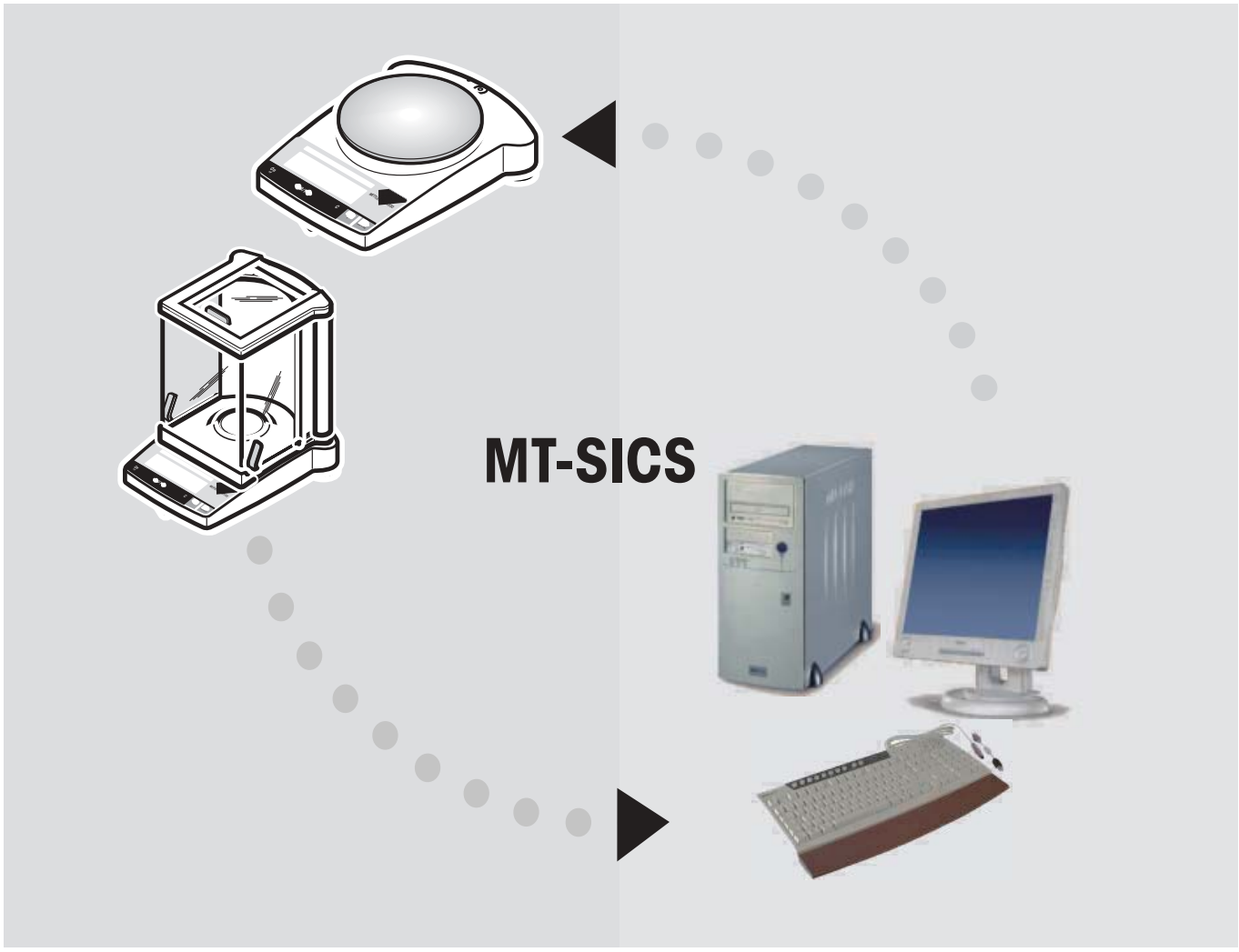
Reference manual

METTLER TOLEDO

METTLER TOLEDO
Standard Interface Command Set
MT-SICS 0 version 2.3x
MT-SICS 1 version 2.2x
MT-SICS 2 version 2.3x for Basic-S (as from Software V 1.20) and for AL/PL/PL-S balances
MT-SICS 3 version 2.2x for Basic-S (as from Software V 1.20) and for AL/PL/PL-S balances



Contents

Overview of all commands

1. Introduction

In weight measurements the demands on the readability and maximum capacity of balances and scales range from less than one microgram up to several hundred tonnes. To meet these and other requirements, METTLER TOLEDO offers an extensive range of balances and scales. Many of the balances and scales used have to be capable of integration in a complex computer or data acquisition system.

To enable you to integrate balances in your system in a simple manner and utilize their capabilities to the full, most balance functions are also available as appropriate commands via the data interface.

Standardization of the commands

All new METTLER TOLEDO balances launched on the market support the standardized command set "METTLER TOLEDO Standard Interface Command Set" (MT-SICS), which is divided into 4 levels, depending on the functionality of the balance:

- MT-SICS level 0 Command set for the simplest balance, e.g. weighing cell.
- MT-SICS level 1 Extension of the command set for standard balances, i.e. balances without integrated applications.
- MT-SICS level 2 Extension of the command set by the commands specific for a balance family, e.g. MT-SICS level 2 for the Basic-S and for AL/PL/PL-S balance line.
- MT-SICS level 3 Application-specific commands as an extension of the command set, e.g. MT-SICS level 3 standard for dynamic weighing or as independent command set, e.g. MT-SICS for dryers.

A particular distinguishing feature of this concept is that the commands combined in MT-SICS level 0 and 1 are identical for all balances. Both the simplest weighing balance and a fully expanded weighing work station recognize the commands of MT-SICS level 0 and 1.
Investigations of various applications have shown that the vast majority of all system solutions can be handled with the commands of MT-SICS level 0 and 1. This means for you: if you restrict yourself to the commands of MT-SICS level 0 and 1, you can expand your system with additional balances from METTLER TOLEDO without having to change your application programs.

What do the commands of MT-SICS level 0 and 1 offer?

You can use the commands of MT-SICS level 0 and 1 to perform the following operations via the interface:

- request weighing results,
- tare the balance and preset the tare weight,
- zero the balance,
- identify MT-SICS implementation,
- identify the balance,
- reset the balance,
- control the display,
- control the keys for operation of the balance.

The commands of MT-SICS level 2

You can naturally use the data interface to exploit all functions available with your current balance or application. These additional functions are collected in the commands of MT-SICS level 2.
When creating your software application, please note that whereas the commands of MT-SICS level 2 have been specially tailored to your balance family.

Additional documentation on data interface

Settings of the interface such as baud rate, number of data bits, parity, handshake protocols and connector pin assignment are described in the operating instructions of the peripheral instrument or cable in question.

Version number of the MT-SICS

Each level of the MT-SICS has its own version number which can be requested with the command I1 from level 0.

This manual describes

MT-SICS level 0, version 2.3x

MT-SICS level 1, version 2.2x

MT-SICS level 2 for Basic-S balances version 2.3x

MT-SICS level 3 for Basic-S balances version 2.2x

You can use the command I1 via the interface to request the MT-SICS level and MT-SICS versions implemented on your balance.
Please make sure that the versions implemented on your balance agree with those listed above.

2. Basic information on data interchange with the balance

Each command received by the balance via the data interface is acknowledged by a response of the balance to the transmitter.
Commands and responses are data strings with a fixed format, and will be described in detail in chapter 3.

2.1 Command formats

Commands sent to the balance comprise one or more characters of the ASCII character set. Here, the following must be noted:

- Enter commands only in uppercase.
- The possible parameters of the command must be separated from one another and from the command name by a space (ASCII 32 dec., in this description represented as ␣).
- The possible input for "text" is a sequence of characters of the 8-bit ASCII character set from 32 dec to 255 dec.
- Each command must be closed by C_RL_F (ASCII 13 dec., 10 dec.).

