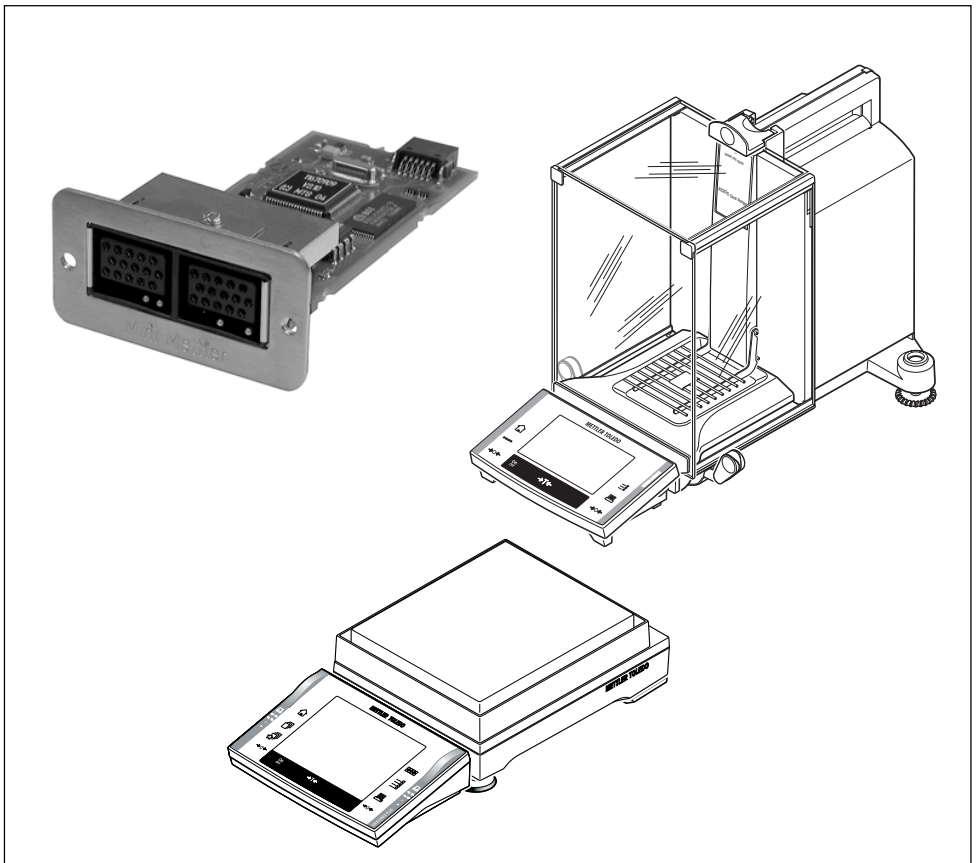


**METTLER TOLEDO**

## Installation and Operating Instructions

### **METTLER TOLEDO AM/PM & AT/MT MiniMettler option "11132510" for Excellence balances**



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# 1 Introduction

## Before we begin

Thank you for choosing the METTLER TOLEDO MiniMettler option. This interface enables a backwards compatibility of METTLER TOLEDO Excellence balances to AM/PM and AT/MT balances, using the MiniMettler interface and commands.

Please read these installation and operating instructions right through before you start using the MiniMettler interface option, so you know how to operate the interface safely and correctly and can make use of all its capabilities.

Please observe the following:

- Some of the commands had to be modified to suit the new capabilities of the balance. Other commands have become completely ineffective. Please refer to the sections 5.1 and 5.2.
- The Excellence balance must have Software version V3.00 or higher. You can download the latest balance Software at: [www.mt.com/balance-support](http://www.mt.com/balance-support).
- Before you work with the MiniMettler Option you must have **read through and understood these installation and operating instructions**.
- **You must observe and follow** these installation and operating instructions.
- It is **not allowed** to operate balances with the MiniMettler option **in hazardous or wet environments**.
- The MiniMettler Option is mounted into the balance and is powered by the balance.
- The MiniMettler option does not contain any parts which can be serviced, repaired, or replaced by the user.
- If the MiniMettler option is not working correctly, please contact your local METTLER TOLEDO dealer.
- If you still have questions which the documentation does not answer, or only partially, please contact your local METTLER TOLEDO dealer who will be pleased to assist you.
- MiniMettler option does not work in standalone-weighing platforms (balances without a terminal).
- The MM option is not 100% functional compatible with AM/PM & AT/MT balances. For the details of the functional limitation, please refer 4.1 "Difference between the original interface and the MiniMettler optional interface"

