

# Reference Manual for

## **METTLER TOLEDO**

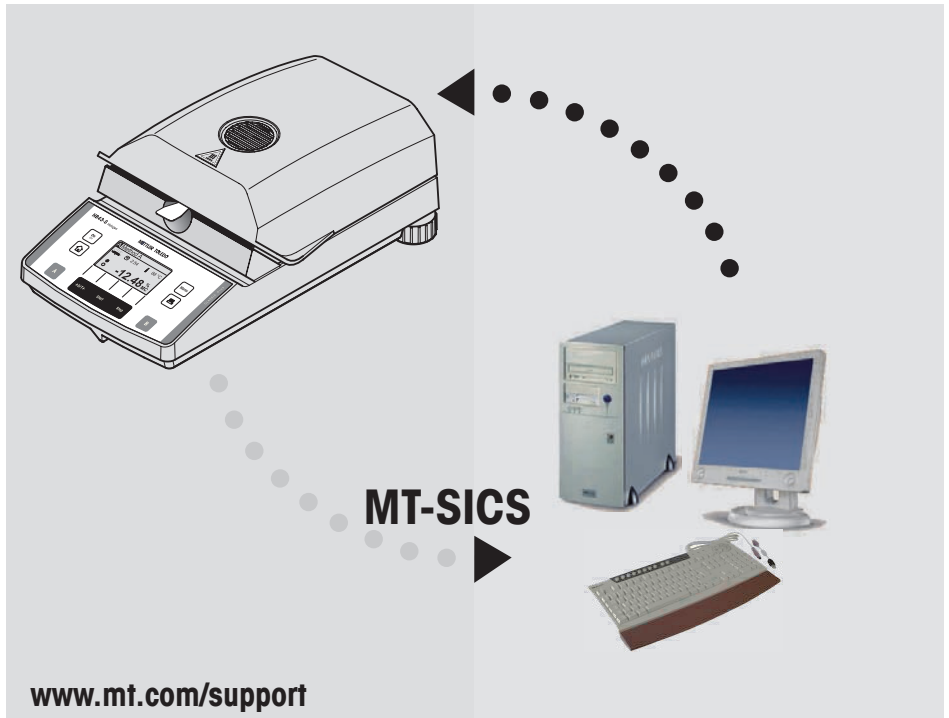
### **Standard Interface Command Set (MT-SICS)**

**MT-SICS 0 version 2.30**

**MT-SICS 1 version 2.20**

**MT-SICS 2 for Halogen Moisture Analyzer HB43-S version 2.30**

**MT-SICS 3 for Halogen Moisture Analyzer HB43-S version 1.30**



**METTLER TOLEDO**



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## Overview of all commands

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# 1 Introduction

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

## Standardization of the commands

All new METTLER TOLEDO balances and Moisture Analyzers 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 equipment:

- 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 family
- MT-SICS level 3 Application-specific commands as independent command set, e.g. MT-SICS level 3 for Halogen Moisture Analyzers HB43-S

A particular distinguishing feature of this concept is that the commands combined in MT-SICS level 0 and 1 are identical for all balances and instruments. Both the simplest weighing balance and a Moisture Analyzer recognize the commands of MT-SICS level 0.

## 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 of the Moisture Analyzer via the interface:

- request weighing results (raw data),
- zero the balance,
- identify MT-SICS implementation (version number),
- identify the Moisture Analyzer (serial number),
- reset the Moisture Analyzer,
- control the display.

## The commands of MT-SICS level 2 and 3 for the Moisture Analyzer

All additional higher level functions for the Moisture Analyzer are collected in the commands of MT-SICS level 2 and 3.

When creating your software application, please note that the commands of MT-SICS level 3 apply to your application and can not be supported by every METTLER TOLEDO balance or instrument.

Most commands in this manual are identical for the HB43-S and the other Moisture Analyzers of METTLER TOLEDO.

## **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.

## **How the Halogen Moisture Analyzer operates**

Your Halogene Moisture Analyzer is used to determine the moisture content of virtually any substance. The instrument operates according to the thermogravimetric principle: At the start of the measurement the Moisture Analyzer determines the weight of the sample, the sample is then rapidly heated with the built-in halogen dryer unit and the moisture evaporates. During the drying, the instrument continuously records the weight of the sample and shows the decrease in the moisture. On completion of the drying, the final result of the moisture or dry substance content of your sample is displayed.

## **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 2.30

MT-SICS level 1, version 2.20

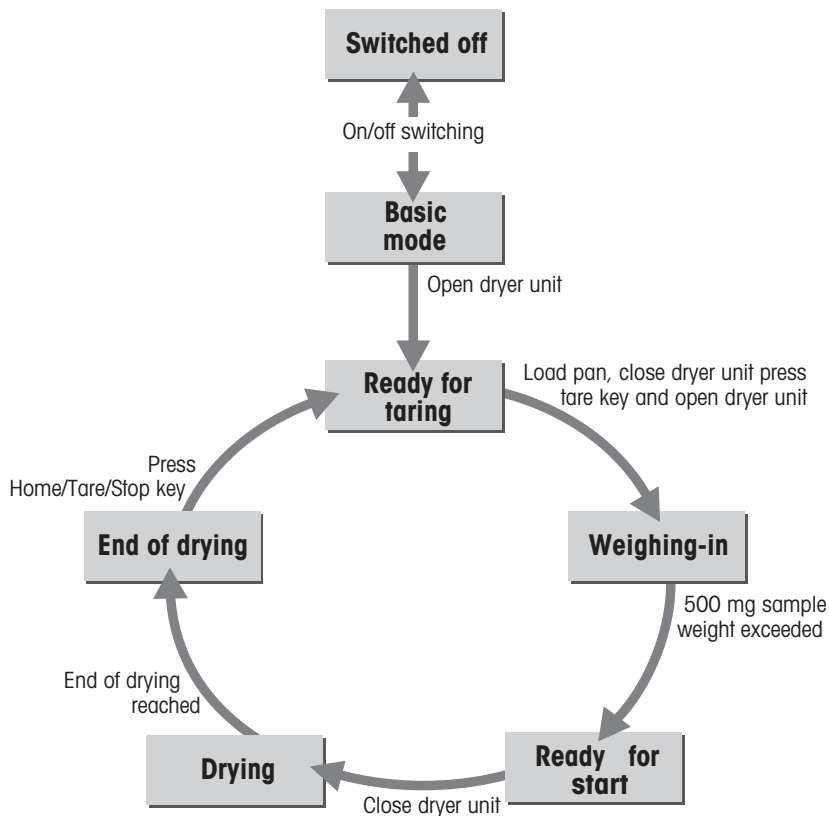
MT-SICS level 2 for Moisture Analyzer version 2.30