The characters C_RL_F, which can be inputted using the Enter or Return key of most entry keypads, are not listed in this description, but it is essential they be included for communication with the balance.

Example
Command to balance which writes Hallo into the balance display:

D␣"Hallo" The command terminator C_RL_F is not shown.

Comment

The quotation marks " " must be inserted in the entry.

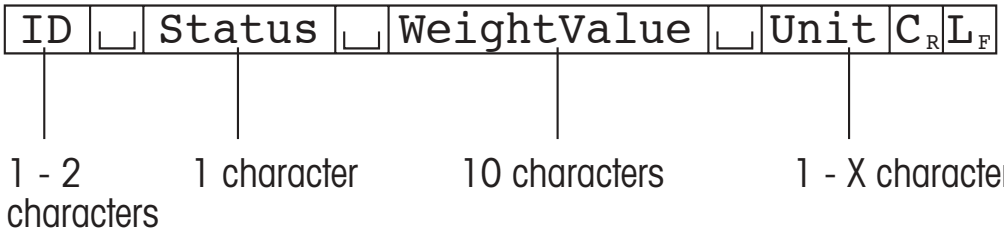
2.2 Response formats

All responses sent by the balance to the transmitter to acknowledge the received command have one of the following formats:

- Response with weight value
- Response without weight value
- Error message

2.2.1 Format of the response with weight value

A general description of the response with weight value is the following.



ID	Response identification.
␣	Space (ASCII 32 dec.).
Status	Status of the balance, see description of the commands and responses.
WeightValue	Weighing result; shown as number with 10 digits, incl. decimal point and sign – directly in front of the first digit if value negative. The weight value appears right-aligned. Preceding zeros are not shown with the exception of the zero to the left of the decimal point. With METTLER TOLEDO DeltaRange balances, outside the fine range the last decimal place is shown as a space.
Unit	Weight unit actually set under unit 1.
C_R	Carriage Return (ASCII 13 dec.).
L_F	Line Feed (ASCII 10 dec.).

Comment

C_RL_F will not be shown in this description.

Examples

Response with stable weight value of 0.256 g:

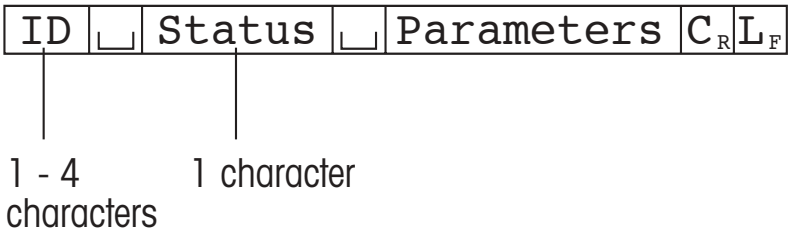
S␣S␣␣␣␣␣␣0.256␣g

Response with stable weight value outside the fine range:

S␣S␣␣␣␣4875.2␣␣g

2.2.2 Format of the response without weight value

A general description of the response without weight value is the following.



ID	Response identification.
␣	Space (ASCII, 32 dec.).
Status	Status of the balance, see description of the commands and responses.
Parameters	Command-dependent response code.
C_R	Carriage Return (ASCII 13 dec.).
L_F	Line Feed (ASCII 10 dec.).

Comment

C_RL_F will not be shown in this description.

Example

Response to D␣"Hallo" when Hallo appears unabridged in the display: D␣A.

2.2.3 Error messages

ID	C_R	L_F

There are three different error messages. The identification always comprises two characters.

ID Error identification
Possible error messages are

ES Syntax error

The balance has not recognized the received command.

ET Transmission error

The balance has received a "faulty" command, e.g. owing to a parity error or interface break.

EL Logical error

The balance can not execute the received command.

C_R Carriage Return (ASCII 13 dec.).

L_F Line Feed (ASCII 10 dec.).

Comment
C_RL_F will not be shown in this description.

2.2.4 Tips for the programmer

Command and response

You can improve the dependability of your application software by having your program evaluate the response of the balance to a command. The response is the acknowledgement that the balance has received the command.

Reset

To be able to start from a determined state, when establishing the communication between balance and system, you should send a reset command to the balance. When the balance or system is switched on or off, faulty characters can be received or sent.

Quotation marks " "

Quotation marks included in the command must always be entered.

3. Commands and responses

The balance receives commands from the system computer and acknowledges the command with an appropriate response.
The following sections contain a detailed description of all commands of the command set in alphabetical order with the associated responses. Commands and responses are closed with C_RL_F. These termination characters are not shown in the following description, but they must always be entered with commands or sent with responses.

3.1 Commands and responses MT-SICS level 0

The commands of MT-SICS level 0 are available with even the simplest balances which support the METTLER TOLEDO Standard Interface Command Set.

I0 – Inquiry of all implemented MT-SICS commands

Command	**I0**	Send list of all implemented MT-SICS commands
Response	**I0 B x1 "1.Command"**	x1 = number of the MT-SICS level where the 1. Command belongs to.
	I0 B x1 "2.Command"	2nd (next) command implemented
	:	
	:	
	I0 A x1 "last Command"	Last command implemented
	I0 I	The list cannot be sent at present as another operation is taking place

Example

Command	**I0**	Send list of commands
Response	**I0 B 0 "I0"**	Level 0 command "I0" implemented
	I0 B 0 "I1"	Level 0 command "I1" implemented
	:	:
	:	:
	:	:
	I0 B 0 "S"	Level 0 command "S" implemented
	:	:
	:	:
	I0 B 0 "Z"	Level 0 command "Z" implemented
	I0 B 0 "@"	Level 0 command "@" (reset) implemented
	I0 B 1 "D"	Level 1 command "D" implemented
	I0 B 1 "DW"	Level 1 command "DW" implemented
	:	:
	:	:
	I0 A 3 I12	(last command)

Comments

- The I0 command lists all commands implemented in the present software. Thus, there is no need of the supplement sheet delivered with the previous versions of this manual.
- All level 0 commands are listed in alphabetical order before all commands of level 1 etc. This order corresponds to the order how the commands are described in this manual.

I1 – Inquiry of MT-SICS level and MT-SICS versions

Command **I1** Inquiry of MT-SICS level and MT-SICS versions.

Response **I1␣A␣"x1"␣"x2"␣"x3"␣"x4"␣"x5"**

x1 = 0	Balance with MT-SICS level 0 (simplest balance)
x1 = 01	Balance with MT-SICS level 0 and 1 (standard balance)
x1= 012	Balance with MT-SICS level 0, 1 and 2 (standard balance with extensions)
x1 = 03	Balance with MT-SICS level 0 and 3 (simplest balance with a special application)
x1 = 013	Balance with MT-SICS level 0, 1 and 3 (standard balance with a special application)
x1 = 0123	Balance with MT-SICS level 0, 1, 2, and 3 (standard balance with extensions and a special application)
x1 = 3	Application device with MT-SICS level 3 (not necessarily a balance)
X2	Version of the implemented MT-SICS0 commands
X3	Version of the implemented MT-SICS1 commands
X4	Version of the implemented MT-SICS2 commands
X5	Version of the implemented MT-SICS3 commands

I1␣I Command understood, not executable at present.

Example

Command **I1** Inquiry of MT-SICS level and versions.

Response **I1␣A␣"01"␣"2.00"␣"2.00"␣""␣""**

01	Level 0/1 implemented
2.00	Level 0, version V2.00
2.00	Level 1, version V2.00

Comments

- In the case of the MT-SICS level, only fully implemented levels are listed. In other words, if it is not possible to implement all commands from a certain level, the level is not specified.
- In the case of the MT-SICS version, all levels are specified even those only partially implemented.

I2 – Inquiry of balance data

Command	**I2**	Inquiry of balance data.
Response	**I2␣A␣"text"**	Balance data as "text".
	I2␣I	Command understood, not executable at present.