## 2 Interface description and installation

### 2.1 Items delivered

The standard delivery comprises the following items:

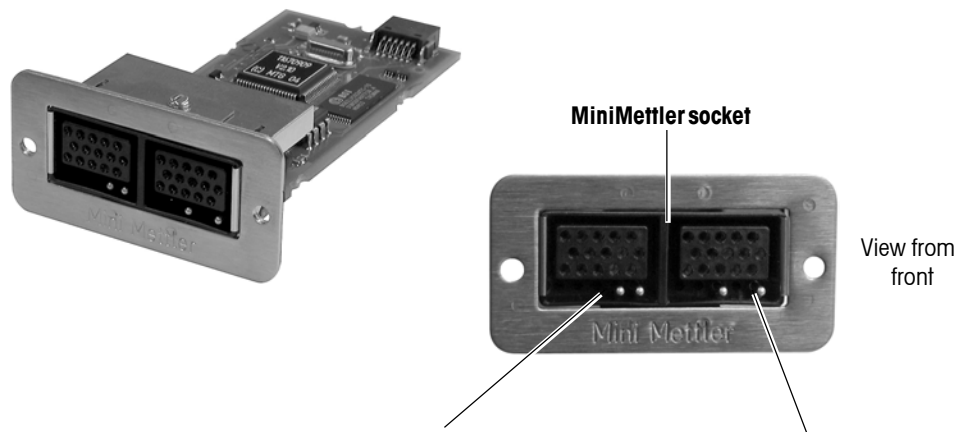
- MiniMettler interface option
- Installation and operating instructions

Items not included in the standard delivery, but available as accessories are:

- MiniMettler – RS232 cable 9-Pin or 25-Pin for connecting the interface to a device with RS232 connection (See accessories).
- MiniMettler – CL cable 5-Pin for connecting the interface to a device with current loop connection (See accessories).

### 2.2 Description of the MiniMettler interface

#### Interface overview



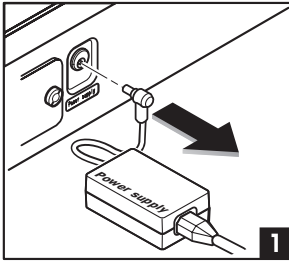
**ReZero connector (for AT/MT only)**

Pin	Function
1	close door IN
2	open door IN
1+2	open & close door alternately IN
3	door is open OUT
4	door is closed OUT
5	Tare command IN
10	not connected
11	GND
14	Transfer command CL or RS232 IN

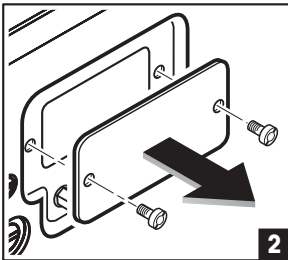
**DATA I/O connector**

Pin	Function
2	DATA IN, RS232C
3	Handshake IN
4	Handshake OUT
7	Rx+, CL
9	Rx-, CL
10	Tx-, CL
12	DATA OUT, RS232C
13	GND
15	Tx+, CL
11+14	"Print/Transfer", IN

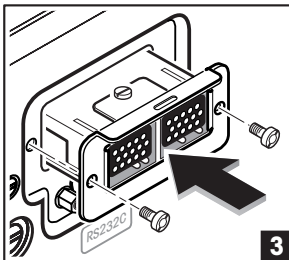
## 2.3 Installation of the MiniMettler interface



Before installing the MiniMettler interface, the balance must be removed from the power, by taking the power cable out of the AC socket (1).

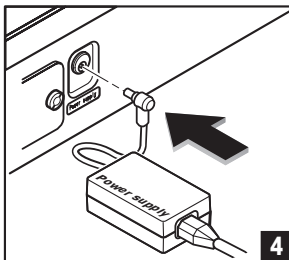


Remove the cover of the interface slot, using a screwdriver (2).



The MiniMettler interface can now be installed by sliding it into the open slot (3).