MT-SICS level 3 for Moisture Analyzer version 1.30

You can use the command I1 via the interface to request the MT-SICS level and MT-SICS versions implemented on your moisture analyzer.

Please make sure that the versions implemented on your moisture analyzer agree with those listed above.

During drying the Moisture Analyzer passes through the following instrument statuses:



The following instrument statuses also exist:

- Entry status
- Startup
- Taring
- Weight adjustment
- Temperature adjustment
- Error status

Some functions or commands can be executed only in particular instrument statuses. In the instrument status "Drying", for example, the value in the display can not be overwritten. If a command can not be executed for this reason, the Moisture Analyzer sends an appropriate message.

You will find detailed information on the functions of the Moisture Analyzer in the operating instructions.



## 2 Basic information on data interchange

Each command received by the Moisture Analyzer via the data interface is acknowledged by a response of the Moisture Analyzer to the transmitter (e.g. computer). 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 Moisture Analyzer comprise one or more characters of the ASCII character set. Here, the following must be noted:

- Commands must be entered in upper case letters (case sensitive!).
- 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  $\square$ ).
- Each command must be closed by  $C_{R}L_F$  (ASCII 13 dec., 10 dec.).

The characters  $C_{R}L_F$ , 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 instrument.

#### Example

Command to Moisture Analyzer which writes Hallo into the display:

$D\square"Ha11o"$       The command terminator  $C_{R}L_F$  is not shown

#### Comment

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

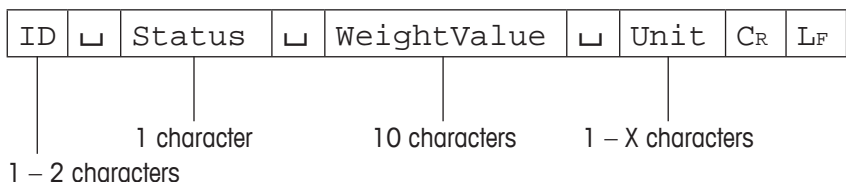
## 2.2 Response formats

All responses sent by the Moisture Analyzer to the transmitter (e.g. computer) 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** Interface status of the Moisture Analyzer, 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.

**Unit** Weight unit

C<sub>R</sub> Carriage Return (ASCII 13 dec.)

L<sub>F</sub> Line Feed (ASCII 10 dec.)

#### Comment

C<sub>R</sub>L<sub>F</sub> will not be shown in this description.

#### Example

Response with stable weight value of 0.256 g:

S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>S<sub>1</sub>0.256□g

### 2.2.2 Format of the response without weight value

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

ID	□	Status	□	Parameters	C <sub>R</sub>	L <sub>F</sub>
----	---	--------	---	------------	----------------	----------------

1 – x characters  
1 character

<b>ID</b>	Response identification
□	Space (ASCII, 32 dec.)
<b>Status</b>	Interface status of the Moisture Analyzer, see description of the commands and responses
<b>Parameters</b>	Command-dependent response code
C <sub>R</sub>	Carriage Return (ASCII 13 dec.)
L <sub>F</sub>	Line Feed (ASCII 10 dec.)

---

#### Comment

C<sub>R</sub>L<sub>F</sub> will not be shown in this description.

---

#### Example

Response to D□"HALLO" when HALLO appears unbridged in the display: D□A.

### 2.2.3 Error messages

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

ID	C <sub>R</sub>	L <sub>F</sub>
----	----------------	----------------

<b>ID</b>	Error identification Possible error messages are
<b>ES</b>	Syntax error The Moisture Analyzer has not recognized the received command.
<b>EL</b>	Logical error The Moisture Analyzer can not execute the received command.
<b>C<sub>R</sub></b>	Carriage Return (ASCII 13 dec.)
<b>L<sub>F</sub></b>	Line Feed (ASCII 10 dec.)

---

#### Comment

C<sub>R</sub>L<sub>F</sub> 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 Moisture Analyzer to a command. The response is the acknowledgement that the Moisture Analyzer has received the command.

#### Reset

To be able to start from a definite condition when establishing the communication between Moisture Analyzer and system, you should send a reset command to the Moisture Analyzer.

When the Moisture Analyzer is switched off, meaningless characters may be received or sent.

#### Quotation marks ""

Quotation marks included in the command must always be entered.

## **3 Commands and responses**

The Moisture Analyzer receives commands from the system (e.g. 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 always closed with  $C_{R}L_{F}$ . 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.

