Instructions for installation and operation

METTLER TOLEDO
WMH-Ex weighing platforms

METTLER TOLEDO

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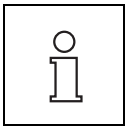
Signs and symbols used in these instructions

Warning.

Always observe the warnings to avoid faults or hazards and to ensure correct functioning.



Valuable additional information, notes, or tips.

→	Right-hand arrow before a term or a section number: refer to this term or section number.
☞	Action, measure, setting, command input, etc.
1., 2. …	Multi-step measures are numbered.
/	In interface commands, this character signifies a space (20 hex).
italic	Words and expressions in *italics* are explained in the → Glossary (section 9.1).

1 Introducing the WMH-Ex line weighing platforms

1.1 Introducing the WMH-Ex weighing platforms

The WMH-Ex weighing platforms are high-resolution weighing instruments suitable for installation in automated production and testing equipment in hazardous environments from Zone 1 on.

The WMH-Ex weighing platforms correspond to the tried-and-true METTLER TOLEDO K...x line with regard to mechanical functioning and hardware. The software, on the other hand, was derived from the MODULO WM weighing modules or WMH weighing platforms developed for the automation industry. This allows optimum configuration of the WMH-Ex weighing platforms to customer-specific requirements and the easy direct connection to process control systems.

Thanks to their exceptionally fast response to changes in weight, the weighing platforms are suitable for accurate weight control and for precise dispensing to a specified target weight. The MonoBloc technology by METTLER TOLEDO used in the weighing cells guarantees outstanding ruggedness and long service life. The built-in adjustment weight permits automatic *adjustment* and accuracy testing without manual intervention, and ensures utmost weighing accuracy and *long term stability*.

The WMH-Ex weighing platforms are connected to the APS768x power supply unit via the Current Loop interface. The ACM200 communication module enables connection to a PC or a PLC.

1.2 Summary of main characteristics

1.2.1 Weighing performance

- High-resolution weighing platforms with up to 300,000 measurement points
- Built-in weight for *adjustment* or accuracy test with no manual intervention
- Switch-on, adjustment and test also possible with *preload*
- No preload adjustment required
- Readability, weighing mode, filter settings, and stability criteria can be set via interfaces

1.2.2 Mechanical features

- Exceptionally rugged thanks to METTLER TOLEDO MonoBloc weighing cell technology
- Compact, stainless steel housing containing weighing cell and electronics, easy to clean

1.2.3 Interfaces and connections

- Current loop (CL) by WMH-Ex; RS232, RS422/RS485 by ACM200 communication module
- Comprehensive set of commands for optimum adaptation to the application and the environmental conditions
- Power supply via the APS768x power supply unit
- Connection via a D-Sub 9-pin plug for the interfaces RS232 and RS422/RS485 or via a 7-pin round plug for the current loop interface
- Auxiliary display connected via RS232; IND690 and IND780 can be connected via RS232 or RS422 to ACM200.

1.2.4 Approvals

	ATEX	FM
Ignition protection type	II 2 GD −10 °C < Ta < +40 °C	Class I, II, III Division 1 Groups A – G
IP protection type	IP66/67	...

1.3 Safety notes

1.3.1 General safety notes

- Only use the WMH-Ex weighing platforms in enclosed (indoor) spaces.
- The electronics and measuring cell of the WMH-Ex weighing platforms are only protected against penetration of liquids and dust if the original parts are used.
- Switch off the power source or disconnect the weighing platform from the system before you build it in or modify it.
- Do not open the WMH-Ex weighing platforms. If you ever have problems with your weighing platform, please contact your METTLER TOLEDO adviser or your supplier (→ 6.2, Page 28).

1.3.2 Safety precautions for operation in hazardous areas

There is an increased risk of injury and damage when the WMH-Ex weighing platforms are used in hazardous areas.

Special care must be taken when working in such hazardous areas. The rules for behaviour are based on the concept of "Safe Distribution" established by METTLER TOLEDO.

Competence

- The WMH-Ex weighing platforms may only be installed, maintained and repaired by authorised METTLER TOLEDO service personnel.

Ex approval

- No modifications may be made to the terminal and no repair work may be performed on the modules. Any weighing platform or system modules that are used must comply with the specifications contained in the installation instructions. Non-compliant equipment jeopardises the intrinsic safety of the system, cancels the "Ex" approval and renders any warranty or product liability claims null and void.
- The safety of the weighing system is only guaranteed when it is operated, installed and maintained in accordance with the respective instructions (→ 1.6, Page 8).
- Also comply with the following:
  - regulations and standards in the respective country
  - the statutory requirement for electrical equipment installed in hazardous areas in the respective country
  - all instructions related to safety issued by the owner
- The explosion-protected weighing system is to be checked to ensure compliance with the requirements for safety before being put into service for the first time, following any service work and every three years, at least.

Operation

- Prevent the build-up of static electricity. Always wear suitable working clothes when operating or performing service work in an hazardous area.
- Do not use protective hoods.
- Remove any protective film from the load plate before the initial start-up.
- Avoid causing damage to the weighing platforms.

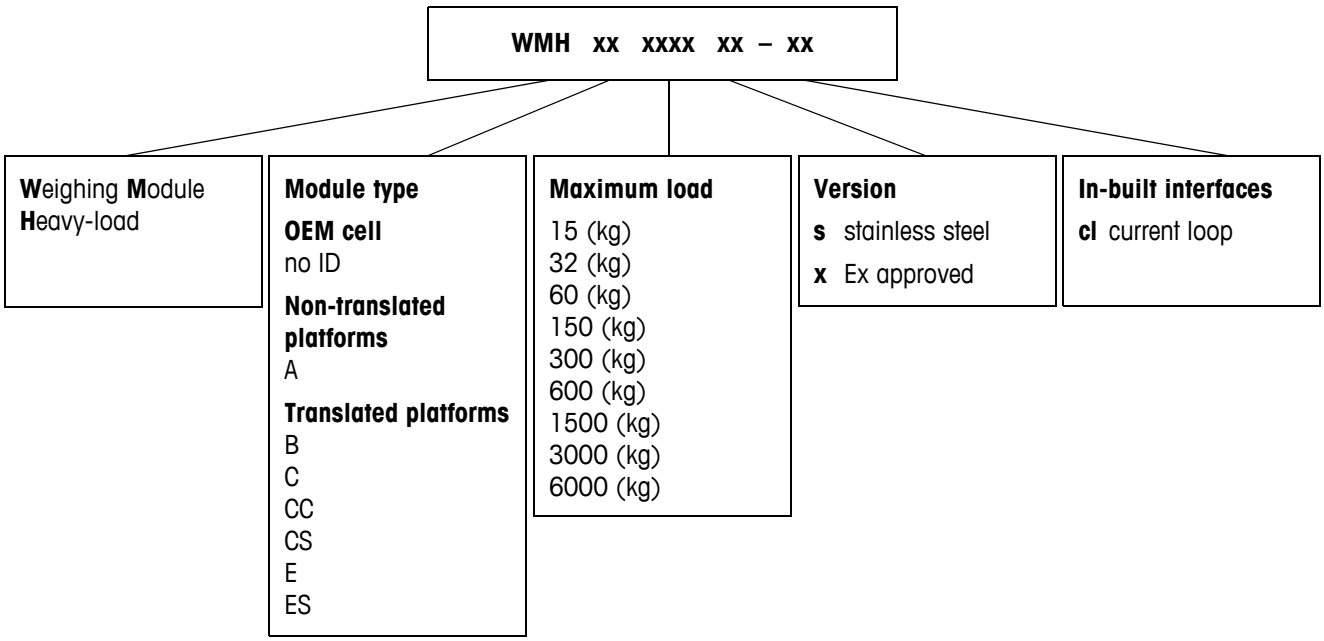
Installation

- Only install or perform maintenance work on the weighing system in the hazardous areas if the following conditions are fulfilled:
  - the owner has issued a permit ("spark permit" or "fire permit")
  - the area has been rendered safe and the owner's safety co-ordinator has confirmed that there is no danger
  - the necessary tools and any required protective clothing are provided (danger of the build-up of static electricity)
- The certification papers (certificates, manufacturer's declarations) must be present.
- Lay cables in such a way that they are protected from damage.
- Only route cables into the housing of the system modules via the suitable cable coupler and ensure proper seating of the seals.

1.4 Meaning of the type designation

You can identify the properties of your weighing platform using the type designation on the type plate. The designation code is easy to figure out.

The type designation of the WMH-Ex weighing platforms always contains the specification of the current loop interface. The ACM200 converts the connectivity to RS232 and RS422/RS485 (in the safe zone).



Examples

WMH32sx-cl Weighing module for OEM use or repair. Not installed in a platform or scale.
Maximum load: 32 kg, made of stainless steel, Ex approved, with current loop interface

WMHA32sx-cl Weighing platform without transmission, with maximum load of 32 kg, made of stainless steel, Ex approved, with current loop interface

WMHB60sx-cl Weighing platform with transmission, with maximum load of 60 kg, made of stainless steel, Ex approved, with current loop interface

1.5 Compatibility with products of the K...x line

All mechanical and electrical properties of the WMH-Ex weighing platforms are identical to those of the respective products of the K line. See table below. The WMH-Ex weighing platforms differ only with regard to software. It is not possible to download the software of the WMH-Ex line in a TBrick..-Ex weighing cell.