Use the screws of the cover plate, to fixate the interface.

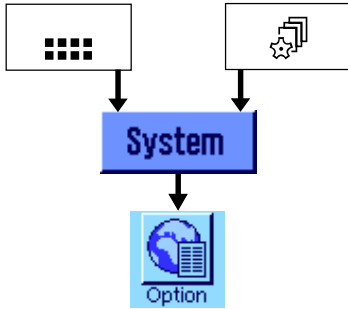


Connect the balance back to the power (4).

### 3 Interface and Application settings

Before you can establish a connection , you must configure the MM option in the balance. The MM option is configured using the system setting "Option" of the balance software. This section gives an overview of all parameters. Information about each parameter is found in section 5.3.

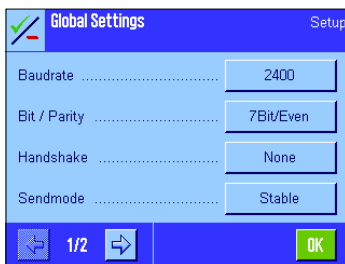
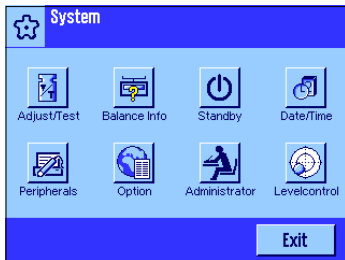
#### 3.1 Calling up the configuration menu in Option



Press button «**....**» to select the application menu or press button «**☆**» to select the user settings menu.

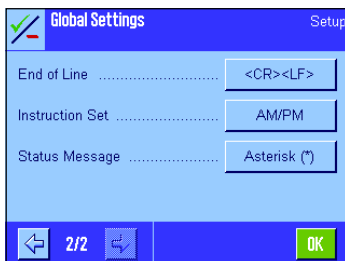
Then click on «**System**», to call up the system settings.

From system settings, click on «**Option**». Then configuration menu (Global Settings) is displayed. It includes the following settings:



**Default setting:** "MM-Option"

2400 baud, 7 bit/even, Handshake None, Sendmode Stable, end of line character <CR><LF>, Instruction Set AM/PM, Status Message Asterisk (\*)



Status Message is not relevant with Host setting, but only with Printer setting in "Dynamic Weighing application". (See section 3.3)

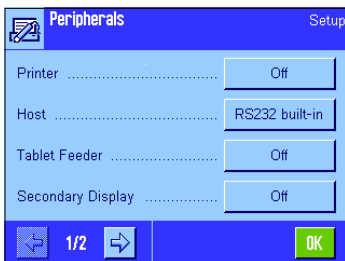
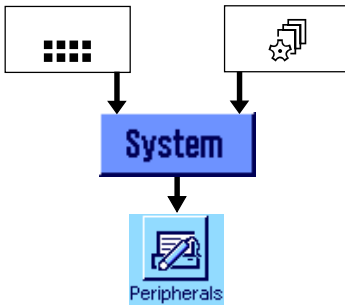


Once MM option was selected in "Host" or "Printer" in Peripherals (see section 3.2 and 3.3), those parameters cannot be changed.

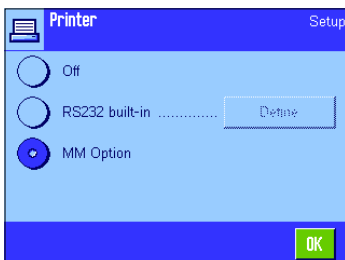
## 3.2 Configuring and activating MM connection in Host

### Overview

The MiniMettler parameters listed are only available with Host, all other peripherals are not supported (Except Printer in the "Dynamic Weighing Application". See section 3.3).



Press «Host».

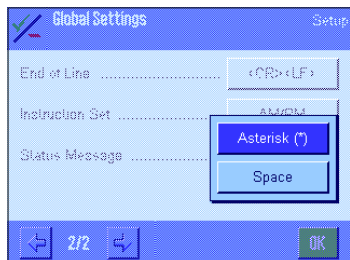


Select «MM Option».