Example

Command	**I2**	Inquiry of balance type.
Possible responses	**I2␣A␣"PB8001-S␣Standard␣8109.0␣g"** **I2␣A␣"AB204-S␣Standard␣210.0090␣g"**	

Comments

- With DeltaRange balances, the last decimal place is available only in the fine range.
- The number of characters of "text" depends on the balance type.

I3 – Inquiry of balance SW version and type definition number

Command	**I3**	Inquiry of balance SW version and type definition number.
Responses	**I3␣A␣"text"**	Balance SW version and type definition number as "text".
	I3␣I	Command understood, not executable at present.

Examples

Command	**I3**	Inquiry of SW version number(s) and type definition number.
Response	**I3␣A␣"1.05␣1.1.1.17.7"**	
	1.05	Software version number
	1.1.1.17.7	Type definition number

Comment

The first number (digits prior to the first space in the text string) is the SW version number. The second SW version number is optional, and depends on the balance type. The last number (following the last space) is the type definition number for service purposes.

I4 – Inquiry of serial number

Command	**I4**	Inquiry of serial number.
Responses	**I4␣A␣"text"**	Serial number as "text".
	I4␣I	Command understood, not executable at present.

Example

Command	**I4**	Inquiry of serial number.
Response	**I4␣A␣"0123456789"**	

Comments

- The serial number agrees with that on the model plate and is different for every balance.
- The serial number can be used, for example, as a device address in a network solution.
- The response to I4 appears unsolicited after switching on and after the reset command (@).

I5 – SW-Identification number

Command	**I5**	Inquiry of SW-Identification number.
Responses	**I5␣A␣"x"**	SW-Identification number as Text. x: SW-Identification number.
	I5␣I	Command understood, not executable at present.

Example

Command	**I5**	Inquiry of SW-Identification number.
Response	**I5␣A␣"12345678A"**	SW-Identification number with index.

Comments

- The SW-Identification number is unique for every Software.

S – Send stable weight value

Command	**S**	Send the current stable net weight value.
Response	**S␣S␣WeightValue␣Unit**	Current stable weight value in unit actually set under unit 1.
	S␣I	Command not executable (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.

Example

Command	**S**	Send a stable weight value.
Response	**S␣S␣␣␣␣␣␣100.00␣g**	The current, stable weight value is 100.00 g.

Comments

- The duration of the timeout depends on the balance type.
- To send the stable weight value in actually displayed unit, see 'SU' command in level 2

SI – Send weight value immediately

Command	**SI**	Send the current net weight value, irrespective of balance stability.
Response	**S␣S␣WeightValue␣Unit**	Stable weight value in unit actually set under unit 1.
	S␣D␣WeightValue␣Unit	Nonstable (dynamic) weight value in unit actually set under unit 1.
	S␣I	Command not executable (balance is currently executing another command, e.g. taring).
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.

Example

Command	**SI**	Send current weight value.
Response	**S␣D␣␣␣␣␣␣129.07␣g**	The current weight value is unstable (dynamic) and is 129.07 g.

Comments

- The response to the command SI is the last internal weight value (stable or dynamic) before receipt of the command SI.
- To send weight value immediately in actually displayed unit, see 'SIU' command in level 2

SIR – Send weight value immediately and repeat

Command	**SIR**	Send the net weight values repeatedly, irrespective of balance stability.
Response	**S␣S␣WeightValue␣Unit**	Stable weight value in unit actually set under unit 1.
	S␣D␣WeightValue␣Unit	Nonstable (dynamic) weight value in unit actually set under unit 1.
	S␣I	Command not executable (balance is currently executing another command, e.g. taring).
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.

Example

Command	**SIR**	Send current weight values at intervals.
Response	**S␣D␣␣␣␣␣␣129.07␣g**	
	S␣D␣␣␣␣␣␣129.08␣g	
	S␣S␣␣␣␣␣␣129.09␣g	
	S␣S␣␣␣␣␣␣129.09␣g	
	S␣D␣␣␣␣␣␣114.87␣g	
	…	The balance sends stable or nonstable weight values at intervals.

Comments

- SIR is overwritten by the commands S, SI, SR, @ and hardware break and hence cancelled.
- The number of weight values per second depends on the balance type.
- To send weight value in actually displayed unit, see 'SIRU' command in level 2

Z – Zero

Command	**Z**	Zero the balance.
Response	**Z␣A**	The following then holds: gross = net + tare = 0. Zero setting performed, i.e. stability criterion and zero setting range complied with.
	Z␣I	Zero setting not performed (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).
	Z␣+	Upper limit of zero setting range exceeded.
	Z␣–	Lower limit of zero setting range exceeded.

Example

Command	**Z**	Zero.
Response	**Z␣A**	Zero setting performed.

Comments

- The tare memory is cleared during zero setting.
- The zero point determined during switching on is not influenced by this command, i.e. the measurement ranges remain unchanged.
- The duration of the timeout depends on the balance type.

ZI – Zero immediately

Command	**ZI**	Zero the balance immediately regardless the stability of the balance.
Response	**ZI␣D**	Re-zero performed under non-stable (dynamic) conditions.
	ZI␣S	Re-zero performed under stable conditions.
	ZI␣I	Zero setting not performed (balance is currently executing another command, e.g. taring).
	ZI␣+	Upper limit of zero setting range exceeded.
	ZI␣–	Lower limit of zero setting range exceeded.

Example 1

Command	**ZI**	Zero immediately.
Response	**ZI␣S**	Zero setting performed, weight value was stable.

Example 2

Command	**ZI**	Zero immediately.
Response	**ZI␣D**	Zero setting performed, weight value was dynamic (non-stable).

Comments

- The tare memory is cleared after zero setting.
- The zero point determined during switching on is not influenced by this command, i.e. the measurement ranges remain unchanged.

@ – Reset

Command	@	Resets the balance to the condition found after switching on, but without a zero setting being performed.
Response		
	I4␣A␣"text"	Serial number of the balance, the balance is ready for operation.

Example

Command	@	
Response	**I4␣A␣"1114350697"**	Balance is reset, its serial number is 1114350697.

Comments

- All commands awaiting responses are cancelled.
- Key control is set to the default setting K␣1.
- The tare memory is reset to zero.
- The "reset" command is always executed.
- If the balance is on standby, it is switched on.

3.2 Commands and responses MT-SICS level 1

The commands of MT-SICS level 1 are available with all standard balances which support the METTLER TOLEDO Standard Interface Command Set.

D – Balance display

Write into balance display

Command	**D␣"text"**	Write text into balance display.
Response	**D␣A**	text appears unabridged left-aligned in the balance display marked by a symbol, e.g. *.
	D␣R	The end of the text appears in the balance display, the start is cut off. text is marked by a symbol, e.g. *.
	D␣I	Command not executable.
	D␣L	Command understood, parameter wrong or balance with no display.

Example

Command	**D␣"HALLO"**	Write "HALLO" into the balance display.
Response	**D␣A**	The full text "HALLO" appears in the balance display.

Clear balance display

Command	**D␣""**	Clear balance display.
Response	**D␣A**	Balance display cleared, marked by a symbol, e. g. *.
	D␣I	Command not executable.

Comments

- A symbol in the display, e.g. * indicates that the balance is displaying an invalid weight value.
- The maximum number of characters of "text" visible in the display depends on the balance type.

DW – Weight display (Display show Weight)

Command	**DW**	Switch main display to weight mode.
Response	**DW␣A**	Main display shows the current weight value.
	DW␣I	The command has been understood, but is not executable.

K – Key control

Commands	**K␣1**	When a key is pressed, execute the corresponding function, but do not send.
	K␣2	When a key is pressed, do not execute the corresponding function and send nothing.
	K␣3	When a key is pressed, do not execute the key function, but send the corresponding key code.
	K␣4	When a key is pressed, execute the corresponding function and send its function code. If the corresponding function can not be executed immediately, the function code K␣B␣y for the start of the function and K␣A␣y or K␣I␣y for the end of the function are sent. This behavior applies to taring, zeroing, calibrating, testing, printing, etc. If a function may not be executed, the function code K␣I␣y is sent.
Response	**K␣A**	Key control command understood and successfully executed.
	K␣I	Key control command understood but not executable at present, e.g. balance actually in menu or input mode.
	K␣L	Key control command understood, but command parameter wrong.