Unlike the K line, WMH-Ex weighing platforms feature the following properties:

- Easy communication and a multitude of setting options via the use of the METTLER TOLEDO Standard Interface Command Sets (MT-SICS)
- Direct connection without a weighing terminal

WMH-Ex weighing platforms are suitable for automated applications with direct connection to a PLC.

	Part No.	WMH-Ex weighing platforms	K...x line
OEM cells	42 102 045	WMH15sx-cl	TBrick 15-Ex
	42 102 046	WMH32sx-cl	TBrick 32-Ex
Weighing platforms	42 102 047	WMHA15sx-cl	KA15sx-T4
	42 102 048	WMHA32sx-cl	KA32sx-T4
	42 102 049	WMHB60sx-cl	KB60sx-T4
	42 102 050	WMHCC150sx-cl	KCC150sx-T4
	42 102 051	WMHCC300sx-cl	KCC300sx-T4
	42 102 052	WMHCS300sx-cl	KCS300sx-T4
	42 102 053	WMHCS600sx-cl	KCS600sx-T4
	42 102 054	WMHC300sx-cl	KC300sx-T4
	42 102 055	WMHC600sx-cl	KC600sx-T4
		Additional products available on request	

1.6 Initial start-up

1.6.1 System configuration

A WMH-Ex weighing platform can be connected to the ACM communication module (safe area) via the power supply unit APS768x (hazardous area), just as a K...x weighing platform. The following components are required for this:

Component	Description		ME number
WMH-Ex weighing platform	Weighing platform **with** connection cable, see Table (→ 1.5, Page 7)		
WMH-Ex OEM cell	Weighing platform **without** connection cable, see Table (→ 1.5, Page 7)		
Attached cable	Length: 0.3 m; integral part of the weighing platform; Cable is integrated to the weighing platform, but the other end is open and has to be connected to the terminal box.		
Terminal box	Included in the delivery content of the weighing platform		
6-wire Ex-i cable	Length: 5 m; included in the delivery content of the weighing platform; both ends of the cable are open and have to be connected to the terminal box and APS768x power supply unit.		
APS768x power supply unit	Power supply unit in hazardous area; available for 3 mains voltage levels	120 V [1]	22 021 261 **&** 22 023 337 [2]
		230 V	22 021 262 **&** 22 023 337 [2]
		100 V [3]	22 021 263 **&** 22 023 337 [2]
4-wire Ex-i cable	Length: 10 m; included in the delivery content of the ACM200 communication module; both ends of the cable are open and have to be connected to the APS768x power supply unit and ACM200 communication module		
ACM200 communication module	Communication module in safe area, available with AC/DC feed-in & RS232/RS422 data interface	AC feed-in RS232	22 016 767
		AC feed-in RS422	22 016 767 & 22 023 348 [4]
		DC feed-in RS232	22 023 347
		DC feed-in RS422	22 023 347 & 22 023 348 [4]
Data communication cable for the RS232 data interface	Length: 10 m; included in the delivery content of the ACM200 communication module		
Data communication cable for RS422 interface	Data dommunication cable has to be defined and provided by the end user. Required outer cable diameter is 4–8 mm		

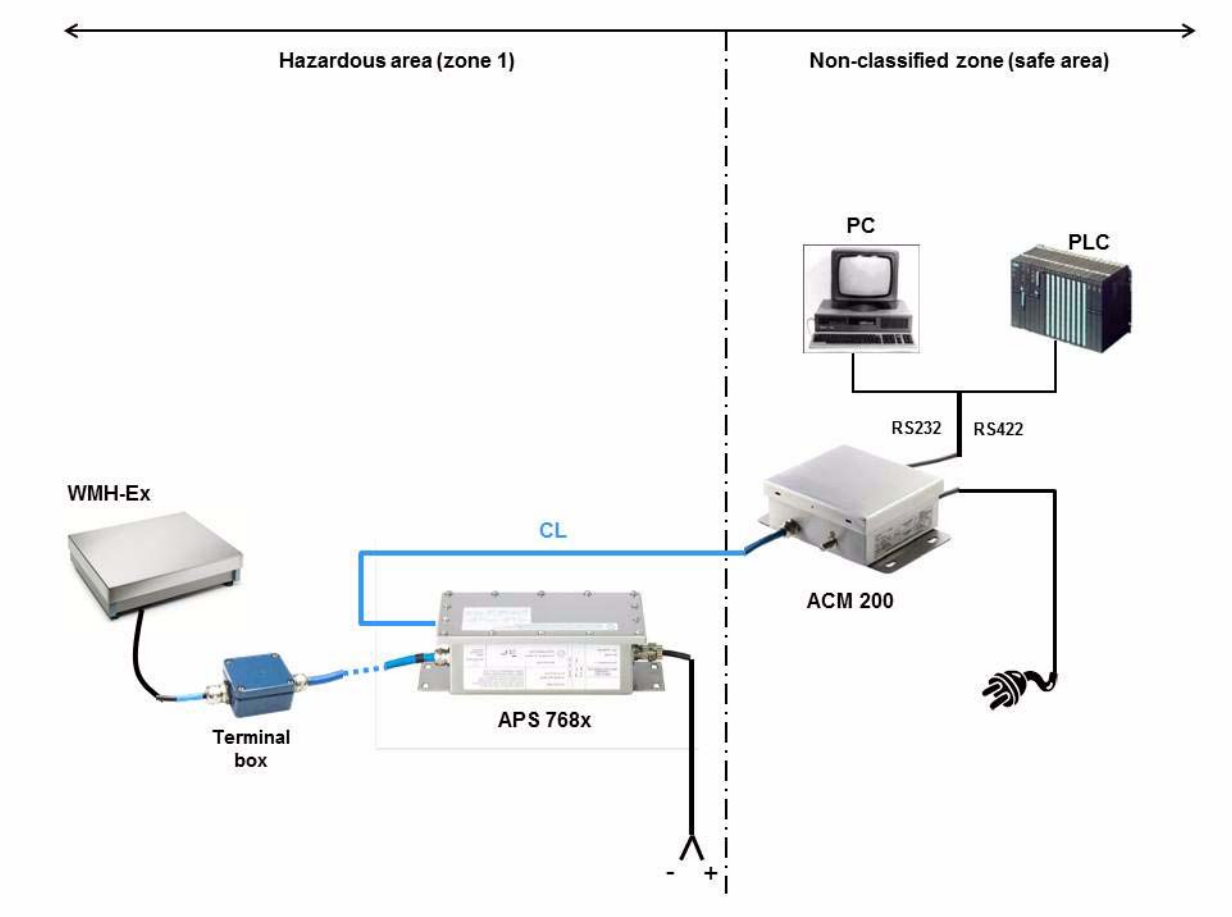
[1] This version is available for the US market. Power connection cable has to be defined and provided by the end user.

[2] Additional CL interface for the communication with the ACM200 communication module in the safe area.

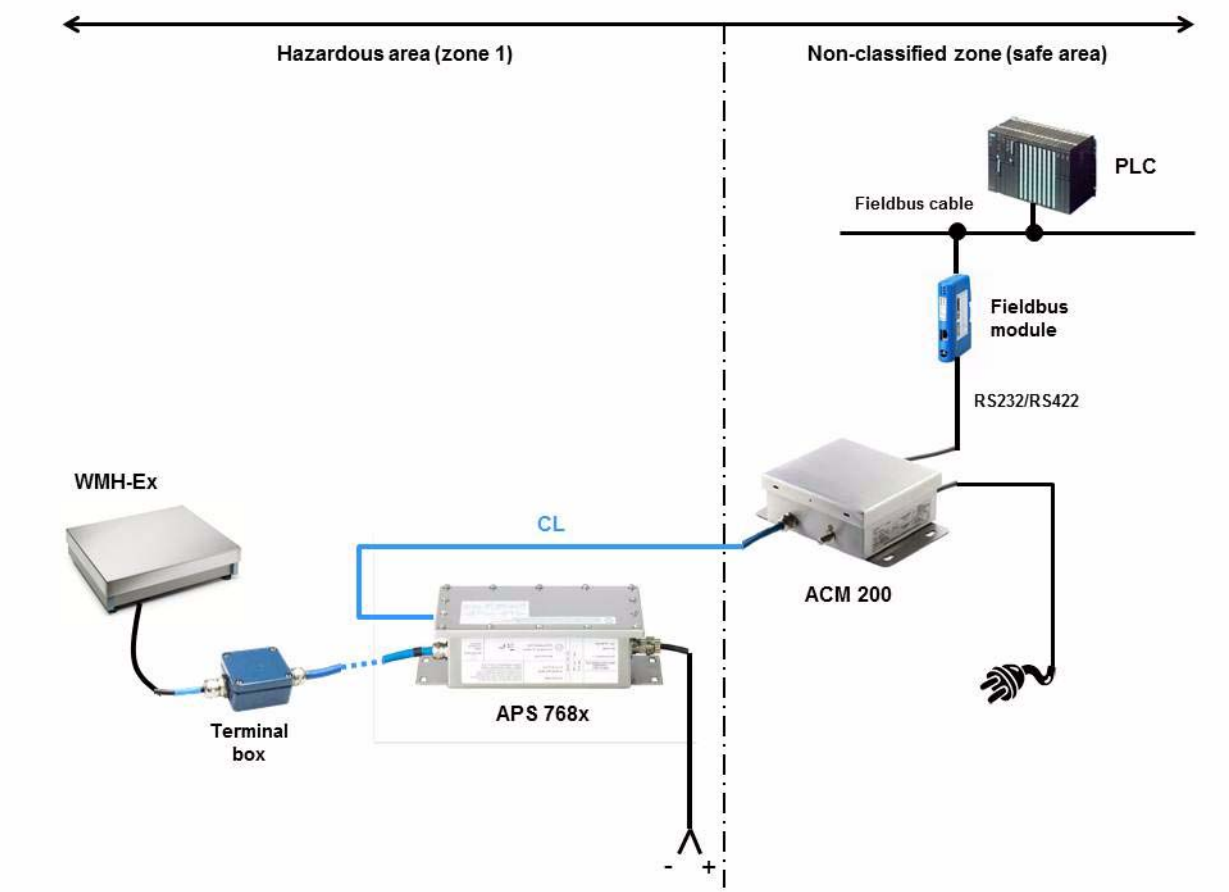
[3] This version is only available for the Japanese market.