### 3.2 Configuring and activating MM connection in Printer (only the data output for Dynamic Weighing application)

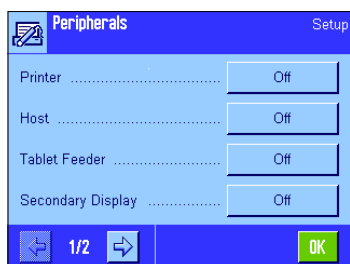
#### Overview

If you need PM backward compatibility with XP/XS balance in Dynamic Weighing application, the following configuration in Printer is necessary.

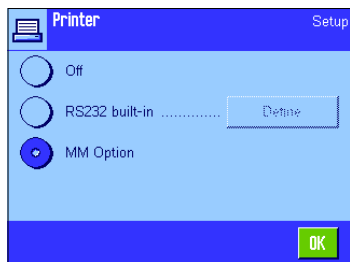


#### Status Message

In the Global Settings (See section 3.1), chose «Asterisk (\*)» or «Space», according to the current system requirement.



Press «Printer»



Select «MM Option».



## 4 The MiniMettler interface

### 4.1 Differences between the original interface and the MiniMettler optional interface

The technical differences between the original interface and the optional AM/PM interface for Excellence balances are listed below. **Detailed comparison can be found in sections 5.1 and 5.2.**

- No galvanic isolation of the signals (applies to both current loop and RS232 signals).
- No connector for auxilliary displays or GM54 output mode.
- No status indicators (wave symbol, drop symbol) provided at the terminal.
- The Excellence terminals are not operating with the keys alone, but mainly via the touch screen.
- Processes of long duration can only be cancelled at the balance terminal.
- Commands continue to be accepted during the balance configuration and adjustment (calibration) processes.
- The stability detector can no longer be set manually, but is automatically optimized for every weighing process.
- Recognition of a break condition does not cause any change in the balance settings, i.e. a break does not cause the balance to be reset into the condition it was in before it was switched on.
- The "vibration adapter" function (wave symbol) is no longer provided. Balance measurement quality has now been defined, so that the "MI" command, which originally related to the former "vibration adapter", now applies to measurement quality.
- The "weighing process adapter" function (drop symbol) is no longer provided. Balance weighing mode has now been defined, so that the "ML" command, which originally related to the former "weighing process adapter", now applies to weighing mode.
- DataPac-M is not supported
- GM devices are not supported
- The changes mean that the following commands now have no effect. They continue to be accepted by the optional PC board's software without an error message being given, but not all of them elicit a response (as was the case with the original interface). They are therefore not documented any further in these instructions:

AM/PM: MA, W

AT/MT: CFE, CFG, DFR, CFW, DST, DSX, MD, RK, RX, W, @, `.'

- The following commands have not been changed, and can therefore be used exactly as before:

AM/PM: M, B, MZ, S, SI, SIR, SNR, SR, T, TI

AT/MT: CA, CFD, EC, EOL, HS, MT, S, SI, SIR, SNR, <crLf>, AD, R0, R1, B, M, MZ, T

- All other commands have been adapted as far as possible to suit the new capabilities offered by Excellence balances. When using them, these operating instructions must be consulted to see exactly whether the same command arguments are valid and what the significance of the balance's responses is:

AM/PM: CA, D, DX, DY, ID, MI, ML, MS, U

AT/MT: CFG, CFP, D, DB, DX, DY, RG, U, US, UX, WI, MI, ML, MS, ID, IDX, ?

**10****4.2 AM/PM balance supported commands**

<b>B</b>	Base	<b>MZ</b>	AutoZero
<b>CA</b>	Calibration	<b>S</b>	Send Stable Result
<b>D</b>	Display Text	<b>SI</b>	Send Immediate Result
<b>DX</b>	Control DeltaTrac Display	<b>SIR</b>	Send Continuously
<b>DY</b>	Weighing-in	<b>SNR</b>	Send Automatically
<b>ID</b>	Balance Identification	<b>SR</b>	Send Automatically with Threshold
<b>M</b>	Mode Reset	<b>T</b>	Tare
<b>MA</b>	Switching on/off weighing-in aid	<b>TI</b>	Immediate taring
<b>MI</b>	Weighing quality	<b>U</b>	Select Unit or Divisor
<b>ML</b>	Weighing Mode	<b>W</b>	Controlling peripherals from the balance
<b>MS</b>	Stability detection		