Response when **K␣3** is active

	K␣C␣x	Key x was pressed briefly or key x was released after more than 2 seconds.
	K␣R␣x	Key x was pressed and held for around 2 seconds. This response repeats every 2 seconds as long as key x remains pressed.
		The keys are coded as follows:
		↺/F x = 1
		-> 0/T <- and On/Off: x = 3
		⮆ and Menu: x = 4
		1/10d x = 2

Example with an activated K␣3 command:

K␣R␣4	Key 4 was pressed and held around 2 seconds.
K␣C␣4	Key 4 was released.

Response when **K␣4** is active

K␣A␣y	Function y was released by pressing the correspondent key and successfully executed.
K␣I␣y	Function y was released by pressing the correspondent key, but it could not be successfully executed, e.g. calibration was aborted by user.
K␣B␣y	Function y was released and started, the execution needs time to complete. These functions are marked with an asterix (*). After this response, either K␣A␣y or K␣I␣y follows.

The balance functions are coded as follows:

Calibration*	y = 0
tare/re-zero*	y = 2
Data transfer to printing device*	y = 3
Enter menu	y = 4
Quit menu and save parameters	y = 5
Quit menu without saving	y = 6
Standby (instrument can be switched on with reset command)	y = 9
Switch weight unit	y = 10
Set factory setting	y = 12

Command	**K␣4**	When a key is pressed, execute the corresponding function and send the function code as an acknowledgement.
Responses	**K␣A**	Each time a key is pressed, immediate acknowledgement with the corresponding function code will be sent.
	K␣B␣1	The taring function has been started -> taring active.
	K␣A␣1	Taring completed successfully.
	K␣B␣1	The taring function has been started -> taring active.
	K␣I␣1	Taring not completed successfully, taring aborted.

Comments

- K␣1 is the factory setting (default value).
- K␣1 active after balance switched on and after the reset command
- Only one K command is active at any one time.
- A distinction must be made between key code K␣3 and function code K␣4. The key code is specific to the balance type, the function code corresponds to the above table.

SR – Send weight value on weight change (Send and Repeat)

Command **SR␣PresetValue␣Unit**

Send the current stable weight value and then continuously after every weight change greater or equal to the preset value a nonstable (dynamic) value followed by the next stable value, range = 1d to max. load.

SR If no preset value is entered, the weight change must be at least 12.5 % of the last stable weight value, minimum = 30d.

Response **S␣S␣WeightValue␣Unit**

Current, stable weight value in unit actually set under until 1.

Weight change.

S␣D␣WeightValue␣Unit

Dynamic weight value in unit actually set under until 1.

S␣S␣WeightValue␣Unit

Next stable weight value in unit actually set under until 1.

S␣I Command not executable (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).

S␣L Command understood, parameter wrong.

S␣+ Balance in overload range.

S␣– Balance in underload range.

Example

Command	**SR␣10.00␣g**	Send the current stable weight value followed by every load change ≥ 10 g.
Response	**S␣S␣␣␣␣␣100.00␣g**	Balance stable.
	S␣D␣␣␣␣␣115.23␣g	100.00 g loaded.
	S␣S␣␣␣␣␣200.00␣g	Balance again stable.

Comments

- SR is overwritten by the commands S, SI, SIR, @ and hardware break and hence cancelled.
- If, following a nonstable (dynamic) weight value, stability has not been reached within the timeout interval, the response "S␣I" is sent and then a nonstable weight value. Timeout then starts again from the beginning.
- The preset value must be entered in unit actually set under until 1.

T – Tare

Command	**T**	Tare, i.e. store the next stable weight value as a new tare weight value.
Response	**T␣S␣WeightValue␣Unit**	Taring performed, i.e. stability criterion and taring range complied with. The tare weight value returned corresponds to the weight change on the balance in the unit actually set under unit 1 since the last zero setting.
	T␣I	Taring not performed (balance is currently executing another command, e.g. zero setting, or timeout as stability was not reached).
	T␣+	Upper limit of taring range exceeded.
	T␣–	Lower limit of taring range exceeded.

Example

Command	**T**	The balance is tared and has a value of 100.00 g in the tare memory.
Response	**T␣S␣␣␣␣␣100.00␣g**	

Comments

- The tare memory is overwritten by the new tare weight value.
- The duration of the timeout depends on the balance type.
- The function of the combined tare and zero setting key corresponds to the zero setting (Z) command of the interface.
- Clearing tare memory: see command TAC.
- Unit 1 is the weight unit displayed after the balance has been switched on.

TA – Inquiry/presetting of tare weight value

Inquiry of tare weight value

Command **TA** Inquiry of the tare weight value.

Response **TA␣A␣TareWeightValue␣Unit**

Current tare weight value in unit actually set under until 1.

TA␣I Current tare weight value can not be transfered at present as another operation is taking place.

Setting of tare preset value

Command **TA␣TarePresetValue␣Unit**

Entry of a tare preset value in unit actually set under unit 1.

Response **TA␣A␣WeightValue␣Unit**

Entry accepted, returned value rounded to actual readability. The balance display shows the net value referred to the inputted tare value.

TA␣I Taring not performed (balance is currently executing another command, e.g. zero setting, or timeout as stability was not reached).

TA␣L Command understood, parameter wrong.

Example

Command **TA␣100.00␣g** Tare.

Response **TA␣A␣␣␣␣␣100.00␣g** The balance has 100.00 g in the tare memory.

Comments

- The tare memory will be overwritten by the preset tare weight value.
- The inputted tare value will be automatically rounded by the balance to the current readability.
- The preset value must be entered in the unit actually set under unit 1.
- The taring range is specified to the balance type.

TAC – Clear tare value

Command	**TAC**	Clear tare value.
Response	**TAC␣A**	Tare value cleared, 0 is in the tare memory.
	TAC␣I	Command not executable (balance is currently executing another command, e.g. zero setting, or timeout as stability was not reached).

TI – Tare Immediately

Command	**TI**	Tare immediately, i.e. store the current weight value, which can be stable or non stable (dynamic), as tare weight value.
Response	**TI␣S␣WeightValue␣Unit**	Taring performed, stable tare value. The new tare value corresponds to the weight change on the balance since the last zero setting.
	TI␣D␣WeightValue␣Unit	Taring performed, non-stable (dynamic) tare value.
	TI␣I	Taring not performed (balance is currently executing another command, e.g. zero setting).
	TI␣L	The command is not executable, e.g. certified version of balance.
	TI␣+	Upper limit of taring range exceeded.
	TI␣–	Lower limit of taring range exceeded.

Example

Command	**TI**	Tare immediately.
Response	**TI␣D␣␣␣␣␣␣117.57␣g**	The tare memory holds a non-stable (dynamic) weight value.

Comments

- The tare memory will be overwritten by the new tare weight value.
- After a non-stable (dynamic) stored tare weight value, a stable weight value can be determined. However, the absolute value of the stable weight value determined in this manner is not accurate.
- The stored tare weight value is sent in the unit actually set under unit 1.
- The taring range is specified to the balance type.

3.3 Commands and responses MT-SICS level 2 for Basic-S and for AL/PL/PL-S

The commands of MT-SICS level 2 are supported by all Basic-S and for AL/PL/PL-S balances.

C0 – Inquiry/setting of calibration setting

Inquiry of calibration setting

Command **C0** Inquiry of the calibration setting.

Response **C0␣A␣x1␣x2␣"WeightValue␣Unit"**

Weight value and unit specify the value of the weight for an external calibration requested from the user via the display (see command C2). The unit corresponds to the factory setting of unit 1, e.g. gram (g) with standard balances or carat (ct) with carat balances respectively.