[4] This order number has to be used in addition to the base order number in order to equip ACM200 with a RS422 interface in addition to the standard RS232 interface.

1.6.2 Connection options with RS232/RS422 to PC or PLC



1.6.3 Connection options with Fieldbus module and PLC

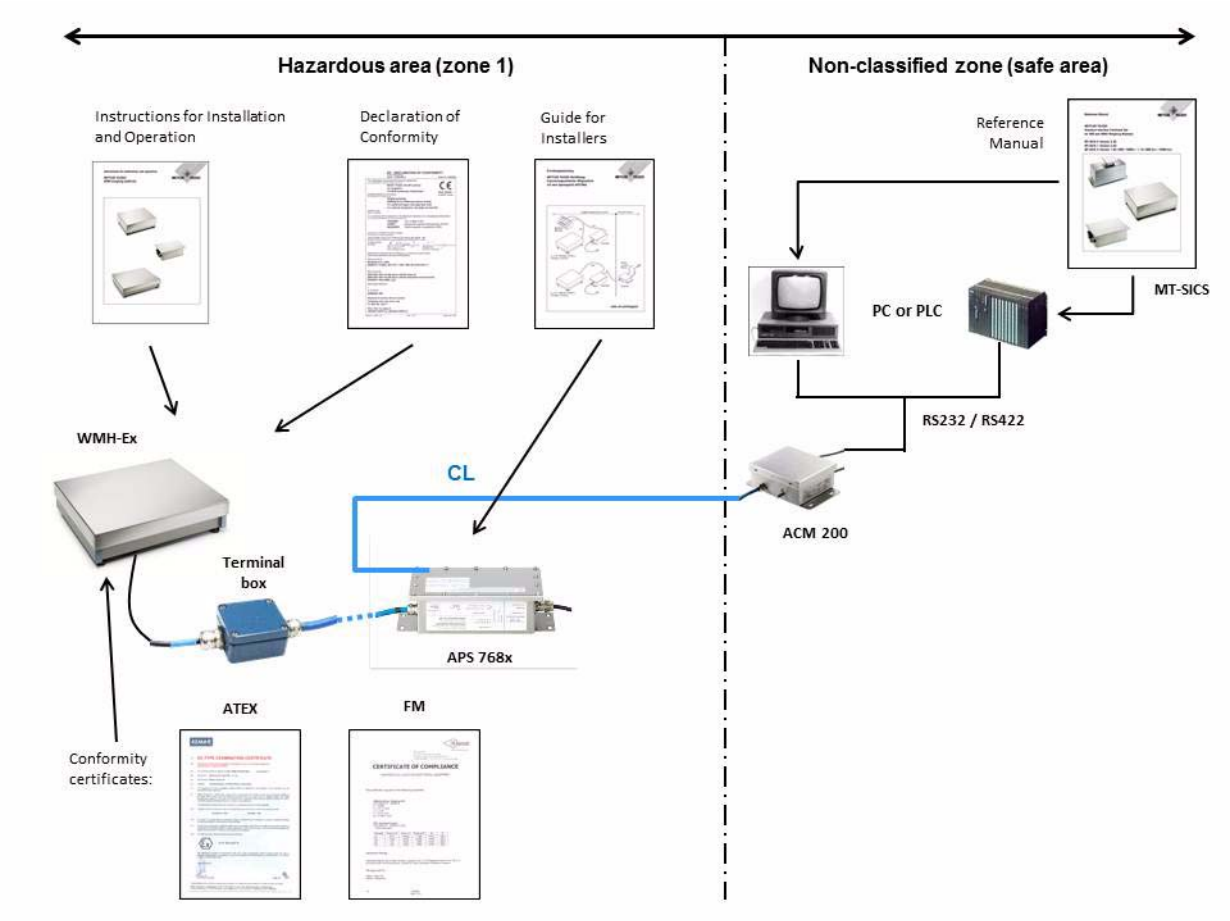


1.7 Documentation overview

1.7.1 Documentation description

Ref.	Document	Products	ME number	Content
[0]	Instructions for installation and operation	WMH-Ex weighing platforms	42 909 027	Specific properties of the WMH-Ex series as opposed to the K line (higher-level document)
[1]	Installation information	Table and stand scales for hazardous areas KA15sx-T4 to KCC300..x-T4	22 006 743	Safety and installation information Configuration options Planning assemblies Dimensions of K-line products. All safety precautions are also valid for the corresponding products of the WMH-Ex series (→ 1.5, Page 7)
[2]	Installation information	Floor scales/Pit scales for hazardous areas KC300..x-T4 to KN1500..x-T4	22 006 746	
[3]	Operating instructions	Table and stand scales for hazardous areas KA15sx-T4 to KCC300..x-T4	22 006 731	Safety precautions General information Operating limits Cleaning regulations Standard accessories for K-line products. All safety precautions are also valid for the corresponding products of the WMH-Ex series (→ 1.5, Page 7)
[4]	Operating instructions	Floor scales/Pit scales for hazardous areas KC300..x-T4 to KN1500..x-T4	22 006 737	
[5]	Guide for installers	Explosion-proof weighing system with APS768x power supply unit	22 021 223	Safety precautions System overview Installation Fabricating cables Connecting a barcode reader Installing a CL/CL interface Technical data Control drawing
[6]	Reference manual	Standard Interface Command Set for WM and WMH weighing modules	42 101 959	Description of the standardised command set "METTLER TOLEDO Standard Interface Comand Set" (MT-SICS)
[7]	CE Declaration of Conformity	WM, WMH, and WMH-Ex weighing modules	42 101 996	Declaration of Conformity Conformity Certificate

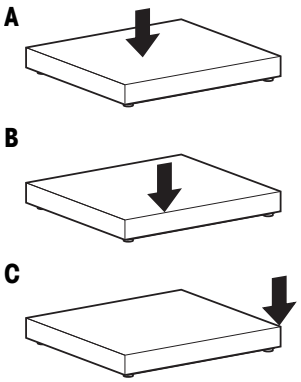
1.7.2 Connections between the individual documents



1.8 Items delivered

- WMH-Ex... weighing platform including 5 m EX-cable
- CD-ROM with product documentation, commissioning software, "WM_e-Loader"
- Instructions for installation and operation (this document)
- Documents [1] to [7] (→ 1.6, Page 8)

1.9 Operating limits



The weighing platform has such a rugged design that no damage should result if the maximum weighing capacity is occasionally exceeded.

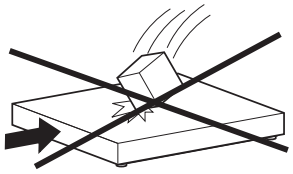
The static load-bearing capacity, i. e., the maximum permissible load, is dependent on the type of loading (positions A – C).

	WMHA15sx WMHA32sx	**WMHB60sx**	**WMHCC150sx WMHCC300sx**	**WMHC300sx WMHCS300sx**	**WMHC600sx WMHCS600sx**
A	50 kg	120 kg	500 kg	500 kg	1000 kg
B	40 kg	80 kg	300 kg	330 kg	650 kg
C	30 kg	40 kg	150 kg	165 kg	330 kg

A with central load

B with side load

C with one-sided corner load



- Avoid falling loads, shocks and lateral impacts.

2 Important instructions for mechanical installation of the weighing platform

The performance of your weighing platform is heavily dependent on the environmental conditions, the equipment used to carry the weighing sample, as well as other external influences.

In this chapter you will receive valuable tips for creating the best possible conditions for maximum weighing performance.

2.1 Relationship between accuracy, weighing time, and environment

The WMH weighing platform is designed so that under good conditions it can record a weight very exactly and rapidly and transmit the results over a built-in interface.

The *weighing time*, i. e. the time between loading the weight and obtaining a valid weighing result, depends directly on the desired measuring accuracy as well as on external influences such as shocks and vibrations acting on the weighing platform, or air movements close to the weighing plate.

- The higher the accuracy or *repeatability* required, the longer the weighing time.
- The stronger the external influences, the more they must be eliminated by filter damping (→ 4.5, Page 19), which makes the *weighing time* longer.

To guarantee fast and precise weighing results, especially if the weighing platform is integrated into production and testing equipment, the concept for installing must be worked out with care. The smaller the minimum change in weight that must still be recorded, the more important it is to observe the instructions in the next section.

2.2 Installation instructions

The information for the proper installation of the scale is contained in the installation instructions of the K line, i. e. documents [1] and [2] (→ 1.6, Page 8).