**4.3 AT/MT balance supported commands**

<b>AD</b>	AutoDoor	<b>MS</b>	Stability Detector (ASD)
<b>B</b>	Base	<b>MT</b>	Serial Transmission Mode
<b>CA</b>	Calibration	<b>MZ</b>	AutoZero
<b>CFD</b>	Set Default Configuration	<b>RG</b>	Range Select
<b>CFP</b>	Print Configuration	<b>R n</b>	Keyboard Control (Global)
<b>D</b>	Display Text	<b>S</b>	Send Stable Result
<b>DB</b>	Generate Beep Sound	<b>SI</b>	Send Immediate Result
<b>DX</b>	Control DeltaTrac Display	<b>SIR</b>	Send Continuously
<b>DY</b>	Weighing-in	<b>SNR</b>	Send Automatically
<b>EC</b>	Command Acknowledge	<b>SR</b>	Send Automatically with Threshold
<b>EOL</b>	End-of-Line Mode	<b>T</b>	Tare
<b>HS</b>	Handshake Mode	<b>U</b>	Select Unit or Divisor
<b>ID</b>	Balance Identification	<b>US</b>	Select Active Unit
<b>IDX</b>	User Identification	<b>UX</b>	Redefine Units
<b>M</b>	Mode Reset	<b>WI</b>	Control Draft Shield
<b>MI</b>	Vibration Adapter ("Wave")	<b>?</b>	Help
<b>ML</b>	Weighing Process Adapter ("Drop")	<b>&lt;crLf&gt;</b>	Repeat Last Valid Command

## 5 Appendix

### 5.1 Comparison between AM/PM and AM/PM optional interface commands

AM/PM Command name	AM/PM remarks	XP/XS with MM remarks	XP/XS MT-SICS remarks
<b>Calibration</b>	CA	CA	C3 or C2
<b>Send Stable</b>	S	S	S
<b>Send Immediate</b>	SI	SI	SI
<b>Send Immediate and repeat</b>	SIR	SIR	SIR
<b>Send Next and Repeat</b>	SNR	SNR	SNR
<b>Send and Repeat</b>	SR [threshold]	SR [threshold]	SR [threshold]
<b>Display Text</b>	D text;unit;symbol	D text <i>no symbols or units</i>	D *text*
<b>DeltaTrac</b>	DX p1 DX p1 p2 DX p1 p2 T DX p1-p2 DX p1-p2 T DX T DX	DX p1 DX p1 p2 DX p1 p2 T DX p1-p2 DX p1-p2 T	P122 0 p1 p1 P122 0 p1 p2 P122 1 p1 p2 P123 0 p1 p2 P123 1 p1 p2
<b>Weigh in with DeltaTrac</b>	DY DY Nom pT mT	DY DY Nom pT mT	P120 P121 and M21
<b>Unit</b>	U	U	M21
<b>Redefine Units</b>	Ux	Ux	M22 and M21
<b>Write Output</b>	<i>W For GM54 and LV10</i>		
<b>Base</b>	B_x x = value B	B_x x = value B	TA_x_g TAC
<b>Resetting to default setting</b>	M	M	@ <i>only M01, M02, M03 &amp; M29</i>
<b>Off/on switching of weighing-in aid</b>	MA		
<b>Vibration adapter</b>	MI <i>back to default setting</i> MI 1 <i>stable</i> MI 2 <i>normal</i> MI 3 <i>unstable</i>	MI <i>back to default setting</i> MI 1 <i>stable</i> MI 2 <i>normal</i> MI 3 <i>unstable</i>	M02 2 <i>back to default setting</i> M02 1 <i>stable</i> M02 2 <i>standard</i> M02 3 <i>unstable</i>
<b>Weighing Process Adapter</b>	ML <i>back to default setting</i> ML 1 <i>dosing</i> ML 2 <i>universal</i> ML 3 <i>absolute</i> ML 4 <i>animal weighing</i>	ML <i>back to default setting</i> ML 1 <i>dosing</i> ML 2 <i>universal</i> ML 3 <i>absolute</i>	M01 0 <i>back to default setting</i> M01 1 <i>dosing</i> M01 0 <i>universal</i> M01 3 <i>check weighing</i>
<b>ASD</b>	MS <i>back to default setting</i> MS 1 <i>coarse</i> MS 2 <i>default</i> MS 3 <i>fine</i> MS 4 <i>very fine</i>	MS <i>back to default setting</i> MS 1 <i>coarse</i> MS 2 <i>default</i> MS 3 <i>fine</i> MS 4 <i>very fine</i>	M29 2 <i>back to default setting</i> M29 0 <i>very fast</i> M29 2 <i>reliable &amp; fast</i> M29 3 <i>reliable</i> M29 4 <i>very reliable</i>
<b>Auto Zero</b>	MZ <i>back to default setting</i> MZ 0 <i>off</i> MZ 1 <i>on</i>	MZ <i>back to default setting</i> MZ 0 <i>off</i> MZ 1 <i>on</i>	M03 1 <i>back to default setting</i> M03 0 <i>off</i> M03 1 <i>on</i>
<b>Tare</b>	T	T	Z Zero
<b>Immediate Taring</b>	TI	TI	ZI <i>Immediate Zero</i>
<b>Identification</b>	ID <i>example for answer:</i> <i>STANDARD V10.50.00*</i> <i>TYPE: PM 4800</i> <i>INR: k 24142</i>	ID <i>example for answer:</i> <i>MM-Option XP/XS V3.00</i> <i>TYPE: XP6002SDR</i> <i>INR: 1119292911</i>	I4 and I11