## **IO Inquiry of all implemented MT-SICS commands**

Command	<b>IO</b>	Send list of all implemented MT-SICS commands
Response	<b>IO└B└x1└"1.Command"</b> x1 = ident of the MT-SICS level where the 1. Command belongs to. <b>IO└B└x1└"2.Command"</b> : : <b>IO└A└x1└"last Command"</b> Last command implemented. End of the list <b>IO└I</b> The list cannot be sent at present as another operation is taking place	

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### Example

Command	<b>IO</b>	Send list of commands
Response	<b>IO└B└0└"IO"</b> <b>IO└B└0└"I1"</b> : <b>IO└B└0└"S"</b> : : <b>IO└A└3└"HA403"</b> Level 3 command "HA403" implemented	Level 0 command "IO" implemented Level 0 command "I1" implemented : Level 0 command "S" implemented : : Level 3 command "HA403" implemented

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### Comments

- The **IO** command lists all commands implemented in the present software.
- 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	<b>I1</b>	Inquiry of MT-SICS level and MT-SICS versions
Response	<b>I1└┬┴┬"x1"└┬"x2"└┬"x3"└┬"x4"└┬"x5"</b>	
	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

### Example

Command	<b>I1</b>	Inquiry of MT-SICS level and versions
Response	<b>I1└┬┴┬"3"└┬"2.30"└┬"2.20"└┬"2.30"└┬"1.30"</b>	
	3	Application device with MT-SICS level 3
	2.30	Level 0, version V2.30
	2.20	Level 1, version V2.20
	2.30	Level 2, version V2.30
	1.30	Level 3, version V1.30

## **I2 Inquiry of instrument data**

Command **I2** Inquiry of instrument data

Response **I2└A└"text"** Instrument data as "text"

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### **Example**

Command **I2** Inquiry of instrument type

Responses **I2└A└"HB43S└Moisture-Analyzer└54.010└g"**

## **I3 Inquiry of SW version and type definition number**

Command **I3** Inquiry of Moisture Analyzer SW version and type definition number

Response **I3└A└"TEXT"** Moisture Analyzer SW version and type definition number as TEXT

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### **Example**

Command **I3** Inquiry of SW version number(s) and type definition number

Response **I3└A└"1.00└4.10.5.93.43"**  
1.00 Software version  
4.10.5.93.43 Type definition number

## **I4 Inquiry of serial number**

Command **I4** Inquiry of serial number

Response **I4└A└"text"** Serial number as "text"

---

### **Example**

Command **I4** Inquiry of serial number

Response **I4└A└"0123456789"**



## 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.

### Comment

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

## S Send stable weight value

Command	s	Send the current stable weight value
Response	S␣S␣WeightValue␣Unit	Current stable weight value
	S␣I	Command not executable (Moisture Analyzer is currently executing another command)
	S␣+	Balance in overload range
	S␣-	Balance in underload range

### Example

Command	s	Send a stable weight value
Response	S␣S␣␣␣␣␣␣␣␣␣1.000␣g	The current, stable weight value is 1.000 g

### Comment

- Timeout approx. 30 s.

<b>SI</b>	<b>Send weight value immediately</b>
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Command	<b>SI</b>	Send the current weight value, irrespective of balance stability
Response	<b>S</b> <b>S</b> <b>S</b> <b>WeightValue</b> <b>Unit</b>	Stable weight value
	<b>S</b> <b>D</b> <b>/WeightValue</b> <b>Unit</b>	Nonstable (dynamic) weight value
	<b>S</b> <b>I</b>	Command not executable (Moisture Analyzer is currently executing another command)
	<b>S</b> <b>+</b>	Balance in overload range
	<b>S</b> <b>-</b>	Balance in underload range

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**Example**

Command	<b>SI</b>	Send current weight value
Response	<b>S</b> <b>D</b> <b>2.907</b> <b>g</b>	The current weight value is unstable (dynamic) and is 2.907 g

<b>SIR</b>	<b>Send weight value immediately and repeat</b>
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Command	<b>SIR</b>	Send the weight values repeatedly, irrespective of balance stability
Response	<b>S</b> <b>S</b> <b>S</b> <b>WeightValue</b> <b>Unit</b>	Stable weight value
	<b>S</b> <b>D</b> <b>WeightValue</b> <b>Unit</b>	Nonstable (dynamic) weight value
	<b>S</b> <b>I</b>	Command not executable (Moisture Analyzer is currently executing another command)
	<b>S</b> <b>+</b>	Balance in overload range
	<b>S</b> <b>-</b>	Balance in underload range

---

**Example**

Command	<b>SIR</b>	Send current weight values at intervals
Response	<b>S┐D┐┐┐┐┐┐┐┐┐2.907┐g</b>	
	<b>S┐D┐┐┐┐┐┐┐┐┐2.850┐g</b>	
	<b>S┐S┐┐┐┐┐┐┐┐┐2.797┐g</b>	
	<b>S┐S┐┐┐┐┐┐┐┐┐2.775┐g</b>	
	<b>S┐D┐┐┐┐┐┐┐┐┐2.770┐g</b>	
	<b>...</b>	The Moisture Analyzer sends stable or nonstable weight values at intervals of 150 ms

**Comment**

- SIR is overwritten by the commands S, SI and @.

<b>Z</b>	<b>Zero</b>
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Command	<b>z</b>	Zero the Moisture Analyzer
Response	<b>z┐A</b>	Zero setting performed, i.e. stability criterion and zero setting range complied with
	<b>z┐I</b>	Command not executable as the Moisture Analyzer is not in the relevant instrument status (e.g. drying unit open)
	<b>z┐+</b>	Upper limit of zero setting range exceeded
	<b>z┐-</b>	Lower limit of zero setting range exceeded

**Example**

Command	<b>z</b>	Zero
Response	<b>z┐A</b>	Zero setting performed

**Comment**

- This command is equivalent to pressing the **→0/T←** key.

## **ZI**      **Zero immediately**

Command	<b>ZI</b>	Zero immediately, i.e. stores immediately the current weight value, which can be stable or non stable (dynamic), as zero value.
Response	<b>ZI┐S</b>	Zero setting performed, stable weight value
	<b>ZI┐D</b>	Zero setting performed, non-stable (dynamic) weight value
	<b>ZI┐I</b>	Zero setting not performed (Moisture Analyzer is currently executing another command)
	<b>ZI┐L</b>	Command understood but not executable (e.g. certified version of balance)
	<b>ZI┐+</b>	Upper limit of zero setting range exceeded
	<b>ZI┐-</b>	Lower limit of zero setting range exceeded

### **Example 1**

Command	<b>ZI</b>	Zero immediately
Response	<b>ZI┐S</b>	Zero setting performed, weight value was stable

### **Example 2**

Command	<b>ZI</b>	Zero immediately
Response	<b>ZI┐D</b>	Zero setting performed, weight value was dynamic (non-stable)

## **@**      **Reset**

Command	<b>@</b>	Resets the interface to the condition found after switching on, but without a zero setting being performed.
Response	<b>I4┐AL"text"</b>	Serial number of the Moisture Analyzer, the Moisture Analyzer is ready for operation.

