01 responds with the measured value

etc.

Master command	Reaction time	Response WE	Note
S00; MSV?;			9 characters
	max 15 ms		
		Xx crlf	4 characters for COF0, or
		xxxx crlf	6 characters for COF3, or
		xxx...xxx crlf	18 characters for COF4

Which results in the following query times, for example:

Baud rate	Output format	Query time measured value for an WE
9600	COF0	28 ms
19200	COF0	22 ms
9600	COF3	30 ms
19200	COF3	25 ms
9600	COF4	45 ms
19200	COF4	31 ms

These times should only be used as a guide.

4.7 Setting a parameter in all the connected WE’s

If the measurement query is executed properly, the parameters can be set in all the WEs connected at the bus. Proceed as follows:

1. Select all the WEs by entering the broadcast command **S98;**
   All the WEs execute the command, but do not send a response.
2. Enter the required parameters.
3. Use the command **TDD1;** to store the parameter power fail safe in the EEPROM.
4. Use **Sii;** to select the next WE, to read control parameters, for example.

This sequence can also be used when taring with the **TAR;** command, for example, or for changing over between gross and net output.

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