With internal calibration, neither weight value nor unit appears.

x1 Calibration mode

x1=0 Mode = Manual
The calibration can only be triggered manually.
A change in the ambient conditions has no influence on the initiation of the calibration procedure.

x1=1 Mode = Auto, status display AutoCal or Cal not activated.
The sensors built into the balance monitor the ambient conditions; however, the change is so small that a calibration is not necessary.

x1=2 Mode = Auto, status display "AutoCal" or "Cal" flashes.
The sensors built into the balance have determined a considerable change in the ambient conditions. The balance requests a calibration or at least a test (see "TST" command).

x2 Calibration weight

x2=0 Internal weight (factory setting)

x2=1 External weight
The current value of the external weight can be seen in the menu of the balance under "Calibration" (see Operating instructions).

C0␣I The calibration status and the current setting of the calibration can not be transferred at present as another operation is taking place.

Example

Command **C0** Inquiry of status and setting of the calibration.

Response **C0␣A␣2␣1␣"␣␣␣100.000␣g"**

Current setting of mode is "Auto".
The ambient conditions of the balance have changed so much that the balance requests a calibration (x1=2) with the external weight (x2=1).
For a calibration initiated with the command C2, a weight of 100.000 g is needed.

Setting the calibration setting

Command **C0␣x1␣x2** Set calibration setting.

x1	**Calibration mode**
x1=0	Mode = Manual A change in the ambient conditions has no influence on the initiation of the calibration procedure.
x1=1	Mode = Auto, the sensors built into the balance monitor the ambient conditions. When a considerable change in the ambient conditions is determined, the status display AutoCal or Cal will be activated; this means the balance will ask for calibration.

x2	**Calibration weight**
x2=0	Use internal weight (factory setting)
x2=1	Use external weight The current value of the external weight can be seen in the menu of the balance under "Calibration" (see Operating instructions.

Response **C0␣A** Calibration setting set.

C0␣L Calibration setting can not be set, e.g. parameter wrong or certified version of the balance or no internal calibration weight.

C0␣I Commend not executable as the balance is, e.g. being tared.

Example

Command **C0␣0␣1** Set calibration setting to manual and external.

Response **C0␣A** Calibration setting set.

Comments

- Setting x1=1 and x2=0 corresponds to the menu setting "FACT" under "Calibration".
- For balances without internal calibration weight, only x1=0 and x2=1 is possible.

C1 – Initiate calibration according to current setting

Command	**C1**	Start calibration in the current setting.
First response	**C1␣B**	The calibration procedure has been started. Wait for second response (see Comment)
	C1␣I	A calibration can not be performed at present as another operation is taking place. No second response follows.
	C1␣L	Calibration operation not possible, e.g. with certified balance. No second response follows.
Further responses	**C1␣"text"**	Weight request with external calibration.
	C1␣A	Calibration has been completed successfully.
	C1␣I	The calibration procedure was aborted as, e.g. stability not attained or wrong weights loaded.

Example

Command	**C1**	Start calibration.
Response	**C1␣B**	Calibration operation started.
	C1␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	C1␣"␣␣␣2000.00␣g"	Prompt to load calibration weight 2000.00 g.
	C1␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	C1␣A	Calibration completed successfully.

Comment

Commands sent to the balance during the calibration operation are not processed and responded to in the appropriate manner until the calibration is at an end.

C2 – Initiate calibration with external weight

Command	**C2**	Initiate external calibration. Inquiry of the weight used by means of the CO command.
First response	**C2␣B**	The calibration procedure has been started.
	C2␣I	A calibration can not be performed at present as another operation is taking place. No second response follows.
	C2␣L	Calibration operation not possible, e.g. as a calibration with an external weight is not admissible (certified balance). No second response follows.
Further responses	**C2␣"text"**	Prompt to unload or load the balance.
	C2␣A	Calibration has been completed successfully.
	C2␣I	The calibration procedure was aborted as, e.g. stability not attained or wrong weight loaded.

Example

Command	**C2**	Start calibration.
Response	**C2␣B**	Calibration operation started.
	C2␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	C2␣"␣␣␣2000.00␣g"	Prompt to load calibration weight 2000.00 g.
	C2␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	C2␣A	Calibration completed successfully.

Comment

Commands sent to the balance during the calibration operation are not processed and responded to in the appropriate manner until the calibration is at an end.

C3 – Initiate calibration with internal weight

Command	**C3**	Initiate internal calibration.
First response	**C3␣B**	The calibration procedure has been started. Wait for second response.
	C3␣I	A calibration can not be performed at present as another operation is taking place. No second response follows.
	C3␣L	Calibration operation not possible, e.g. as internal weight missing. No second response follows.
Further responses	**C3␣A**	Calibration has been completed successfully.
	C3␣I	The calibration was aborted as, e.g. stability not attained or the procedure was aborted with the C key.

Example

Command	**C3**	Initiate internal calibration.
Response	**C3␣B**	Calibration operation started.
	C3␣A	Calibration completed successfully.

Comment

Commands sent to the balance during the calibration operation are not processed and responded to in the appropriate manner until the calibration is at an end.

I11 – Balance type

Command	**I11**	Inquiry of model designation of the balance.
Response	**I11␣A␣"text"**	"text" represents the model designation.
	I11␣I	The model designation can not be transfered at present as another operation is taking place.

Example

Command	**I11**	Inquiry of model designation of the balance.
Response	**I11␣A␣"PB3002-S"**	The balance is a PB3002-S.

Comment

A sequence of maximum 20 characters is possible as "text".

PWR – Power on/off

Command	**PWR␣x**	Switch balance on or off. x = 0 Set balance to standby mode. x = 1 Switch balance on.
Response	**PWR␣A**	Balance has been switched off successfully
	PWR␣A **I4␣A␣"text"**	Balance with the serial number according to text has been switched on succesfully (see also I4 command).
	PWR␣I	Command not executable as the balance is, e.g. being tared.
	PWR␣L	Command understood, parameter wrong

Comment

If balance is powered by battery, a PWR␣0 will switch off the balance completely (not only standby), so it is not possible to communicate with the balance until it is switched on by key again.

SNR – Send stable weight value and repeat after each deflection

Command **SNR␣PresetValue␣Unit**

Send current stable weight value in Unit 1 and repeat after each deflection greater or equal to the preset value (see Comment).

Response **S␣S␣WeightValue␣Unit**

Current stable weight value (1. value)

S␣S␣WeightValue␣Unit

: Next stable weight value after preset deflection (2 value) etc.

:

S␣I	Command not executable (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).
S␣L	Command understood, parameter wrong
S␣+	Balance in overload range.
S␣–	Balance in underload range.

Example

Command **SNR␣50␣g**

Response **S␣S␣␣␣␣␣␣12.34␣g**

S␣S␣␣␣␣␣␣67.89␣g

Comment

The preset value is optional. If no value is defined, the deflection limit depends on balance readability as follows:

readability	min. deflection
0.01 mg	0.01 g
0.1 mg	0.1 g
0.001 g	1 g
0.01 g	1 g
0.1 g	1 g
1 g	5 g

SNRU – Send stable weight value with currently displayed unit and repeat after each deflection

Command **SNRU␣PresetValue␣Unit**

As the SNR command, but with currently displayed unit.

Response **S␣S␣WeightValue␣Unit**

Current stable weight value (1. value)

S␣S␣WeightValue␣Unit

: Next stable weight value after preset deflection (2 value) etc.

:

S␣I	Command not executable (balance is currently executing another command, e.g. taring, or timeout as stability was not reached).
S␣L	Command understood, parameter wrong
S␣+	Balance in overload range.
S␣–	Balance in underload range.