### **Example**

Command	<b>@</b>	
Response	<b>I4┐AL"1114350697"</b>	Moisture Analyzer is reset, its serial number is 1114350697.

### **Comment**

All current commands are terminated on @ command

## 3.2 Commands and responses MT-SICS level 1 for Halogene Moisture Analyzer HB43-S

The commands of MT-SICS level 1 are available with all standard balances which support the METTLER TOLEDO Standard Interface Command Set. With the HB43-S Halogen Moisture Analyzer, only the commands D and DW are supported.

### D Display

#### Write into display

Command	<code>D<sub>L</sub>"TEXT"</code>	Write TEXT into Moisture Analyzer display
Response	<code>D<sub>L</sub>A</code>	TEXT appears unabridged left-aligned in the Moisture Analyzer display.
	<code>D<sub>L</sub>R</code>	The end of the text appears in the Moisture Analyzer display, the start is cut off
	<code>D<sub>L</sub>I</code>	Command not executable
	<code>D<sub>L</sub>L</code>	Command understood, parameter wrong

#### Example

Command	<code>D<sub>L</sub>"HALLO"</code>	Write HALLO into the Moisture Analyzer display
Response	<code>D<sub>L</sub>A</code>	The full text HALLO appears in the Moisture Analyzer display

#### Clear display

Command	<code>D<sub>L</sub>" "</code>	Clear Moisture Analyzer display
Response	<code>D<sub>L</sub>A</code>	Display cleared

#### Comments

- A display command can be cleared with the DW or Reset command.
- This command can be executed only in the instrument statuses "basic mode", "ready for taring", "weighing-in" and "ready for start".

## **DW**    **Weight display (Display show Weight)**

Command	<b>DW</b>	Switch display to weight mode
Response	<b>DW┐A</b>	Display shows the current weight value
	<b>DW┐I</b>	Command not executable

---

### **Comment**

This command can be executed only in the instrument statuses "basic mode", "ready for taring", "weighing-in" and "ready for start".

### 3.3 Commands and responses MT-SICS level 2 for Halogen Moisture Analyzer HB43-S

<b>DAT</b>	<b>Date</b>
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#### Inquiry of date

Command **DAT** Inquiry of current date of the Moisture Analyzer

Response **DAT␣A␣dd␣mm␣yyyy**  
"dd␣mm␣yyyy" represents the date in the format  
day␣month␣year

#### Set date

Command **DAT␣dd␣mm␣yyyy**  
Set date in the format "dd␣mm␣yyyy"

Response **DAT␣A** Date has been set  
**DAT␣L** Command not executed as the date format was not  
correct  
Inquiry of date of the Moisture Analyzer

#### Example

Command **DAT** Current date of the Moisture Analyzer is  
2 April 2000

Response **DAT␣A␣02␣04␣2000**

#### Comments

- The set date is retained after the reset command "@".
- Admissible years: 1.1.1901 – 31.12.2099.

## **PWR Power On/Off**

Command	<b>PWR</b> $\downarrow$ <b>x</b>	Switch Moisture Analyzer On or Off  x = 0            Set Moisture Analyzer to standby mode x = 1            Switch Moisture Analyzer on
Response	<b>PWR</b> $\downarrow$ <b>A</b> <b>PWR</b> $\downarrow$ <b>A</b> <b>I4</b> $\downarrow$ <b>A</b> $\downarrow$ "text"  <b>PWR</b> $\downarrow$ <b>L</b>	Moisture Analyzer has been switched off successfully Moisture Analyzer with the serial number according to text has been switched on successfully (see also <b>I4</b> command) Command understood, parameter wrong

### **Comments**

- In the standby mode, the interface remains active; but all commands except **PWR**, **HA07**, **HA20** and @ are answered with EL.
- On switching on, the Moisture Analyzer also sends the serial number (see also **I4** command).
- On switching off, all current commands are terminated.

## **TIM Time**

### **Inquiry of time**

Command	<b>TIM</b>	Send current time of the Moisture Analyzer
Response	<b>TIM</b> $\downarrow$ <b>A</b> $\downarrow$ hh $\downarrow$ mm $\downarrow$ ss	"hh $\downarrow$ mm $\downarrow$ ss" represents the time in the 24-hour format (hours/minutes/seconds)

### **Set time**

Command	<b>TIM</b> $\downarrow$ hh $\downarrow$ mm $\downarrow$ ss	Set time in 24-hour format (hours/minutes/seconds)
Response	<b>TIM</b> $\downarrow$ <b>A</b> <b>TIM</b> $\downarrow$ <b>L</b>	Time has been set, clock running Command not executed as the time format is not correct (e.g. 22 $\downarrow$ 67 $\downarrow$ 25)

### **Example**

Command	<b>TIM</b>	Inquiry of time
Response	<b>TIM</b> $\downarrow$ <b>A</b> $\downarrow$ 22 $\downarrow$ 56 $\downarrow$ 11	The current time of the Moisture Analyzer is 22 hours, 56 minutes and 11 seconds



### 3.4 Commands and responses MT-SICS level 3 for Halogen Moisture Analyzer HB43-S

All Moisture Analyzer specified commands are combined in MT-SICS level 3 for Halogen Moisture Analyzers HR73, HG53 and HB43-S.