3 Electrical connection, functions of the interfaces

3.1 General

WMH-Ex weighing platforms are only equipped with one data interface. All data must be exchanged between the weighing platform and the system via ACM200 communication module over an RS232, RS422, RS485 or current loop (CL) interface.

You can set the communication parameters (baud rate, number of data and stop bits, etc.) by means of the corresponding commands (→ 4.2, Page 17).

Since by definition only two devices can exchange data with each other across an RS-232 interface, for maintenance, tests, downloads, etc. the data connection to the system must be temporarily interrupted.

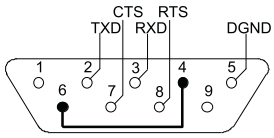
We recommend using standard D-Sub 9 plug-in connections for the RS232, RS422 and RS485 interfaces.

3.2 Downloading new firmware with the "WM e-Loader" program

The firmware of your weighing platform is stored in a re-writable memory. It is therefore possible to download different, new, or application-specific firmware into the weighing platform at a later date. Downloading always takes place via the RS-232 interface. The "WM e-Loader" program required for downloading is delivered with your weighing platform on a CD-ROM. The "WM e-Loader" must first be installed on the hard disk of a PC which has the Windows operating system.

For instructions how to install the "WM e-Loader" program and download firmware, please refer to the "WMH e-Loader_HELP" document on the CD-ROM.

For the "WM e-Loader" program to function correctly, additionally the DTR line (pin 4) and the DSR line (pin 6) on the SubD-9 connector plugged to the PC must be connected together.



4 Pre-operation settings

The optimal setting of the weighing platform for your specific application depends on the requirements and the environmental conditions, especially:

- the weighing mode (check weighing or dispensing to a target weight)
- the specified weighing accuracy or *repeatability* of the weighing results
- the specified number of weighings per unit of time (weighing speed)
- the magnitude of interference factors such as vibrations, drafts, static electrical charges, etc. (→ 2, Page 14)
- the method of loading the weighing sample, and the weighing sample itself

It is therefore not possible to give simple instructions for optimal settings which are valid in all cases. As in section 2, what follows are guidelines and practical tips.

After the weighing platform has been installed and connected, the settings are made with the respective commands via the interface. The commands are described in detail in reference manual "Standard Interface Command Set for WM and WMH weighing modules", part number 42 101 959. In this manual you will also find valuable tips for programmers, as well as information about the possible values for the settings. A copy of the reference manual is delivered with each weighing platform.

Important note

Before you start making settings or initializing the weighing platform, check the following:

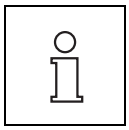
- the accuracy you want to achieve, expressed in display increments
- how frequently you need to test or adjust the weighing platform in operation to fulfil your accuracy requirements
- the weight (*preload*) of your receptacle, if you are using one, and
- the weight and location (internal or external) of the weight you will use for testing or *adjustment*.

If you operate the weighing platform with *preload* and wish to use the built-in weight for periodic checking and adjustment, we advise you to use the commissioning software to check the internal *adjustment* and adjust it if necessary.

If your results do not need to be absolutely accurate to the last decimal place, but only accurate relative to each other, or if you use your own external weight for testing and *adjustment*, you can skip now to section (→ 4.2, Page 17).

4.1 Adjusting the internal adjustment factor

The built-in adjustment weight, which is used for automatic test or adjustment of the weighing platform without manual intervention, was compared at the factory with a certified traceable weight. The resulting adjustment factor is stored in the permanent memory of the weighing platform → *Initial adjustment*.



Note that the maximum value for the *preload* may be 25 % of the nominal *maximum load*, otherwise the internal weight cannot be used because the total load is too high.

The installation position, the use of an attachment (*preload*) or an intensive use of the weighing platform over a long period of time, can cause the *adjustment* using the built-in weight not to reach the expected accuracy. Whether this is the case can be checked at any time with an external weight whose value is known exactly, i. e., with a certified weight.

1. Place the weighing platform on a horizontal surface.
2. Leave the weighing platform connected to the power supply for at least 30 minutes for heat conditions to stabilize.
3. Set the display increment (readability) to the smallest possible value (→ 4.3, Page 18) and the filter to weight control with maximum damping (M01/0, M02/4) (→ 4.5, Page 19).
4. Weigh the known external weight and note the result. If it differs from the reference value by hundreds of display increments even though the weighing platform is absolutely horizontal, you should have the weighing platform checked by a specialist trained by METTLER TOLEDO before you use it again.
5. If the difference is less than this, perform the *adjustment* with the built-in weight by entering command C3.
6. After the weighing platform has completed the *adjustment* with response "C3/A", weigh the known weight again and compare it with the target value.

If it differs from the expected value by more than just a few display increments, the internal adjustment factor should be readjusted. If you wish to adjust the internal adjustment factor, proceed as follows:

1. With command M19, enter the exact value of the adjustment weight you are using for the adjustment. This must be as high as possible, at least 2/3 of the *maximum load* of your weighing platform.
2. Enter command C4 and wait until the weighing platform transmits the response "C4/"/weight value/g"".
3. Load the weight with the prompted value and wait for the response "C4/"////0.0/kg"". The number of decimal places in the response depends on the readability.
4. Remove the weight again. The adjustment automatically completes itself after about 1 minute. The new adjustment factor is effective immediately. You can reset it to the original value (production value) (→ 4.8.3, Page 22).

While the adjustment is in process, the power supply must under no circumstances be switched off or interrupted, otherwise data may be lost. If this happens, the fault can only be repaired by a service technician trained by METTLER TOLEDO and using suitable aids such as service software.

4.2 Setting the interface parameters

Note that commands affecting the interface or its communication mode take effect immediately.

Possible values for the baud rate, number of data bits, parity, stop bits, and *dataflow control (handshake)* are as follows:

Parameter	Possible settings	Factory setting
Baud rate [baud]:	2400, 4800, 9600	9600
Number of data bits:	7 or 8	8
Parity:	even, odd or no (even/odd only possible with 7 data bits)	no parity
Number of stop bits:	1 or 2	1
Dataflow control (handshake):	none	no dataflow control

☞ Use the COM command to set the desired parameters.

The maximum possible baud rate with WMH-Ex weighing platforms is 9600 baud.

Data flow control is not available with hardware or software.

4.3 Setting the readability

The readability is the smallest weight difference which the weighing platform can weigh and transmit over the interface. For example, the WMHA15sx weighing platform can detect differences down to 0.1 g, so the readability d (digit) is 0.1 g.

In practice, to be able to measure accurate to 0.1 g requires good environmental conditions (→ 2, Page 14) and strong filter damping. Determination of the weight takes correspondingly longer than when weighing to 1 g.

Because it is not always necessary to measure with maximum accuracy, the readability can be reduced by factors of ten to gain valuable time. This means, for example, that you can turn a weighing platform with 1 decimal place (d = 0.1 g) into a weighing platform without decimal places (d = 1 g).

☞ Use the RDB (readability) command to set the desired readability.

Note that after the command is confirmed with "RDB/A", the weighing platform always performs a restart. While the weighing platform is restarting, it cannot be addressed.

4.4 Setting the stability criteria

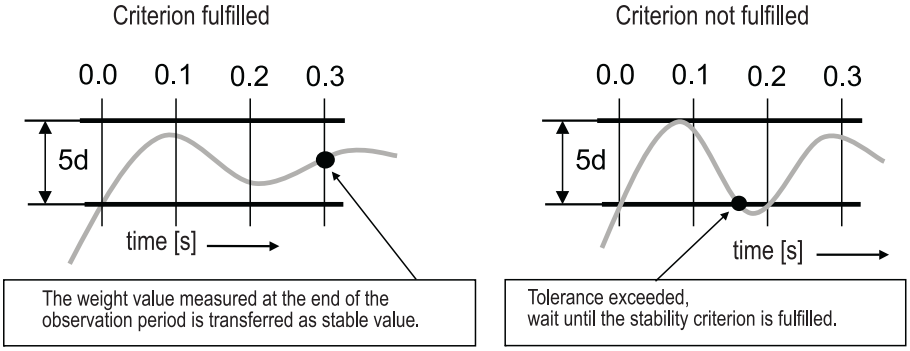
If a weighing result fulfils the stability criterion, the measured value is regarded as stable.

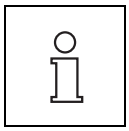
Two parameters define a stability criterion on your weighing platform:

The maximum allowable **difference** (parameter 1) between the largest and smallest weight value which is measured during an **observation period** (parameter 2).

If during the observation period the difference remains below the specified value, the last value measured is regarded as stable, and transmitted via the interface if requested.

The difference (= tolerance) is given in readability steps (digits) (→ 4.3, Page 18), the observation period in seconds. Allowable values are 0.25 to 1000 digits and 0.10 to 3.00 seconds.





The allowable tolerance determines the uncertainty with which a weighing result is regarded as stable, whereas the observation period the shortest possible *stabilization time* after a change in weight. The greater the tolerance, and the shorter the observation period which are selected, the faster, but less accurately, a stable weight value is determined.

Whether or not the stability criterion can be fulfilled depends on the setting of the filter damping (→ 4.5, Page 19) and the current environmental conditions.

If the damping is too weak, or the tolerance too narrow, and/or the observation period too long, under unfavorable circumstances the stability criterion may only be fulfilled after a long time, or not at all. Instead of the stable result, the respective command is only answered after the *timeout* of approximately 40 seconds with, for example, S/I ("Command currently impossible") (→ 5.1, Page 24 to 5.3, Page 25).