Example

Command **SNRU␣50␣g**

Response **S␣S␣␣␣␣␣␣12.34␣g**

S␣S␣␣␣␣␣␣67.89␣g

Comment

The preset value is optional. If no value is defined, the deflection limit depends on balance readability as follows:

readability	min. deflection
0.01 mg	0.01 g
0.1 mg	0.1 g
0.001 g	1 g
0.01 g	1 g
0.1 g	1 g
1 g	5 g

ST – Send stable weight value after pressing ⇨ (transfer) key

Inquiry of the status

Command	**ST**	Inquiry of actual status of the ST function.
Responces	**ST␣A␣0**	Function inactive, no weight value is sent when ⇨ (transfer key) is pressed.
	ST␣A␣1	Function active, weight value is sent each time when ⇨ (transfer key) is pressed.
	ST␣I	The current status can not be transfered at present as another operation is taking place.

Set ST function

Command	**ST␣1**	Send the current stable net weight value each time when ⇨ (transfer key) is pressed (see "S" command with MT-SICS level 0).
Responces	**ST␣0**	Stop sending weight value when transfer key is pressed.
	ST␣A	Command understood and successfully executed.
	ST␣I	Command understood, but not executable at present, e.g. balance is currently executing another function.
	ST␣L	Command understood, parameter wrong.

Example

Command	**ST␣1**	Activate ST function
Responces	**ST␣A**	Command executed When ⇨ (transfer key) is pressed:
	S␣S␣␣␣␣␣123.456␣g	Current net weight is 123.456g.

Comment

- ST␣0 is the factory setting (default value).
- ST function is not active after switching on and after the reset command.

SU – Send stable weight value with currently displayed unit

Command	**SU**	As the "S" command, but with currently displayed unit.
Response	**S␣S␣WeightValue␣Unit**	Command executed.
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.
	S␣I	Command not executable as balance is, e.g. being tared.

Example

Command **SU**

Response **S␣S␣␣␣␣␣␣12.34␣lb**

SIU – Send weight value with currently displayed unit immediately

Command	**SIU**	As the "SI" command, but with currently displayed unit.
Response	**S␣S␣WeightValue␣Unit**	Command executed, stable.
	S␣D␣WeightValue␣Unit	Command executed, dynamic.
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.
	S␣I	Command not executable as balance is, e.g. being tared.

Example

Command **SIU**

Response **S␣D␣␣␣␣␣␣12.34␣lb**

SIRU – Send weight value with currently displayed unit immediately and repeat

Command	**SIRU**	As the "SIR" command, but with currently displayed unit.
Response	**S␣S␣WeightValue␣Unit**	Command executed.
	S␣D␣WeightValue␣Unit	Command executed.
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.
	S␣I	Command not executable as balance is, e.g. being tared.

Example

Command	**SIU**
Response	**S␣D␣␣␣␣␣␣12.34␣lb**

SRU – Send stable weight value with currently displayed unit after deflection

Command	**SRU**	As the "SR" command, but with currently displayed unit.
	SRU␣WeightValue␣Unit	
Response	**S␣S␣WeightValue␣Unit**	Command executed.
	S␣D␣WeightValue␣Unit	Deflection.
	S␣+	Balance in overload range.
	S␣–	Balance in underload range.
	S␣I	Command not executable as balance is, e.g. being tared

Example

Command	**SRU**
Response	**S␣S␣␣␣␣␣␣12.34␣lb**
	S␣D␣␣␣␣␣␣13.88␣lb
	S␣S␣␣␣␣␣␣15.01␣lb

TSTO – Inquiry/setting of the test function

Inquiry of the test function setting

Command	**TSTO**	Inquiry of the setting for the test function.	
Responses	**TSTO␣A␣x␣"WeightValue␣Unit"**		
		x=0	The internal weight is used for the test.
		x=1	The external weight is used for the test.
		Weight value␣Unit	Value of the external weight currently set that is requested in the test from the balance user via the display.
	TSTO␣I	The current setting of the test function can not be transferred at present as another operation is taking place.	

Set test configuration

Command	**TSTO␣x**	Set test configuration of the balance. x = 0 Test with internal weight. x = 1 Test with external weight.
Responses	**TSTO␣A**	Test configuration set.
	TSTO␣L	Wrong parameter or no internal calibration weight.
	TSTO␣I	Command not executable as the balance is, e.g. being tared.

Example

Command	**TSTO**	Inquiry of current setting for the test and the value of the external test weight.
Response	**TSTO␣A␣1␣""**	The current setting corresponds to the test with an external weight. For a test initiated with the TST2 command (see below), an external weight of 2000.00 g is needed.

Comments

- There is no possibility to set the test weight, therefore the weight value is empty.
- With an internal test, no weight value appears.

TST1 – Initiate test function in the current setting

Command	**TST1**	Start test function in the current setting.
First response	**TST1␣B**	The test procedure has been started. Wait for next response (see Comment).
	TST1␣I	The test function can not be executed at present as another operation is taking place. No second response follows.
	TST1␣L	Test not possible. No second response follows.
Further responses	**TST1␣"text"**	Prompt to unload and load the balance.
	TST1␣A␣"WeightValue␣Unit"	Test procedure completed successfully. Value with unit corresponds to the measured test weight. No unit is specified if the test has been performed with the internal weight.
	TST1␣I	The test procedure has been aborted as, e.g. stability was not attained or wrong weights were loaded.

Comment

Commands sent to the balance during the test procedure are not processed and responded to in the appropriate manner until the test procedure is at an end.

TST2 – Initiate test function with external weight

Command	**TST2**	Start test function with external weight. Inquiry of the weight used by means of the TST command (see above).
First response	**TST2␣B**	The test procedure has been started. Wait for next response (see Comment).
	TST2␣I	The test function can not be executed at present as another operation is taking place. No second response follows.
	TST2␣L	Test not possible. No second response follows.
Further responses	**TST2␣"text"**	Prompt to unload and load the balance.
	TST2␣A␣"WeightValue␣Unit"	Test procedure completed successfully. Weight value with unit corresponds to the measured test weight.
		The test procedure has been aborted as, e.g. stability was not attained or wrong weights were loaded.

Example

Command	**TST2␣I**	Initiate test with external weight.
Response	**TST2␣B**	The test procedure could be started.
	TST2␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	TST2␣"Load"	Prompt to load the test weight.
	TST2␣"␣␣␣␣␣␣0.00␣g"	Prompt to unload the balance.
	TST2␣A␣"␣␣␣␣␣␣100.01␣g"	External test completed successfully.

Comment

Commands sent to the balance during the test procedure are not processed and responded to in the appropriate manner until the test procedure is at an end.

TST3 – Initiate test function with internal weight

Command	**TST3**	Start test function with built-in weight.
First response	**TST3␣B**	The test procedure has been started. Wait for next response (see Comment).
	TST3␣I	The test function can not be executed at present as another operation is taking place. No second response follows.
	TST3␣L	Test not possible. No second response follows.
Further responses	**TST3␣A␣"WeightValue"**	
	TST3␣I	Test procedure completed successfully.
		Value corresponds to the deviation from the value of the internal weight.
		The test procedure has been aborted as, e.g. stability was not attained or wrong weights were loaded.

Example

Command	**TST3**	Initiate test with internal weight.
Response	**TST3␣B**	The test procedure could be started.
	TST3␣A␣"␣␣␣␣␣␣0.01"	
		The difference to the specified value is 0.01.

Comment

The commands received immediately after the first response are not processed and responded to in the appropriate manner until after the second response.

M01 – Inquiry/setting of weighing mode

Command	**M01**	Inquiry of weighing mode.
Response	**M01␣A␣x**	x: Weighing 0 = normal weighing 1 = dosing 3 = robust / checkweighing
	M01␣L	Parameters are missing, the command can thus not be executed.
	M01␣I	Command not executable.
Command	**M01␣x**	Setting of weighing mode. See Inquiry.
Response	**M01␣A**	Command executed.
	M01␣L	Parameters wrong (value range, …).
	M01␣I	Command not executable.
Example	**M01 0 → M01 A**	Setting of weighing mode to normal.