#### HA01 Reset application / escape

Command **HA01** Reset application / escape

Response **HA01**↵ Application reset

#### Comment

This command has the same effect as the Reset key, see operating instructions of the Moisture Analyzer. It terminates all current commands and activities.

#### HA02 Set factory settings

Command **HA02** Set factory setting of the menu

Response **HA02**↵ Menu and set to factory setting

#### Comment

All menu parameters are reset to factory settings except RS interface settings and language. This command terminates a drying.

#### HA03 Switch keypad on/off

Command **HA03**↵x x = 0 Keypad of Moisture Analyzer switched off

x = 1 Keypad of Moisture Analyzer switched on (factory setting)

Response **HA03**↵ Command executed

**HA03**↵ Command understood, parameter wrong

## HA05 Start / end drying

Command	<b>HA05</b> □ <b>x</b>	x = 0	End drying, possible only in instrument status "drying"
		x = 1	Start drying, possible only in instrument status "ready for start"
Response	<b>HA05</b> □ <b>A</b>	Command executed	
	<b>HA05</b> □ <b>I</b>	Command not executable as the Moisture Analyzer is not in the relevant instrument status	
	<b>HA05</b> □ <b>L</b>	Command understood, parameter wrong	

### Comment

To abort current drying use **HA01** (Reset application).

## HA06 Trigger audio signal

Command	<b>HA06</b>	Trigger audio signal, e.g. at end of drying
Response	<b>HA06</b> □ <b>A</b>	Command executed

## HA07 Report instrument status change

Command	<b>HA07</b> □ <b>x1</b>	Report each internal status change x1 = 0 Switch off x1 = 1 Switch on
Response	<b>HA07</b> □ <b>A</b>	Command executed
	<b>HA07</b> □ <b>A</b> □ <b>x1</b>	Status change (see <b>HA20</b> ) x1 = 0 "Standby" x1 = 1 "Basic mode" x1 = 2 "Load pan and tare" x1 = 3 "Weighing-in" x1 = 4 "Ready for start" x1 = 5 "Drying" x1 = 6 "End of drying" x1 = 7 "Entry"  x1 = 10 "Startup" x1 = 11 "Taring" x1 = 12 "Weight adjustment" x1 = 13 "Temperature adjustment"  x1 = 101 "Error 1" x1 = 102 "Error 2" x1 = 10n "Error n"
	<b>HA07</b> □ <b>L</b>	Parameter wrong (number, value range,...)
	<b>HA07</b> □ <b>I</b>	Response always available, hence not possible

---

### Comments

- aborted with the **HA01** command
- see also **HA20** command
- also active in standby

## HA08 Request printer records

Command	<b>HA08</b> □ <b>x1</b>	Request printer records: x1 = 0 Do not send printer records x2 = 1 Send printer records
Response	<b>HA08</b> □ <b>A</b>	Command executed
	<b>HA08</b> □ <b>L</b>	Parameter wrong (number, value range, ...)
	<b>HA08</b> □ <b>I</b>	Response always available, hence not possible

### Comments

- The printer records use the 8-bit ASCII IBM table 4.
- Regardless of menu setting (see **HA403**).
- This setting is not stored.
- To reactivate the menu settings, use the "@" command.

## HA20 Inquiry of instrument status

Command	<b>HA20</b>	Inquiry of instrument status		
Response	<b>HA20</b> □ <b>A</b> □ <b>x</b>	x = 0	Status:	"Standby"
		x = 1	Status:	"Basic mode"
		x = 2	Status:	"Ready for taring"
		x = 3	Status:	"Weighing in"
		x = 4	Status:	"Ready for start"
		x = 5	Status:	"Drying"
		x = 6	Status:	"End of drying"
		x = 7	Status:	"Entry"
		x = 10	Status:	"Startup"
		x = 11	Status:	"Taring"
		x = 12	Status:	"Weight adjustment"
		x = 13	Status:	"Temperature adjustment"
		x = 101	Status:	"Error 1"
		... ..		
		x = 10n	Status	"Error n", see operating instructions of the Moisture Analyzer

### Comments

- With the message **HA20**□**A**□**6** instrument status "End of drying", it is not apparent whether drying was ended correctly or terminated. This is possible only via the command **HA25** – Inquiry of drying weight.
- Also active in standby.

## HA21 Inquiry of heating module position

Command	<b>HA21</b>	Inquiry of heating module position	
Response	<b>HA21</b> ␣ <b>A</b> ␣ <b>x</b>	x = 0	Heating module closed
		x = 1	Heating module open

## HA22 Inquiry of last balance adjustment

Command	<b>HA22</b>	Inquiry of last successful balance adjustment	
Response	<b>HA22</b> ␣ <b>A</b> ␣ <b>x1</b> ␣ <b>x2</b> ␣ <b>x3</b> ␣ <b>x4</b> ␣ <b>x5</b> ␣ <b>x6</b>		
		x1	Number of the successful adjustments
		x2	Day of the last successful adjustment
		x3	Month of the last successful adjustment
		x4	Year of the last successful adjustment
		x5	Hour of the last successful adjustment
		x6	Minute of the last successful adjustment

### Example

Command	<b>HA22</b>		
Response	<b>HA22</b> ␣ <b>A</b> ␣ <b>15</b> ␣ <b>02</b> ␣ <b>04</b> ␣ <b>2000</b> ␣ <b>09</b> ␣ <b>34</b>		
		A total of 15 successful balance adjustments have been performed.	
		The last took place on April 02, 2000 at 9.34.	

### Comments

- The time of the last successful balance adjustment is specified in the 24-hour format.
- Possible years are 1999 ... 2099.
- The counter for the balance adjustments runs to 65535.