4.4.1 Stability criterion for weighing

The "Send" commands transmit weighing results via an interface. To obtain a stable weight value, the stability criterion for the weighing function must be fulfilled.

☞ Define the maximum allowable tolerance (uncertainty) and the observation period for the weighing function with command M30/0/Tol/Period (factory setting: 0.5 d, 1 s).

4.4.2 Stability criterion for the taring function

The tare command T can only be executed when the stability criterion for this function has been fulfilled. The allowable difference affects the accuracy of the *tare weight* stored in the *tare memory*.

☞ Define the maximum allowable tolerance (uncertainty) and the observation period for the taring function with command M30/1/Tol/Period (factory setting: 0.5 d, 1.5 s).

4.4.3 Stability criterion for zero setting

At every switch-on and every Z command a *zero point* is established. The *zero point* serves as the basis for all measurements until the weighing platform is reset to zero or tared. Zero setting can only be performed when the stability criterion for this function has been fulfilled.

☞ Define the maximum allowable tolerance (uncertainty) and the observation period for the zero-setting function with command M30/2/Tol/Period (factory setting: 0.5 d, 1.5 s).

4.5 Filter setting

Filters of various types and dampings are available. To make the best use of the weighing module, the filter type must be adapted to the application and the damping to the environmental conditions (air flow, vibrations).

The commands M01 and M02 are used for the selection of the filter type and its damping.

4.5.1 Filter type

The filter type is set according to the application. There are basically two different weighing modes (applications):

- check weighing with adaptive and fixed filters
- dispensing to a target weight

The filter type is set via the M01 command:

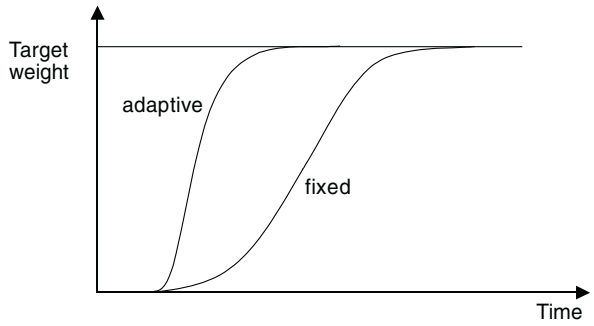
Command	Weighing mode
M01/0	Check weighing with adaptive filters
M01/1	Dispensing to a target weight
M01/2	Check weighing with fixed filters
M01/3	User-defined, fixed filters which can be configured with M33, see document [6] (→ 1.6, Page 8)

Check weighing with adaptive and fixed filters

The goal of check weighing is to determine the current weight of the weighing sample *reproducibly* as quickly as possible after it has been loaded, and to convey the measured value.

Adaptive filters are especially suited for this task. Their damping depends on the change in weight over time. When the weighing sample is loaded, the weight change is large and the damping is very weak. In the *stabilisation phase*, damping increases when the change in weight decreases. This can clearly reduce the time required for weight determination.

Fixed filters can be used as an alternative to adaptive filters. Depending on the application and environment, measurement results can be determined quickly and precisely with these filters.



Comparison of adaptive and fixed filters under ideal conditions

Dispensing until a specified target weight is reached

This application, also called gravimetric filling, was designed especially for dispensing procedures. The filters were designed in such a way that the weighing signal follows the dispensing flow with as little delay as possible. Using the weighing results, a dispensing system can be controlled in such a way that the target weight is reached as quickly and precisely as possible.

4.5.2 Filter damping

Using filter damping, the set weighing mode (filter type) can be optimized to the environment. Five different damping levels are available.

Command	Filter damping	Environment
M02/0	weakest damping	stable
...	…	…
M02/4	strongest damping	unstable

The M33 command enables a continuous setting of the damping for *fixed filters* with weighing mode M01/3.

The *weighing duration* primarily depends on the environmental conditions. Fast and, accordingly, sensitive filters can be used in a calm environment. Filters with strong damping, and therefore a longer response time, are used in restless environments.

To find the best setting for each environment, we recommend proceeding empirically. We recommend starting with the strongest damping and reducing the damping incrementally by making measurements. Note that the effective measurement precision and the *weighing duration* are also dependent upon the stability criterion (→ 4.4, Page 18).

4.6 Setting the weight for the testing and adjustment function

To ensure long-term weighing accuracy, you should periodically check the weighing platform either with the built-in adjustment weight or with an external adjustment weight, and adjust the weighing platform if necessary. For the built-in adjustment weight to be used, the preload must not exceed 25 % of the nominal *maximum load*. There are specific commands for specifying the type and size of the weight used.

4.6.1 Setting the test weight

The test function consists of two steps. In the first step the built-in weight, or an external weight of known magnitude (target value), is loaded. The weighing platform then calculates the difference between the measured value and the target value, and transmits the difference via the interface.

☞ If you use the built-in weight for the test function, execute command TST0/0 (factory setting).

– or –

☞ If you want to execute the test function with an external test weight during the weighing operation, execute command TST0/1 and specify the value of the external test weight used with command M20/weight value/g.
Note that the value of the test weight must lie within the allowable range (→ 7.1, Page 31).
Example: Test weight 10,000.0 g: M20/10000.0/g.

☞ As Step 2, the designated test can now be performed with the TST1 command (→ 5.4, Page 26).

4.6.2 Setting the adjustment weight

By means of *adjustment*, the weighing platform is adjusted so that the measured weight value is exactly equal to the target value of the adjustment weight. Two measuring points are adjusted: zero and the adjustment point.

☞ If you use the built-in weight for the adjustment function, execute command C0/0/0 aus (factory setting).

– or –

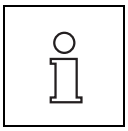
☞ If you want to adjust the weighing platform with an external weight during the weighing operation, execute command C0/0/1, and specify the value of the external adjustment weight with M19/weight value/g.
Note that the value of the adjustment weight must lie within the allowable range (→ 7.1, Page 31).
Example: Adjustment weight 10,000.0 g: M19/10000.0/g.

☞ As Step 2, the designated calibration can now be performed with the C1 command (→ 5.4, Page 26).

4.7 Setting the update rate for continuous weight transmission

In weighing applications such as dispensing to a specified target weight, the dispensing system must continuously monitor the change in weight to control the dispensing process. For this situation, you can set the number of weight values which pass across the interface in so-called "send continuous" mode.

☞ Set the update rate with the UPD command. Allowable values are 1 to 7, 9, 12 and 19 weight values per second (factory setting is 9).



Update rates greater than 4 weight values per second require a corresponding setting of the baud rate (→ 4.2, Page 17). This is explained in the reference manual "Standard Interface Command Set for WM and WMH weighing modules" (description of the UPD command).

4.8 Programming tips and aids

4.8.1 Weighing platform identification

There are a number of commands to permit unique identification of the weighing platform by the higher-level system. By means of these commands you can inquire the serial number, the model designation of the weighing platform, and other information. The I10 command allows you to give each weighing platform a name of its own.

4.8.2 List of settings

With the LST command you can list all the current settings which you can change with your configuration of the weighing platform. This enables you to check and document the configuration.

4.8.3 Resetting the settings

All settable values, parameters, names, and the adjustment factor (→ 4.1, Page 16) can be reset to the factory settings with the FSET command. When you do this, the settings you made are lost.

☞ If you wish to reset all the parameters except the interface parameters (→ 4.2, Page 17), enter FSET/0 .

☞ If you wish to reset all the parameters including the interface parameters, enter FSET/1. Note that after you have done this, communication via the interface may no longer function.

While resetting is in process, the power supply must under no circumstances be switched off or interrupted, otherwise data may be lost. If this happens, the fault can only be repaired by a service technician trained by METTLER TOLEDO and using suitable aids such as service software.

For this reason, it is recommended only to use the FSET command if a weighing platform needs to be completely reconfigured or initialized from scratch, or if the adjustment factor needs to be reset.

4.8.4 List of the implemented interface commands

Command I0 produces a list of all commands currently implemented in the weighing platform.

4.8.5 Examples of initialization routines (command sequences)

The following examples show command sequences for setting the weighing platform which must be executed in an initialization routine, or manually via the service interface, before commencing the actual weighing operation.

Note the following:

- The weighing platform responds to each of these commands with a reply which you absolutely must capture and analyze in your manual configuration or routine so as to be able to react accordingly.
- The weighing performance actually achieved, such as *repeatability* and *weighing time*, must be determined by experimentation.

Example 1: Check weighing

WMHA32sx-cl weighing platform. Testing and *adjustment* with built-in weight. Fastest possible check weighing in a stable environment, readability 0.1 g, *repeatability* 0.1 g.

Step (section)	Command / parameter	Explanation / comment
1. (4.2)	COM/0/6/3/0	Interface to 9600 baud, 8 bits, no parity, 1 stop bit, no handshake.
2. (4.3)	RDB/1	Readability (display step) to 0.1 g. Caution: After this command a restart is executed! It may therefore be advisable only to execute the command at the end of the initialization routine.
3. (4.4.1) (4.4.2) (4.4.3)	M30/0/1/0.3 M30/1/1/0.3 M30/2/1/0.3	Stability criterion for weighing, taring, and zero setting function: max. difference 1 display step (0.1 g) within 0.3 seconds, i. e. after a change of load the minimum weighing duration until stability is at least 0.3 seconds.
4. (4.5.1)	M01/0	Filter type to weight control (corresponds to factory setting)
5. (4.5.2)	M02/1	Filter damping to weak ("stable environment"), must be ev. adapted according to tests
6. (4.6.1)	TST0/0	For testing, use the built-in adjustment weight; corresponds to factory setting.
7. (4.6.2)	C0/0/0	For adjustment, use the built-in adjustment weight; corresponds to factory setting.
8. (4.8.1)	I10/"Track 12"	Set name of weighing platform to "Track 12".