M02 – Inquiry/setting of environment

Command	**M02**	Inquiry of environment.
Response	**M02␣A␣x**	x: environment 0 = very stable 2 = standard 4 = very unstable
	M02␣L	Parameters are missing, the command can thus not be executed.
Command	**M02␣I**	Command not executable.
	M02␣x	Setting of environment. See Inquiry.
Response		
	M02␣A	Command executed.
	M02␣L	Parameters wrong (value range, …).
Example	**M02␣I**	Command not executable.
	M02 1 → M02 A	Switching on environment.

M03 – Inquiry/setting of AutoZero

Command	**M03**	Inquiry of AutoZero.
Response	**M03 A x**	x: Weighing 0 = AutoZero is switched off 1 = AutoZero is activated
	M03 L	Parameters are missing, the command can thus not be executed.
	M03 I	Command not executable.
Command	**M03 x**	Setting of AutoZero. See Inquiry.
Response	**M03 A**	Command executed.
	M03 L	Parameters wrong (value range, …).
	M03 I	Command not executable.
Example	**M03 1 → M03 A**	Switching on AutoZero function.

M21 – Inquiry/setting of unit

Command	**M21**	Inquiry of unit.
Response	**M21 B Des Unit**	Des: Designation of unit 0 = unit 1, to MT-SICS
	M21 A Des Unit	1 = Display unit
		Unit: 0 = g 1 = kg 2 = t 3 = mg 4 = microgram 5 = carat 6 = Newton 7 = pounds 8 = ounces 9 = troy ounces 10 = grain 11 = penny weight 12 = Momme 13 = Mesghal 14 = Tael Hong Kong 15 = Tael Singapore 16 = Tael Taiwan 17 = Tical 18 = tola 19 = baht
	M21 L	Parameters are missing, the command can thus not be executed.
	M21 I	Command not executable.

Command	**M21␣Des␣Unit**	Setting of unit(s). See Inquiry.
Response	**M21␣A**	Command executed.
	M21␣L	Parameters wrong (value range, …).
	M21␣I	Command not executable.

Examples

M21 0 1 → **M21 A**

Setting of unit 1 to "kg".

M21 → **M21 B 0 1**

Inquiry of unit, unit 1 = "kg".

→ **M21 A 1 5**

Inquiry of unit, unit 2 = "ct".

Comments

- All S commands are given in Unit 1 according to the definition of the MT-SICS.
- You can only select units that can be changed in the menu.

M25 – Inquiry of application selection

Command	**M25**	Inquiry of application selection.
Response	**M25 B No "Name"** **M25 B …**	No: Number of application
	M25 A No "Name"	Name: Name of application
	M25 L	Parameters are missing, the command can thus not be executed.
	M25 I	Command not executable.

Examples

```
M25     → M25 B 1 "Weighing"
          M25 B 2 "…"
              : :
          M25 A 6 "Dynamicweighing manual"
```

M26 – Inquiry/setting of current application

Command	**M26**	Inquiry of actual current application.
Response	**M26 A x**	x: Number of application
	M26 L	Parameters are missing, the command can thus not be executed.
	M26 I	Command not executable.
Command	**M26 x**	Setting application number. x: Number according to appl. list (command M25).
Response	**M26 A**	Command executed.
	M26 L	Parameters wrong (value range, …).
	M26 I	Command not executable.

Example

```
M26 3   → M26 A
```

Application 3 is activated.

Comment

Application number: Number of the application according to the application list (command M25).

M29 – Inquiry/setting of value release

Command	**M29**	Inquiry of value release.
Response	**M29␣A␣x**	x: value release 0 = very stable 2 = standard 4 = very unstable
	M29␣L	Parameters are missing, the command can thus not be executed.
	M29␣I	Command not executable.
Command	**M29␣x**	Setting of value release. See inquiry.
Response	**M29␣A**	Command executed.
	M29␣L	Parameter wrong (value range, …).
	M29␣I	Command not executable.

Example **M29 3** → **M29 A**

Setting of value release to "reliable".

3.4 Commands and responses MT-SICS level 3 for Basic-S and for AL/PL/PL-S

The commands of MT-SICS level 3 Basic-S standard are supported by the standard version of all Basic-S and for AL/PL/PL-S balances, see also response to the I2 command from MT-SICS level 0.

SM0 – Cancel SM2 and SM3 commands

Requirement

The SM0 command can be used only if the application "Dyn A" or "Dyn M" has been activated in the menu.

Command	**SM0**	Cancel the standby for the automatic start of a dynamic weighing activated by the SM2 and SM3 commands.
Response	**SM0␣A**	Standby for the automatic start has been cancelled.
	SM0␣I	The command can not be executed at present as another operation is taking place.
	SM0␣L	The application "Dyn A" or "Dyn M" is not set, the command can thus not be executed.

SM1 – Start dynamic weighing immediately and transfer a result

Requirement		The SM1 command can be used only if the application "Dyn A" or "Dyn M" has been activated in the menu.
Command	**SM1**	Balance immediately starts a dynamic weighing and transfers the result after elapse of the weighing time (WeighTime).
	SM1␣A	The dynamic weighing has been started, wait for second response. During the weighing operation, i.e. until the second response, no further commands can be executed.
First response	**SM1␣I**	The command can not be executed at present as another operation is taking place (e.g. dynamic weighing in progress). No second response follows.
	SM1␣L	The application "Dyn A" or "Dyn M" is not set, the command can thus not be executed. No second response follows.
Second response	**SM␣*␣WeightValue␣Unit**	Weight value corresponds to the mean value of all measured values determined by the balance during the weighing time. The unit corresponds to the current weight unit in the display.
	SM␣I	The dynamic weighing has been aborted, e.g. with the "C" key.
	SM␣+	Abort, overload during the integration.
	SM␣–	Abort, underload during the integration.

Example

Command	**SM1**	Start a weighing immediately and transfer the result.
Response	**SM1␣A**	Command understood, result follows.
	SM␣*␣␣␣␣␣␣␣23.76␣g	Result of the dynamic weighing is 23.76 g.

Comments

- The balance does not perform stability or plausibility checks for the start.
- Initiation of start via the weight change can be implemented by first activating an SR or SIR command and evaluating the weighing results.
- With the TI and SM1 commands, the balance can be used in unstable surroundings in which stable results are no longer achieved (e.g. in fume cupboards with powerful ventilation).

SM2 – Start dynamic weighing and transfer a result

Requirement The SM2 command can be used only if the application "Dyn A" or "Dyn M" has been activated in the menu.

Command	**SM2**	Balance starts a dynamic weighing after the minimum load is exceeded and transfers the result via the interface after elapse of the weighing time.
First response	**SM2␣A**	The dynamic weighing has been started, wait for second response. During the weighing operation, i.e. until the second response, no further commands can be executed.
	SM2␣I	The command can not be executed at present as another operation is taking place (e.g. dynamic weighing in progress). No second response follows.
	SM2␣L	The application "Dyn A" or "Dyn M" is not set, the command can thus not be executed. No second response follows.
Second response	**SM␣*␣WeightValue␣Unit**	Weight value corresponds to the mean value of all measured values determined by the balance during the weighing time. The unit corresponds to the current weight unit in the display.
	SM␣I	The dynamic weighing has been aborted, e.g. with the "C" key.
	SM␣+	Abort, overload during the integration.
	SM␣–	Abort, underload during the integration.

Example

Command	**SM2**	Start a dynamic weighing after minimum load "MinWeight" exceeded and transfer the result.
Response	**SM2␣A**	Command understood, result follows.
	SM␣*␣␣␣␣␣␣␣24.30␣g	Result of the dynamic weighing is 24.30 g.

Comments

- The SM2 command can be active at the same time as the other send commands (SI, SIR).
- The single start standby is cancelled by the SM0 and @ commands before start of the weighing.