## HA23 Inquiry of last heating module adjustment

Command	<b>HA23</b>	Inquiry of the last successful heating module adjustments
Response	<b>HA23</b> ␣ <b>A</b> ␣ <b>x1</b> ␣ <b>x2</b> ␣ <b>x3</b> ␣ <b>x4</b> ␣ <b>x5</b> ␣ <b>x6</b>	
		x1 Number of successful adjustments
		x2 Day of the last successful adjustment
		x3 Month of the last successful adjustment
		x4 Year of the last successful adjustment
		x5 Hour of the last successful adjustment
		x6 Minute of the last successful adjustment

### Example

Command	<b>HA23</b>	
Response	<b>HA23</b> ␣ <b>A</b> ␣ <b>15</b> ␣ <b>02</b> ␣ <b>04</b> ␣ <b>2000</b> ␣ <b>09</b> ␣ <b>34</b>	A total of 15 successful heating module adjustments have been performed. The last took place on April 02, 2000 at 9.34.

### Comments

- The time of the last successful heating module adjustment is specified in the 24-hour format.
- Possible years are 1999 ... 2099.
- The counter for the heating module adjustments runs to 65535.

## HA24 Inquiry of temperature

Command	<b>HA24</b>	Inquiry of current temperature
Response	<b>HA24</b> ␣ <b>A</b> ␣ <b>x</b>	Current temperature in °C

### Example

Command	<b>HA24</b>	Inquiry of current temperature
Response	<b>HA24</b> ␣ <b>A</b> ␣ <b>105</b>	The temperature is 105°C.

## HA25 Inquiry of drying weights

Command **HA25** Inquiry of drying weight of the last or current drying

Response **HA25**␣A␣x1␣x2␣x3␣x4

**x1 Drying status**

x1 = 0 No drying exists

x1 = 1 Drying running

x1 = 2 Drying ended

x1 = 3 Drying terminated

**x2 Wet weight in grams**

**x3 Current weight or dry weight in grams**

**x4 Drying time (seconds)**

---

### Example 1

Command **HA25** Inquiry of drying weights

Response **HA25**␣A␣2␣12.345␣7.890␣180

Drying has been ended regularly, wet weight  
12.345 g, dry weight 7.890 g,  
drying time 180 seconds

### Example 2

Command **HA25** Inquiry of drying weights

Response **HA25**␣A␣0␣0.000␣0.000␣0

No drying exists, e.g. as the battery was discharged

---

### Comment

Together with the command **HA07** – Report instrument status change – dryings can be shown in parallel on the host.

## HA26 Inquiry of drying data

Command **HA26** $\square$ **x1** Inquiry of drying data in configurable display mode

x1 = 0 currently set display mode  
x1 = 1 Grams  
x1 = 2 DC (dry content)  
x1 = 3 MC (moisture content), (factory setting)  
x1 = 4 AM (ATRO moisture content)  
x1 = 5 AD (ATRO dry content)

Response **HA26** $\square$ **A** $\square$ **x1** $\square$ **x2** $\square$ **x3** $\square$ **x4** $\square$ **x5** $\square$ **x6**

**x1 Drying status**

x1 = 0 No drying exists  
x1 = 1 Drying running  
x1 = 2 Drying ended  
x1 = 3 Drying terminated

**x2 Display mode**

x2 = 1 Grams  
x2 = 2 DC (dry content)  
x2 = 3 MC (moisture content), (factory setting)  
x2 = 4 AM (ATRO moisture content)  
x2 = 5 AD (ATRO dry content)

**x3 Wet weight in grams**

**x4 Current weight or dry weight in grams**

**x5 Actual result in requested display mode**

**x6 Drying time (seconds)**

**HA26** $\square$ **L** Command understood, parameter wrong

### Example 1

Command **HA26** $\square$ **3** Inquiry of drying data

Response **HA26** $\square$ **A** $\square$ **2** $\square$ **3** $\square$ **4.762** $\square$ **3.066** $\square$ **35.61** $\square$ **497**

Drying has been ended regularly, result requested in % moisture content, wet weight 4.762 g, dry weight 3.066 g, 35.61% moisture content, drying ended at 497 seconds



## Example 2

Command **HA26□2** Inquiry of drying data  
Response **HA26□A□1□2□2.672□2.467□92.33□143**  
Drying is running, result requested in % dry content,  
wet weight 2.672 g, dry weight 2.467 g, 92.33%  
dry content, drying for 143 seconds in progress

---

### Comment

- If a drying is inexistent (e.g. after a RAM LOST), the parameters x3..x6 are set to 0.
- If the measuring results exceed the tolerances for ATRO result display (L-999.99% AM or >999.99% AD) the selected results in x2 = 4 AM or x2 = 5 AD will automatically be transferred in x2 = 3 MC or x2 = 2 DC respectively.

## HA27 Inquiry of drying result

Command **HA27□x1** Inquiry of drying data in configurable display mode  
x1 = 0 currently set display mode  
x1 = 1 Grams  
x1 = 2 DC (dry content)  
x1 = 3 MC (moisture content), (factory setting)  
x1 = 4 AM (ATRO moisture content)  
x1 = 5 AD (ATRO dry content)  
(only with HB43-6)

Response **HA27□A□x1□x2**  
**x1** **Drying status** (always 7 digit number)  
**x2** **Display mode** (g, %DC, %MC, %AM, %AD)

**HA27□I** Response not available (drying in progress)

---

### Example

Command **HA27□3** Inquiry of drying result  
Response **HA27□A□□-73.25%MC**  
Drying result -73.25% MC

---

### Comment

If the measuring results exceed the tolerances for ATRO result display (L-999.99% AM or > 999.99% AD) the selected results in x1 = 4 AM or x1 = 5 AD will automatically be transferred in x1 = 3 MC or x1 = 2 DC respectively.

## HA40 Inquiry / setting of language

### Inquiry of language

Command **HA40** Inquiry of language currently set

Response **HA40□A□x** x Language (see below)

### Setting language

Command **HA40□x** Set language

x = 1 English

x = 2 German

x = 3 French

x = 4 Italian

x = 5 Spanish

x = 6 Russian

x = 7 Japanese (Nihongo)

x = 8 Portuguese

Response **HA40□A** Language set

**HA40□L** Command understood, parameter wrong

## HA40X Inquiry / setting of menu parameters

All commands on the inquiry / setting of menu parameters work similarly. As an example the inquiry for the startmode setting and the actual setting of the startmode is shown.