Example 2: Dispensing to a specified target weight

WMHA32sx-cl weighing platform, testing and *adjustment* with external adjustment weight of 10000.6 g (*preload* 3500 g). Dispensing to target weight in stable environment.

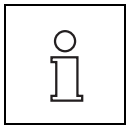
Step (section)	Command / parameter	Explanation / comment
1. (4.2)	COM/1/6/3/0	Interface to 9600 baud, 8 bits, no parity, 1 stop bit, no handshake.
2. (4.4.1) (4.4.2) (4.4.3)	M30/0/2/0.8 M30/1/1/0.8 M30/2/1/0.8	Stability criterion for weighing, taring, and zero setting function: max. difference 2 display steps (0.2 g) for weighing and 1 display step (0.1 g) for taring, zero setting within 0.8 seconds; i. e. after change of load, minimum *weighing time* to stability is at least 0.8 seconds.
3. (4.5.1)	M01/1	Filter type to dispensing to target weight.
4. (4.5.2)	M02/1	Filter damping to weak ("stable environment"), must be ev. adapted according to tests.
5. (4.6.1)	TST0/1 M20/10000.6/g	Use external test weight, value 10000.6 g.
6. (4.6.2)	C0/0/1 M19/10000.6/g	Use external adjustment weight, value of adjustment weight 10000.6 g.
7. (4.7)	UPD/19	Transmission rate (update rate) to 19 weight values per second.

5 Commands and functions in weighing operation

The weighing operation includes weight measurement and transmission of the results via the interface to the control system. Depending on the application, there are various different ways in which a weighing function can be executed, and values which can be transmitted. Only the most important commands which you can use in weighing operation are described here. You will find further commands in the reference manual "Standard Interface Command Set for WM and WMH weighing modules", part number 42101959.

5.1 Weight value transmission

The weight values which are transmitted refer either to the zero point or to the point which resulted from the tare command, depending on whether the last function executed was a zero setting or a taring (→ 5.2, Page 25, 5.3, Page 25). Note that at every switch-on a new zero point, the switch-on zero point, is established.



Commands which only terminate normally when a stability criterion is fulfilled abort if stability is not reached within approximately 40 seconds (*Timeout*).

5.1.1 Weight inquiry and transmission of a single, stable weight value

Transmission command S (Send weight value) transmits the current stable weight value.

If the weighing platform is in the *stabilization phase*, the weight value is only transmitted after the stability criterion for weighing has been fulfilled (→ 4.4.1, Page 19).

☞ Execute command S. The weighing platform replies with "S/S/current weight value/g". The second "S" in the reply signifies stable. After *timeout* the weighing platform replies with "S/I".

5.1.2 Weight inquiry and immediate transmission of a single weight value

Transmission command SI (Send immediate) immediately transmits the current weight value, irrespective of whether it is stable or dynamic (unstable).

☞ Execute command SI. The weighing platform answers immediately with "S/S/current weight value/g" if the value is stable, or with "S/D/current weight value/g" if the value of the stability criterion is not yet fulfilled (*Dynamic weight value*).

5.1.3 Automatic transmission of the stable weight value after every change in weight

Transmission command SNR (Send Next Stable and Repeat) transmits the current stable weight value, followed automatically by every subsequent weight value that fulfils the stability criterion after a change in weight. If necessary, you can specify the required change in weight.

☞ Execute command SNR. The weighing platform replies with "S/S/current weight value/g". After each change of weight and subsequent stabilization, the weighing platform automatically transmits the new *stable weight value*.

☞ If you do not wish to receive any further values, terminate automatic transmission by executing an S, SI or @ (reset) command. Otherwise, the SNR command remains active.

5.1.4 Continuous transmission of all current weight values

Transmission command SIR (Send Immediate and Repeat) continuously transmits all weight values over the interface as they are generated, irrespective of whether they are stable or dynamic. This continuous transmission mode is of especial interest if you are dispensing to a specified target weight, since it enables you to follow the change in weight over time.

The actual number of values transmitted per second can deviate from the set update rate (→ 4.7, Page 21) by a maximum of 1 value/second.

☞ Execute command SIR. The weighing platform answers immediately with "S/S/current weight value/g" if the value is stable, or with "S/D/current weight value/g" if the current value does not fulfill the stability criterion. Transmission of weight values continues until you either send a different transmission command (S, SI) or perform a reset with character @ (reset command).

5.2 Taring functions

5.2.1 Taring and establishing a stable tare weight

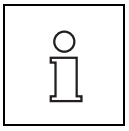
When the T (Tare) command is used, the current stable weight value relative to the momentary zero point is regarded as the tare weight, transferred to the *tare memory*, and transmitted across the interface. Following this, the current weight value is set to zero. If the weighing platform is in the *stabilization phase*, the command is only executed after the stability criterion for taring has been fulfilled (→ 4.4.2, Page 19), otherwise it is cancelled.

☞ Execute command T.
The weighing platform replies with "T/S/current tare value/g". The current weight value (*net weight*) is now set to zero. After *timeout*, no taring takes place; instead, the weighing platform replies with "T/I" (command currently impossible).

5.2.2 Immediate taring and establishing the current tare weight

When the TI (Tare Immediate) command is used, the current weight value relative to the momentary zero point is immediately regarded as the *tare weight*, transferred to the *tare memory*, and transmitted across the interface, irrespective of whether or not the stability criterion for the taring function is fulfilled. Following this, the current weight value (*net weight*) is set to zero.

☞ Execute command TI.
The weighing platform replies with "TI/S/current tare value/g" if the tare value is stable, or with "TI/D/current tare value/g" if the stability criterion for taring is not fulfilled.
Note that in the second case the zero value is also considered unstable.



The taring function cannot be executed if the current weight value, relative to the momentary zero point, is negative. In this case the weighing platform replies with "T/I" or "TI/I".

5.3 Zero-setting functions

The zero-setting function establishes a new zero point (reference point), sets the current weight value to zero, and clears the *tare memory*. The zero-setting function is automatically executed every time the weighing platform is switched on.

5.3.1 Zero-setting with stability fulfillment

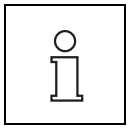
When the Z (Zero) command is used, if the current weight is stable a new zero point is established. If the weighing platform is in the *stabilization phase*, the Z command is only executed after the stability criterion for zero-setting has been fulfilled (→ 4.4.3, Page 19).

☞ Execute command Z.
The weighing platform replies with "Z/A". The current weight value and the *tare memory* are now set to zero. After *timeout*, no zero-setting takes place; instead, the weighing platform replies with "Z/I" (command currently impossible).

5.3.2 Immediate zero-setting

When the ZI (Zero immediate) command is used, a new zero point is established immediately, irrespective of whether or not the stability criterion for the zero function is fulfilled.

☞ Execute command ZI.
The weighing platform replies with "ZI/S" if the current weight value was stable, or with "ZI/D" if the stability criterion for zero-setting was not fulfilled.
Note that in the second case the new zero point is a momentary value and may therefore deviate from a stable zero point.



If the weighing platform does not find any zero point when switched on due to the filter setting (→ 4.5, Page 19 and the prevailing environmental conditions, the ZI command is executed after the time limit is exceeded).

5.4 Test and adjustment functions

The stability criteria for the test and adjustment function have been relatively strictly defined because these two functions generally affect the measuring accuracy of the weighing platform. These criteria cannot be changed.

5.4.1 Test function

One of the TST commands starts the test function described in section (→ 4.6.1, Page 21). The difference which is then transmitted is the adjustment error, also known as the *sensitivity deviation*, which has arisen due to drift or long use since the last *adjustment*. Depending on the result, a decision can be made as to whether an *adjustment* is necessary.

If the difference is much more than several hundreds of display increments (digits), it must be assumed that the weighing platform has been improperly handled, or suffered a shock or impact. In this case, you should have the weighing platform checked by a specialist before you use it again.

There are several alternatives for the test function:

☞ If you wish to perform the test with the current setting (→ 4.6.1, Page 21), execute command TST1.

☞ If you wish to perform the test with an external weight whose value is set with command M20, execute command TST2. The reply "TST2/"Value/g"" prompts you to load the test weight, and subsequently "TST2/"0.0000/g"" prompts you to remove it.

☞ If you wish to perform the test with the built-in weight, i. e. without manual intervention, execute command TST3.

5.4.2 Adjustment

If because of the test result you want to perform an *adjustment*, you can start the function described in section (→ 4.6.2, Page 21) with one of the commands C (Calibration).

Similar to the test function, there are also several alternatives for the adjustment function:

☞ If you wish to execute the *adjustment* with the current setting (→ 4.6.2, Page 21), execute command C1.

☞ If you wish to perform the *adjustment* with an external weight whose value is set with command M19, execute command C2.
The reply "C2/"Value/g"" prompts you to load the external adjustment weight, and subsequently "C2/"0.0000/g"" prompts you to remove it.

☞ If you wish to perform the *adjustment* with the built-in weight, i. e. without manual intervention, execute command C3.