The information contained in this table has been collected to the best of our knowledge and represents the latest update. In addition, Mettler-Toledo GmbH will in no event be liable for consequences of any kind arising out of, or in connection with, the use of the this table.

\* The MM option covers only the functionality of "STANDARD V10.50.00" and has some functional limitation described in 4.1 "Difference between the original interface and the MiniMettler optional interface"

## 5.2 Comparison between AT/MT and AT/MT optional interface commands

### AT/MT versus XP with MiniMettler Option interface commands

AT/MT Command name	AT/MT remarks	XP with MM remarks	XP/XS MT-SICS remarks
<b>Autodoor</b>	AD_0 off AD_1 off AD_? current setting	AD_0 off AD_1 off AD_? current setting	M07_0 off M07_1 on
<b>Base</b>	B_x x = value B	B_x x = value B	TA_x_g TAC
<b>Calibration</b>	CA start CA_0 off CA_1 on CA_U external CA_? current setting CA_S status CA_T test	CA start CA_0 off CA_1 on CA_U external CA_? current setting CA_T test	C3 start CO_0_0 off CO_1_0 on CO_0_1 external CO current setting TST3 test
<b>Configuration Default</b>	CFD	CFD not the same	<seeML, MI, MZ, AD, MS & CA defaults> not the same
<b>Store configuration</b>	CFE	auto saved	
<b>Configuration access</b>	CFG	always allowed (1)	
<b>Configuration Print</b>	CFP	CFP not the same	
<b>Configuration Read</b>	CFR		
<b>Configuration Write</b>	CFW		
<b>Display Text</b>	D text;unit;symbol	D text no symbols or units	D "text"
<b>Beep</b>	DB DB_1 DB_2 DB_3 DB_C DB_E DB <Hex7> DB_0	DB DB_1 not the same DB_2 not the same DB_3 not the same DB_C not the same DB_E not the same DB <Hex7> not the same	M12_0 not the same M12_2 not the same M12_0 (2x) not the same M12_2, M12_3 not the same M12_0 not the same M12_0 not the same M12_0 not the same
<b>Display status</b>	DST	n/a = no icons	n/a = no icons
<b>Display select</b>	DSX		
<b>DeltaTrac</b>	DX p 1 DX p 1 p2 DX p 1 p2 T DX p 1-p2 DX p 1-p2 T DX T DX C DX	DX p 1 DX p 1 p2 DX p 1 p2 T DX p 1-p2 DX p 1-p2 T DX C DX	P122 0 p1 p1 P122 0 p1 p2 P122 1 p1 p2 P123 0 p1 p2 P123 1 p1 p2 P120 P120
<b>Weigh in with DeltaTrac</b>	DY DY Nom p T mT DYB	DY DY Nom p T mT DY and B 2 commands	P120 P121 and M21 P121 and TA
<b>Command Acknowledge</b>	EC	EC	
<b>End of Line mode</b>	EOL_CR EOL_CRLF EOL_? current setting	EOL_CR EOL_CRLF EOL_? current setting	
<b>Handshake mode</b>	HS_hard HS_soft HS_Pause HS_CL HS_off HS_? current setting	HS_hard HS_soft HS_Pause HS_CL HS_off HS_? current setting	
<b>Identification</b>	ID	ID not the same	I11
<b>Extended identification</b>	IDX	IDX	I10 is balance ID
<b>Immediate Taring</b>	TI	TI 10 instead 7 characters	Z1 Immediate Zero
<b>Reset mode</b>	M	M	<see, ML, MI, MZ, MS & MT defaults> not the same
<b>Readout increment</b>	MD		