### Inquiry of menu parameters

Command	<b>HA401</b>	Inquiry of startmode
Response	<b>HA401┐A┐x1</b>	
		x1 = 0 Startmode automatic (factory setting)
		x1 = 1 Startmode manual

---

### Example

Command	<b>HA401</b>	Inquiry of startmode
Response	<b>HA401┐A┐1</b>	Startmode manual

---

### Setting menu parameters

Command	<b>HA401┐x1</b>	Setting of startmode
		x1 = 0 Startmode automatic (factory setting)
		x1 = 1 Startmode manual
Response	<b>HA401┐A</b>	Startmode set
	<b>HA401┐L</b>	Command understood, parameter wrong

---

### Example

Command	<b>HA401┐0</b>	Setting startmode to automatic
	<b>HA401┐A</b>	Startmode set

---

### List of menu parameter inquiries / settings

<b>HA401</b>	<b>Startmode</b>	
	x1 = 0	Startmode automatic (factory setting)
	x1 = 1	Startmode manual
<b>HA402</b>	<b>Protection against change in the settings (menu protection)</b>	
	x1 = 0	Menu protection off, changes possible (factory setting)
	x1 = 1	Menu protection on, changes are not possible
<b>HA403</b>	<b>Printer</b>	
	x1 = 0	Printout off
	x1 = 1	Printout on (factory setting)

---

### Comment

After the usage of HA08 the command HA403 has no effect on the printout but only on the setting of printout in the menu.

## HA61 Inquiry / setting of method parameters (part 1)

### Inquiry of display mode, switch-off criteria and temperature profile

Command **HA61□x1** Inquiry of method parameters regarding display mode, switchoff criteria and temperature profile  
x1 = 1 Inquiry of parameters of current method  
x1 = 2 Inquiry of parameters of method A  
x1 = 3 Inquiry of parameters of method B

Response **HA61□A□x1□x2□...□x11**  
Current setting of the method parameters  
x2...x11 Represent the individual parameters (see below)

---

### Example

Command **HA61□2** Inquiry of current setting of the parameters of method A

Response **HA61□A□2□3□6□0□1□105□0□0□0□0**  
(Get the parameters of the method A: method A, Display mode MC, switch-off criterion level 3, Time = 0, standard drying, temperature 105°C, x7-x11 are default values)

---

### Setting display mode, switch-off criteria and temperature profile

Command **HA61□x1□x2□...□x11**  
Set method parameters regarding display mode, switch-off criteria and temperature profile  
x1...x11 represent the individual parameters (see below)

Response **HA61□A** Method parameter set  
**HA61□L** Command understood, parameter wrong

---

## Parameters

### **x1 Number of the method**

x1 = 1 current method (**not allowed to set**)

x1 = 2 method A

x1 = 3 method B

### **x2 Display mode**

x2 = 1 Grams

x2 = 2 DC (dry content)

x2 = 3 MC (moisture content), (factory setting)

x2 = 4 AM (ATRO moisture content)

x2 = 5 AD (ATRO dry content)

### **x3 Switch-off criterion**

x3 = 0 x3 must be 0 if x5 = 3 (LP16 Mode)

x3 = 1 Switch off manually

x3 = 2 Switch off via Timer

x3 = 4 Switch-off criterion weight loss per time unit, level 1; for samples which dry very quickly

x3 = 5 Switch-off criterion weight loss per time unit, level 2; for samples which dry quickly

x3 = 6 Switch-off criterion weight loss per time unit, level 3; suitable for most types of samples (factory setting)

x3 = 7 Switch-off criterion weight loss per time unit, level 4; for samples which dry moderately quickly

x3 = 8 Switch-off criterion weight loss per time unit, level 5; for samples which dry very slowly

x3 = 9 Free switch-off criterion

### **x4 Setting the time for switch-off**

if x3 = 2 Setting the timer in seconds (switch off via timer):

Possible settings of x4: 60 - 28800 in steps of 60 s if

x3 = 9 Setting the time interval in seconds

(free switch-off criterion):

Possible settings of x4: 20 - 180 in steps of 1s

(1mg/20...180s)

if x3 = 0, 1, 4...8: x4 = 0

### **x5 Drying program**

x5 = 1 Standard drying (factory setting)

x5 = 2 Rapid drying

x5 = 3 LP16 (x3 must be 0)

<b>x6</b>	<b>Set temperature in °C</b> Possible settings 50...200 in steps of 1°C
<b>x7</b>	<b>Ramp time in seconds</b> Always 0
<b>x8</b>	<b>Temperature of level 1 of step drying, in °C</b> Always 0
<b>x9</b>	<b>Time of level 1 of step drying, in seconds</b> Always 0
<b>x10</b>	<b>Temperature of level 2 of step drying, in °C</b> Always 0
<b>x11</b>	<b>Time of level 2 of step drying, in seconds</b> Always 0

### Example

Command **HA61**▯2▯3▯6▯0▯1▯105▯0▯0▯0▯0▯0

Set method parameters for method A: Display mode MC, switch-off criterion 3, Time = 0, standard drying, set temperature 105°C, all other are default values.

### Comment

The parameters x7...x11 must always be 0.

Setting the method parameters terminates a drying.

Each drying is ended at the latest after 28800 seconds.