5.5 TriggerMode

TriggerMode provides you with a powerful option for intentional weight-value polling.

In contrast to manually operated weighing applications, the load-change time with automated industrial applications is usually known, and the desired weight value can be intentionally polled with this. Moreover, it is not important which result is currently displayed/transmitted by a weighing module as long as absolutely no weight value is required. For these reasons, the filters remain continually open in TriggerMode (weighing result is unstable) until a weight value is intentionally requested with a command.

The filter opening time and the recognition time of the load change are not applicable here. The filters are reopened completely immediately after the weight value transfer.

Details on TriggerMode are found in the engineering note EN04 "Wägen im Trigger-Mode" (Weighing in TriggerMode).

5.5.1 Activating and deactivating TriggerMode

TriggerMode is activated and deactivated with the TRMO command.

As soon as TriggerMode is activated, the filters are opened and the weighing results become unstable.

TriggerMode must be deactivated for testing and calibration of the weighing module.

5.5.2 TriggerMode: Weight-value polling

Weight-value polling is started at a specific time with the TRS command. Once a settable trigger delay has expired, the filters are closed; as soon as a stable weight value is available, the weighing platform responds with "S/S/current weight value/g". If a stable weight value cannot be determined during the timeout, the weighing platform responds with "S/I".

☞ Execute TRS to poll a stable weight value in TriggerMode.

5.5.3 TriggerMode: Setting to zero

Setting to zero is started at a specific time with the TRZ command. Once a settable trigger delay has expired, the filters are closed; as soon as a stable weight value is available, it is accepted as the new zero point and the weighing platform responds with "Z/A". If a stable weight value cannot be determined during the timeout, the weighing platform responds with "Z/I".

☞ Execute TRZ to set a new zero point in TriggerMode.

5.5.4 Configuring trigger commands

The timeout and trigger delay of the TRS and TRZ commands can be configured with the TRCF command.

6 Maintenance and service

To guarantee the functionality, reliability, and accuracy of your weighing platform even after long use, you must ensure that it is cleaned and serviced at periods corresponding to the soiling hazard and intensity of use.

The information for the proper installation of the scale is contained in the operating instructions of the K line, i. e. documents [3] and [4] (→ 1.6, Page 8).

6.1 Maintenance

Your weighing platform is a highly accurate measuring instrument. To work faultlessly, it is essential for it to be periodically maintained.

The maintenance interval must be chosen according to how the weighing platform is used, its surroundings, and the environmental conditions. Maintenance work may only be performed by a specialist who has been trained by METTLER TOLEDO.

Under normal environmental conditions (no aggressive solids, gasses or liquids), maintenance should be performed every 6 – 12 months. In special cases, the effective required intervals should be determined together with a service technician.

6.1.1 Checking the weighing performance and general condition of the weighing platform

Normally, the accuracy of the weighing platform is monitored with the test function (→ 4.6.1, Page 21). As well as this, and particularly if exceptionally high accuracy is required, it is advisable to have a specialist periodically check the weighing platform for *linearity* and *repeatability,* other parameters, and all seals.

6.1.2 Replacing seals

To protect the weighing platform sufficiently, the seals must be checked periodically and replaced by a professional trained by METTLER TOLEDO at least every two years.

6.2 Correcting weighing platform faults or failure

Proceed systematically according to the following steps and try to correct the fault yourself; the fault may be related to the settings. Never open the housing of the measuring cell.

The weighing platform only executes commands a long time after it is switched on

After the weighing platform is switched on, a long time elapses between sending the transmit, tare, or zero-setting commands, and receiving the reply "S/I", "T/I", or "Z/I":

☞ After switching on, check the zero point by executing an SI command.
If the weight value transmitted deviates from zero by more than a few display increments,and/or if it is not stable, the fault may be that at switch-on no stable value is obtained and therefore no stable *switch-on zero point* is obtained.

☞ Temporarily change the setting of the filters and/or the stability criterion for zero setting, so that a zero setting with Z can be executed successfully (reply "Z/A").

☞ If necessary, reset the filter.

The weighing platform does not transmit the expected value

☞ Check the weighing platform setting with command LST (list settings).

☞ Execute a TST2 or TST3 command to perform the test described in section 5.4.1, Page 26 and refer to the notes contained in that section.

☞ Switch the power supply off and then on again, and check the message transmitted by the weighing platform across the RS-232 interface after the startup phase.
If instead of the serial number an error message ("ERROR") appears, contact your supplier or METTLER TOLEDO consultant.

The weighing platform and commands do not respond

☞ Check the power supply connection.

☞ Following this, check the connection and interface parameter settings of your system.

If the weighing platform displays only underload (S–) or overload (S+)

The configuration data may have been lost after a power outage.

☞ Execute the FSET command.

☞ Execute the initialisation sequence to restore the individual parameter settings.

☞ Repeat the initial calibration (command C4). See also engineering note EN01 "Maximizing the Process-Safety".

If neither you nor the person responsible for maintaining the weighing platform can correct the fault, contact your supplier or your METTLER TOLEDO consultant.

If none of these people are available, contact us by e-mail at BALC.Hotline@mt.com.

In order to help you as much as possible on correcting the faults, please provide the following information (some of which can be obtained with commands, provided the communication with the weighing platform is functioning):

- Designation and serial number (from type label, or using commands I2 and I4)
- Type number TDNR (from type label) and/or software version (only via command I3)
- Size of *preload* if the original weighing plate or weighing platform are not being used
- Short description of the weighing application and the fault or incorrect functioning.

6.3 Initialisation sequence

In most automated processes, an inadvertent current break is detected and the process is restarted accordingly.

To guarantee proper functioning of a weighing module integrated in automatic production processes, METTLER TOLEDO recommends the following checks each time the weighing module is restarted:

- Check whether all of the parameter definitions deviating from the factory settings are set correctly.
- Execute a test function and check the test result.

Example of an initialisation sequence for the determination/checking of customer-specific settings for *filter damping* and *stability criterion*

Step	Command	Response	Logic
1.	MO2	MO2/A/4	Check whether the desired value "4" is saved correctly • if YES: go to Step 3 • if NO: go to Step 2
2.	MO2/4	MO2/A	Set and confirm filter damping "4" Check response MO2/**A**
3.	M30/0	M30/A/0/ 0.3/0.7	Check whether the setting "0.5 digits during 0.7 seconds" is saved correctly • if YES: go to Step 5 • if NO: go to Step 4
4.	M30/0/0.5/0.7	M30/A	Set stability criterion to "0.5 digits during 0.7 seconds" and confirm • Check response M30/**A**
5.	TST3	TST3/B TST3/A/0.6	Test function with internal weight is started. Check whether deviation is smaller than, for example, 1 g (with 15 kg weighing platform) • if YES: test OK • if 1 g < deviation < 5 g: perform automatic calibration • if deviation > 5 g or cannot be executed: have weighing module checked
6.	Initialisation OK		

7 Technical data

7.1 Model-specific data

	WMH15sx	WMH32sx	WMHA15sx	WMHA32sx
Maximum load [1]	15 kg	32 kg	15 kg	32 kg
Readability [2]	0.1 g	0.1 g	0.1 g	0.1 g
Reproducibility (s) [3] (with factory setting and under normal environmental conditions)	0.05 g	0.1 g	0.05 g	0.1 g
Linearity, typical	± 0.2 g	± 0.2 g	± 0.2 g	± 0.2 g
Dimensions weighing platform (WxDxH) [cm]	–	–	35 x 28 x 11.7	35 x 28 x 11.7
Tare range, subtractive	15 kg	32 kg	15 kg	32 kg
Zero-set range	open	open	open	open
Underload relative to *system zero-point* [4]	open	open	–2 kg	–2 kg
Overload relative to *system zero-point*	15.1 kg	32.1 kg	15.1 kg	32.1 kg
External weight or preload when calibrating/testing with external weight (C2) – minimum external weight – maximum preload	 5 kg [5]	 10 kg [5]	 5 kg [5]	 10 kg [5]
Maximum *preload* when calibrating/testing with in-built weight (C3) [6]	3.75 kg	8 kg	3.75 kg	8 kg
External weight or preload for comparison of the internal calibration factor (C4) [7] – minimum external weight – maximum preload	 10 kg 3.75 kg	 20 kg 8 kg	 10 kg 3.75 kg	 20 kg 8 kg
Temperature range – according to accuracy class II – according to accuracy class III	 0 °C to 40 °C –10 °C to 40 °C			

[1] Effective *maximum load,* depending on the *preload.*
If this load is exceeded, the weighing platform responds with "S+", "Z+" or "T+"

[2] Effective readability can be adjusted
only possible for weighing platforms/weighing modules with a maximum load of 15 kg or 32 kg

[3] Corresponds to the standard deviation of 10 consecutive measurements

[4] Underload is indicated when the weighing platform is removed
OEM modules without a weighing platform are designed so that the underload only actuates at the lower limit of the A/D converter area