SM3 – Start dynamic weighing, transfer result and repeat

Requirement		The SM3 command can be used only if the application "Dyn A" or "Dyn M" has been activated in the menu.
Command	**SM3**	Balance starts a dynamic weighing automatically after the set minimum load is exceeded and transfers the result via the interface after elapse of the weighing time. The renewed start standby is restored each time the weight drops below the weight value "MinWeight".
First response	**SM3␣A**	The dynamic weighing has been started, wait for second response. During the weighing operation, i.e. until the second response, no further commands can be executed.
	SM3␣I	The command can not be executed at present as another operation is taking place (e.g. dynamic weighing in progress). No second response follows.
	SM3␣L	The application "Dyn A" or "Dyn M" is not set, the command can thus not be executed. No second response follows.
Second response	**SM␣*␣WeightValue␣Unit**	Weight value corresponds to the mean value of all measured values determined by the balance during the weighing time. Unit corresponds to the current weight unit in the display. Further results follow when the start condition is again met.
	SM3␣I	The dynamic weighing has been aborted, e.g. with the "C" key.
	SM␣+	Abort, overload during the integration.
	SM␣–	Abort, underload during the integration.

Example

Command	**SM3**	Start a dynamic weighing when weight drops below the minimum load "MinWeight", transfer the result and repeat the process.
Response	**SM3␣A**	Command understood, results follows.
	SM␣*␣␣␣␣␣␣␣25.83␣g	Result of the first dynamic weighing is 25.83 g.
	SM␣*␣␣␣␣␣␣␣22.91␣g	Result of the second dynamic weighing is 22.91 g.
	.	
	.	
	SM␣*␣␣␣␣␣␣␣24.05␣g	etc.

Comments

- The SM3 command can be active at the same time as the other send commands.
- The recurring establishment of the start standby is cancelled by the SM0, SM1, SM2 and @ commands.

4. Special features

Parameter values after switching balance off/on

The commands of the standard command are seved on the permanent memory of the balance. This means that all values changed via the interface are saved when the balance is switched off.

Several commands in succession

If several commands are sent in succession without waiting for the corresponding responses, it is possible that the balance confuses the sequence of command processing or ignores entire commands.

Weight unit of weight value

In response strings with a weight value, unit always signifies the unit actually set under unit 1 in the menu of the balance (exeptions see SU, SIU, SIRU and SRU commands (MT-SICS level 2)).

METTLER TOLEDO DeltaRange balances

If the fine range of DeltaRange balances has been exceeded at the time of transmission, the balance sends a weight value as response in which the tenth character is a space.

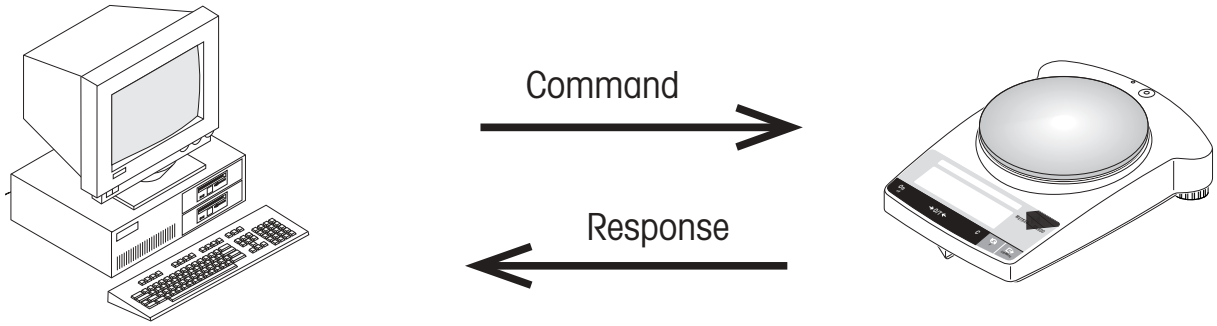
Repeat rate and timeout

The repeat rate with repeat commands and the duration of the timeout (time-limit function) depend on the balance type, see technical data of the balance in question.

5. An example

The following simple formula weighing application shows the data interchange between the computer with the formula weighing program and the balance.

A substance (S = 55 g) comprising components K1 = 100 g and K2 = 21 g needs to be weighed into a beaker.
If too much or too little of the first component is weighed in, the target weight of the second component should be adjusted so that the ratio of the two components remains the same.
The user is guided by the balance display and acknowledges his actions with the tare key.



→ **@** Reset balance.
← **I2␣A␣"PB3002-S␣R␣Standard␣3100.00␣g"**

→ **K␣3** Disable key function and report each keystroke.

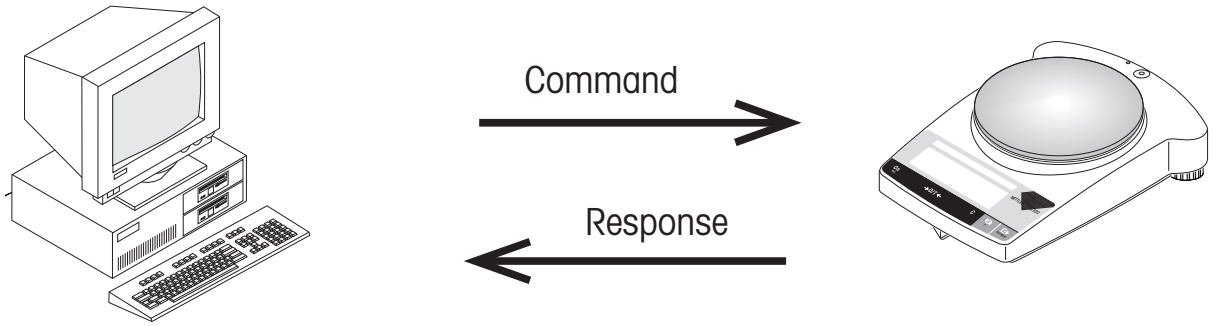
← **K␣A**

→ **D␣"BEAKER"**
Prompt "(load) BEAKER" appears in the display.

← **D␣A** Response to the prompted text.
← **K␣C␣5** Acknowledges pressing of the tare key.

→ **T** Tare weight on the balance.
← **T␣S␣ ␣ ␣ ␣ ␣ ␣70.00␣g**
Beaker weighs 70.00 g.

→ **D␣"C1 100g"**
Prompt, add component 1 = 100 g.



D␣A	Response to the prompted text.
K␣C␣5	Acknowledges pressing of the tare key.
S	Send target weight of component 1.
S␣S␣ ␣ ␣ ␣ ␣ ␣105.00␣g	Target weight of component 1 missed by 5 g.
T	Tare weight on the balance.
T␣S␣ ␣ ␣ ␣ ␣ ␣55.00␣g	Contents of the tare memory, now corresponds to gross weight.
D␣"C2␣21␣g"	Prompt, add component 2 = 21 g.
D␣A	Response to the prompted text.
K␣C␣5	Acknowledges pressing of the tare key.
D␣"Sub␣76␣g"	Display "76 g substance weighed in".
D␣A	Response to the "Display" command.

6. What if...?

Tips from actual practice when the communication between the system (computer) and the balance does not function.

Establishing the communication

Switch the balance off with the corresponding "off" key and then on again with the "on" key. The balance must now send identification string I4, e.g. I4␣A␣"0123456789".
If this is not the case, check the following points.

Connection

For bidirectional communication, at least three connecting lines are needed:

- Data line from the balance (TxD signal with RS232 interface).
- Data line to the balance (RxD signal with RS232 interface).
- Signal ground line (SG with RS232 interface).

Make sure that all these connections are in order. Check the connector pin assignment of the connection cables.

Interface parameters

For the transmission to function properly, the settings of the following parameters must match at both the computer and the balance:

- Baud rate (send/receive rate)
- Number of data bits
- Parity bit

Check the settings at both devices.

Handshake

For control of the transmission, in part separate connection lines are used (CTS/DTR). If these lines are missing or wrongly connected, the computer or balance can not send or receive data. Check whether the balance is prevented from transmitting by handshake lines (CTS or DTR). Set the parameter "protocol" for the balance and the peripheral device to "No Handshake" or "none". The handshake lines now have no influence on the communication.

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