## HA62 Inquiry / setting of method parameters (part 2)

### Inquiry of target weight, print interval, method name and code

Command print **HA62**␣**x1** Inquiry of method parameters regarding target weight,

Interval, method name and Code

x1 = 1 Inquiry of parameters of the current method

x1 = 2 Inquiry of parameters of the method A

x1 = 3 Inquiry of parameters of the method B

Response **HA62**␣**A**␣**x1**␣**x2**␣...␣**x5**

Current setting of the method parameters

x1 = 1 Represent parameters of the current method  
(not allowed)

x1 = 2 Represent parameters of method A

x1 = 3 Represent parameters of method B

x2...x5 Represent the individual parameters  
(see below)

---

### Example

Command **HA62**␣**2** Inquiry of current setting of the parameters of method A

Response **HA62**␣**A**␣**2**␣**3**␣**4**␣"**Substance A**"␣"**0000.0A**"

Method A: Target weight 3g, Print interval 30 s,

Method name "Substanz A"; Code "0000.0A"

---

### Setting target weight, print interval, method name and code

Command **HA62**␣**x1**␣**x2**␣...␣**x5**

Set method parameters regarding print interval

x1...x5 represent the individual parameters (see  
below)

Response **HA62**␣**A** Method parameter set

**HA62**␣**L** Command understood, parameter wrong

---

<b>Parameters</b>	<b>x1</b>	<b>Number of the method</b> x1 = 1 current method (not allowed to set) x1 = 2 method A x1 = 3 method B
	<b>x2</b>	<b>Target weight in grams</b> Possible settings 0.5 ... 54.0 (step 0.5)
	<b>x3</b>	<b>Print interval</b> x3 = 1 No print interval set, manual initiation of printout x3 = 4 Printout every 30 seconds x3 = 5 Printout every 60 seconds x3 = 9 Printout every 300 seconds <b>Note:</b> Print interval is not a method setting, set value applies for all methods!
	<b>x4</b>	<b>Method name</b> Maximum 20 characters, factory setting: " "
	<b>x5</b>	<b>Code</b> It is not possible to set the Code.  Note: It is only visible if the method from the library is not modified

### Example

Command **HA62**□**2**□**3**□**5**□**"MyMethod"**□**" "**

Set parameters for method A: target weight 3.0 g, print interval 60 seconds, Method name "MyMethod"

Response **HA62**□**A** Method parameter set

### Comment:

Setting the method parameters terminates a drying.



## HA632 Definition of freely selectable switch-off criterion

Note: HA632 can only be set if the switch-off criterion of the method is set to free!

Command **HA632**□**x1** Inquiry of  $\Delta g$  and  $\Delta t$   
x1 = 1 Inquiry of parameters of the current method  
x1 = 2 Inquiry of parameters of the method A  
x1 = 3 Inquiry of parameters of the method B

Response **HA632**□**A**□**x1**□**x2**□**x3**  
 $\Delta g$  and  $\Delta t$  set  
x1 = 2 represent parameters of method A  
x1 = 3 represent parameters of the method B

---

Parameters	x1	Number of the method
		x1 = 1 current method (not allowed to set) x1 = 2 method A x1 = 3 method B
	<b>x2</b>	<b><math>\Delta g</math> in mg</b> = Fix 1 mg (cannot be changed)
	<b>x3</b>	<b><math>\Delta t</math> in seconds</b> (20...180)

Response **HA632**□**A**  $\Delta g$  and  $\Delta t$  set  
**HA632**□**L** Command understood, parameter wrong, (number, value range,...)

### Example

Command **HA632**□**2**□**1**□**23**  
Set free switch-off criterion for method A:  
 $\Delta g = 1$ ,  $\Delta t = 23$

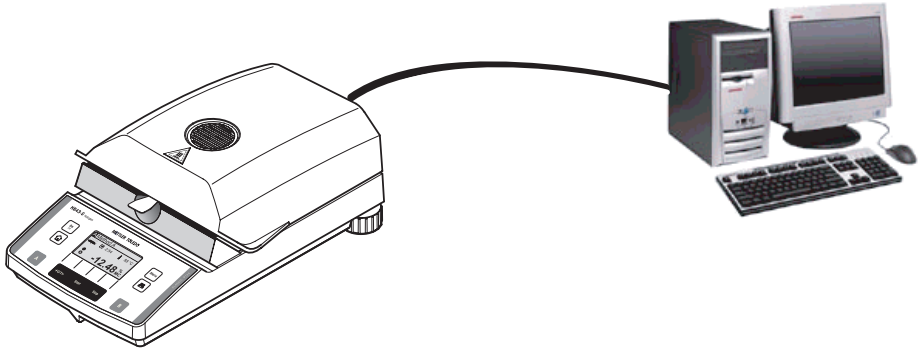
Response **HA632**□**A** Method parameter set

### Comment

Setting the command line terminates a drying.

## 4 System Configuration (HB43-S – Computer)

The HB43-S Halogen Moisture Analyzer is equipped with a 9 pin female RS232C Interface connector. It can be connected to a computer using a cable with order number 11101051 (9 pin) or order number 11101052 (25 pin).



The standard configuration of HB43-S is: 2400 baud, 7 bits, even parity, no handshake. These settings may be adjusted in the menu of HB43-S. Additionally the printout setting in the menu should be "off". This avoids that printout strings are sent to the computer. Please refer to the Operating instruction.

## 5 What if...?

Tips from actual practice when the communication between the system (e.g. computer) and the Moisture Analyzer does not function.

### Establishing the communication

Test whether the unidirectional operation is working:

Switch the Moisture Analyzer off with the "Off" key and then on again with the "On" key.

The Moisture Analyzer must now send the identification string **I4**, e.g. **I4**  
**A**"0123456789". If "METTLER TOLEDO" is printed the communication functions properly. Change the printout setting in the menu to the "off" position.

If no identification string is received, check the following points.

### Connection

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

- Data line from the Moisture Analyzer (TxD signal with RS232 interface).
- Data line to the Moisture Analyzer (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 Moisture Analyzer:

- 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 Moisture Analyzer can not send or receive data.

Check whether the Moisture Analyzer is prevented from transmitting by handshake lines (CTS or DTR).

Set the parameter "handshake" for the Moisture Analyzer and the peripheral device to "No Handshake" or "none". The handshake lines now have no influence on the communication.





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Subject to technical changes.