<b>AT/MT Command name</b>	<b>AT/MT remarks</b>	<b>XP with MM remarks</b>	<b>XP/XS MT-SICS remarks</b>
<b>Vibration adapter</b>	MI_1 <i>stable</i> MI_2 <i>normal</i> MI_3 <i>unstable</i> MI default MI_? <i>current setting</i>	MI_1 <i>stable</i> MI_1 <i>normal</i> MI_1 <i>unstable</i> MI default MI_? <i>current setting</i>	M02_1 <i>stable</i> M02_2 <i>standard</i> M02_3 <i>unstable</i> M02_2 M02 <i>current setting</i>
<b>Weighing Process Adapter</b>	ML_0 <i>no adaption</i> ML_1 <i>dosing</i> ML_2 <i>universal</i> ML_3 <i>absolute</i> ML default ML_? <i>current setting</i>	ML_0 <i>no adaption</i> ML_1 <i>dosing</i> ML_2 <i>universal</i> ML_3 <i>absolute</i> ML default ML_? <i>current setting</i>	M01_2 <i>sensor mode</i> M01_1 <i>dosing</i> M01_0 <i>universal</i> M01_3 <i>checkweighing</i> M01_0 M01 <i>current setting</i>
<b>ASD</b>	MS_0 <i>ASD off</i> MS_1 <i>ASD 1</i> MS_2 <i>ASD 2</i> MS_3 <i>ASD 3</i> MS_4 <i>ASD 4</i> MS_5 <i>ASD 5</i> MS_6 <i>ASD 6</i> MS_7 <i>ASD 7</i> MS default MS_? <i>current setting</i>	MS_0 <i>ASD off</i> MS_1 <i>ASD 1</i> MS_2 <i>ASD 2</i> MS_3 <i>ASD 3</i> MS_4 <i>ASD 4</i> MS_5 <i>ASD 5</i> MS_6 <i>ASD 6</i> MS_7 <i>ASD 7</i> MS default MS_? <i>current setting</i>	M29_0 <i>very fast</i> M29_0 <i>very fast</i> M29_1 <i>fast</i> M29_2 <i>reliable + fast</i> M29_2 <i>reliable + fast</i> M29_3 <i>reliable</i> M29_4 <i>very reliable</i> M29_4 <i>very reliable</i> M29_2 M29 <i>current setting</i>
<b>Transmission mode</b>	MT_Stb MT_all MT_Auto MT_Cont MT default MT_? <i>current setting</i>	MT_Stb MT_all MT_Auto MT_Cont MT default MT_? <i>current setting</i>	K, S K, SI K, SNR K, SIR K, S
<b>Auto Zero</b>	MZ_0 <i>off</i> MZ_1 <i>on</i> MZ default MZ_? <i>current setting</i>	MZ_0 <i>off</i> MZ_1 <i>on</i> MZ default MZ_? <i>current setting</i>	M03_0 <i>off</i> M03_1 <i>on</i> M03_1 M03 <i>current setting</i>
<b>Range Select</b>	RG_F <i>1d</i> RG_C <i>10d</i> RG toggle RG_? <i>current setting</i>	RG_F <i>1d</i> RG_C <i>10d</i> RG toggle RG_? <i>current setting</i>	M23_0 <i>1d</i> M23_1 <i>10d</i>  M23 <i>current setting</i>
<b>Restrict Keyboard</b>	RK_xxxxxxx		
<b>Remote</b>	R0/R1	R0/R1	K4/K2
<b>Restrict external Switches</b>	RK_xxxxxxx		
<b>Send Stable</b>	S	S	S
<b>Send immediate</b>	SI	SI	SI
<b>Send immediate and repeat</b>	SIR	SIR	SIR
<b>Send Next and repeat</b>	SNR	SNR	SNR
<b>Send and repeat</b>	SR[threshold]	SR[threshold]	SR[threshold]
<b>Tare</b>	T	T	Z Zero
<b>Unit</b>	U U<dec>	U U<dec>	M21 M21, M22 <i>Important: Custom Unit1 has to be activated</i>
<b>Unit switch</b>	US_1 <i>activate unit 1</i> US_2 <i>activate unit 2</i> US toggle US_? <i>current setting</i>	US_1 <i>activate unit 1</i> US_2 <i>activate unit 2</i> US toggle US_? <i>current setting</i>	M21_1_x M21_1_x M21_1_x
<b>Redefine Units</b>	UX	UX	M21
<b>Redefine Units</b>	UX [U1][:U2] <i>define unit1 and/or unit2</i> UX toggle UX_? <i>current setting</i>	UX [U1][:U2] <i>define unit1 and/or unit2</i> UX toggle UX_? <i>current setting</i>	M21_1_x M21_1_x
<b>Write Output</b>	W <i>For GM54 and LV10</i>		

The MM option has some functional limitation described in 4.1 "Difference between the original interface and the MiniMettler optional interface"

<b>AT/MT Command name</b>	<b>AT/MT remarks</b>	<b>XP with MM remarks</b>	<b>XP/XS MT-SICS remarks</b>
<b>Draft shield, controlling auto door</b>	WI_0[_R/L] <i>opens the doors (to the right/left)</i>	WI_0[_R/L] <i>opens the doors (to the right/left)</i>	WS_1 <i>opens the doors</i>
	WI_1 <i>close the doors</i>	WI_1 <i>close the doors</i>	WS_0
	WI_D		
	WI_DF		
	WI_DX		
	WI_E		
	WI_EF		
WI_EX			
WI <i>toggle</i>	WI <i>toggle</i>	WS	
WI_? <i>current status</i>	WI_? <i>current status</i>		WS
<b>Break</b>	@		
<b>Help</b>	? <i>overview of all commands</i>	? <i>overview of all commands</i>	
<b>Cancel</b>	.		
<b>Repeat command</b>	<crff>	<crff>	

The information contained in this table has been collected to the best of our knowledge and represents the latest update. In addition, Mettler-Toledo GmbH will in no event be liable for consequences of any kind arising out of, or in connection with, the use of the this table.

### 5.3 Parameters

<b>MiniMettler</b>	<b>Factory setting</b>	<b>Setting range</b>
Baudrate	2400	600, 1200, 2400, 4800, 9600
Bit/Parity	7b-even	7b-even, 7b-odd, 7b-mark (no parity / 2 stopbits), 8b-space (no parity / 1 stopbit)
Handshake	None	None (Pause = 0), RTS/CTS (= Hardware Handshake), Xon/Xoff (Software Handshake), Pause 1, CL (Syn/Ack) (Mettler Toledo Handshake)
Sendmode	Stable	Stable, All, Auto, Continues
End-of-Line	<CR><LF>	<CR><LF>, <CR>
Instruction Set	AM/PM	AM/PM, AT/MT
Status Message	Asterisk (*)	Asterisk (*), Space

### 5.4 Technical Data

<b>MiniMettler interface Option</b>	15-Pin Data I/O connector (no GM bus) Maximum 6 updates/second of AM/PM and 4 for AT/MT commands Universal interface Option for Excellence and Excellence Plus balances
<b>Possible applications</b>	Replacement of AM/PM & AT/MT balances in systems and applications, using AM/PM & AT/MT interface commands (DataPac is not supported)
<b>Part number</b>	
AM/PM MiniMettler Option for Excellence balances	11132510
<b>Accessories</b>	
MiniMettler-RS232 cable, 9-Pin female, 1.5 m	210493
MiniMettler-RS232 cable, 25-Pin female, 1.5 m	210491
MiniMettler-CL cable, 9-Pin female, 1.5 m	47936



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\* P 1 1 7 8 0 5 7 8 \*

Subject to technical changes and to changes in the accessories supplied with the instruments.