[5] Maximum load minus weight used

[6] Calibration/test with high (pre)load with built-in weight not possible

[7] Sum of weight used plus preload is less than maximum load

	WMHB60sx	**WMHCC150sx**	**WMHCC300sx**	**WMHCS300sx**
Maximum load [1]	60 kg	150 kg	300 kg	300 kg
Readability	1 g	1 g	2 g	2 g
Reproducibility (s) [3] (with factory setting and under normal environmental conditions)	0.4 g	0.5 g	1 g	1 g
Linearity, typical	± 1 g	± 2 g	± 5 g	± 5 g
Dimensions weighing platform (WxDxH) [cm]	500 x 400 x 123	800 x 600 x 130	800 x 600 x 130	800 x 800 x 115–140
Tare range, subtractive	60 kg	150 kg	300 kg	300 kg
Zero-set range	open	open	open	open
Underload relative to *system zero-point* [4]	–4 kg	–15 kg	–15 kg	–35 kg
Overload relative to *system zero-point*	60.1 kg	151 kg	301 kg	301 kg
External weight or preload when calibrating/testing with external weight (C2) – minimum external weight – maximum preload	 20 kg [5]	 50 kg [5]	 100 kg [5]	 100 kg [5]
Maximum *preload* when calibrating/testing with in-built weight (C3) [6]	15 kg	37.5 kg	75 kg	75 kg
External weight or preload for comparison of the internal calibration factor (C4) [7] – minimum external weight – maximum preload	 40 kg 15 kg	 100 kg 37.5 kg	 200 kg 75 kg	 200 kg 75 kg
Temperature range – according to accuracy class II – according to accuracy class III	 0 °C to 40 °C –10 °C to 40 °C			

[1] Effective *maximum load,* depending on the *preload*.
If this load is exceeded, the weighing platform responds with "S+", "Z+" or "T+"

[3] Corresponds to the standard deviation of 10 consecutive measurements

[4] Underload is indicated when the weighing platform is removed

[5] Maximum load minus weight used

[6] Calibration/test with high (pre)load with built-in weight not possible

[7] Sum of weight used plus preload is less than maximum load

	WMHCS600sx	**WMHC300sx**	**WMHC600sx**
Maximum load [1]	600 kg	300 kg	600 kg
Readability	10 g	2 g	10 g
Reproducibility (s) [3] (with factory setting and under normal environmental conditions)	5 g	1 g	5 g
Linearity, typical	± 10 g	± 5 g	± 10 g
Dimensions weighing platform (WxDxH) [cm]	800 x 800 x 115–140	1000 x 800 x 115–140	1000 x 800 x 115–140
Tare range, subtractive	600 kg	300 kg	600 kg
Zero-set range	open	open	open
Underload relative to *system zero-point* [4]	–35 kg	–30 kg	–30 kg
Overload relative to *system zero-point*	601 kg	301 kg	601 kg
External weight or preload when calibrating/testing with external weight (C2) – minimum external weight – maximum preload	 200 kg [5]	 100 kg [5]	 200 kg [5]
Maximum *preload* when calibrating/testing with in-built weight (C3) [6]	150 kg	75 kg	150 kg
External weight or preload for comparison of the internal calibration factor (C4) [7] – minimum external weight – maximum preload	 400 kg 150 kg	 200 kg 75 kg	 400 kg 150 kg
Temperature range – according to accuracy class II – according to accuracy class III	0 °C to 40 °C –10 °C to 40 °C		

[1] Effective *maximum load,* depending on the *preload*.
If this load is exceeded, the weighing platform responds with "S+", "Z+" or "T+"

[3] Corresponds to the standard deviation of 10 consecutive measurements

[4] Underload is indicated when the weighing platform is removed

[5] Maximum load minus weight used

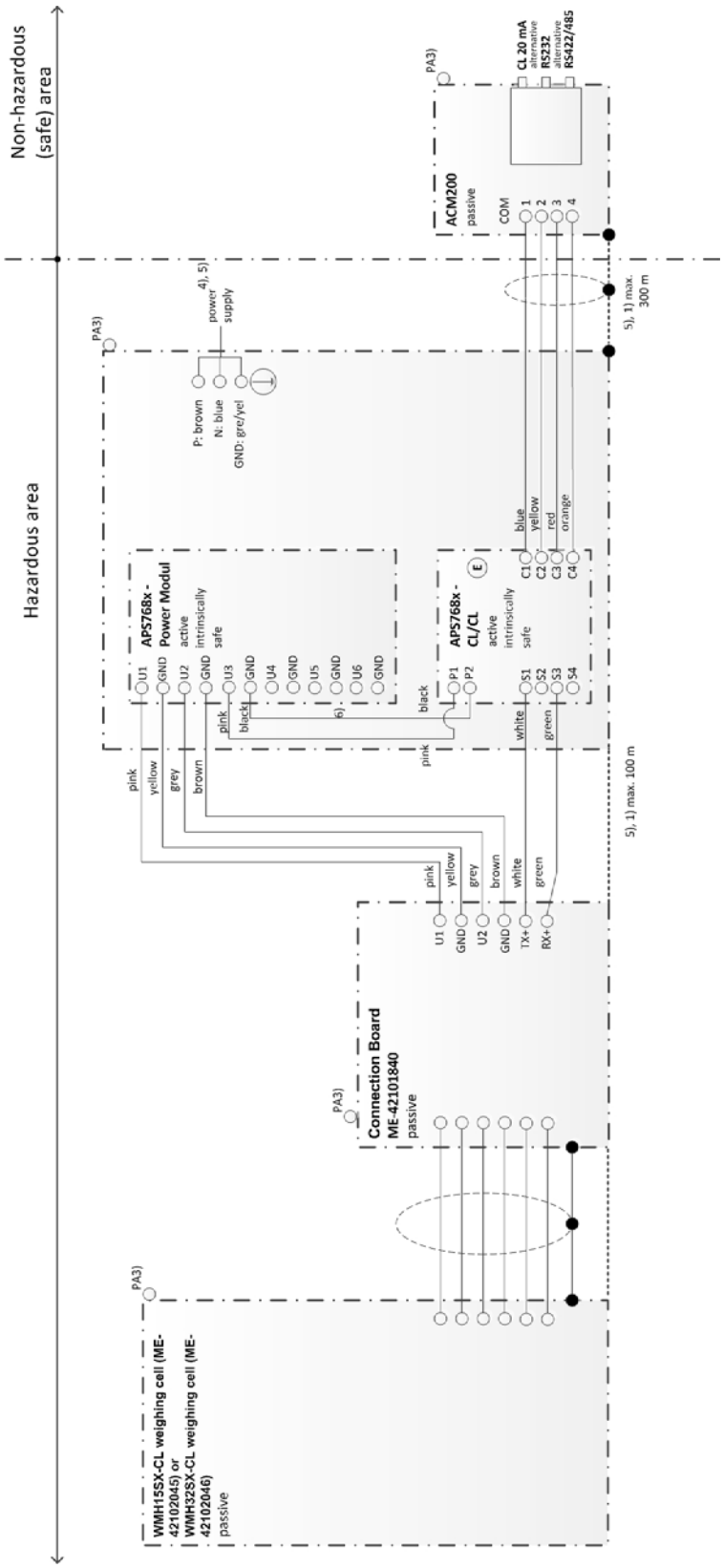
[6] Calibration/test with high (pre)load with built-in weight not possible

[7] Sum of weight used plus preload is less than maximum load

7.2 General technical data

The electrical data are contained in the *Guide for installers: Explosion-proof weighing system with the APS768x power supply unit,* i. e., document [5] (→ 1.6, Page 8).

7.3 Control Drawing



PSUx / APS768x – Intrinsically safe connection values

	U_o/V_{oc}	I_o/I_{sc}	P_o	C_o/C_a	L_o/L_a
U1	8.7 V	133 mA	1.15 W	1 µF	0.3 mH
U2	12.6 V	42 mA	0.53 W	0.4 µF	1 mH
U3	7.15 V	107 mA	0.77 W	1 µF	0.3 mH
U4	10.5 V	74 mA	0.78 W	0.6 µF	0.3 mH
U5	5.4 V	240 mA	1.30 W	1 µF	0.3 mH
U6	12.6 V	92 mA	1.16 W	0.5 µF	0.3 mH

Ⓒ

APS768x-CL/CL – Intrinsically safe connection values Ⓔ

	U_o/V_{oc}	I_o/I_{sc}	P_o	C_o/C_a	L_o/L_a
Scale Interface S1 – S4	7.15 V	24 mA	43 mW	0.2 µF	0.2 mH
Communication Interface C1 – C4	7.15 V	107 mA	270 mW	0.3 µF	0.6 mH

CENELEC approval

Cable in accordance with standards EN50039 and EN60079-14 for intrinsically safe circuits

- Cable lead-in via grounding cable gland
- Cable according to Guide for installers ME-22021223

1) Cable 4 x 2 x 0.5 mm^2 + 1 x 0.5 mm^2 shielded and paired
2) Cable 3 x 2 x 0.75 mm^2 shielded and paired
2a) Cable 2 x 2 x 0.5 mm^2 shielded and paired
3) Connection of equipotential bonding (EB) in accordance with national regulations. It must be ensured that the housing of all units are at the same potential by means of EB connections. No compensating current may flow across the shield of the intrinsically safe cables
4) PSUx/APS768x power supply connection in accordance with national regulations, see model plate for line voltage and frequency, $U_m \leq 250$ V
5) Lay cabling securely so that it does not move and effectively protect it it against damage
6) Via internal cables in APS768x

Temperature range: –10 °C ... + 40 °C

$_cFM_{US}$ approval

USA: Installation shall be in accordance with ANSI/ISA RP 12.6.01
Canada: Installation shall be in accordance with the Electricol Code C2.R1

- Cable lead-in via grounding cable gland
- Cable according to Guide for installers ME-22021223

1) Cable 4 x 2 x 0.5 mm^2 + 1 x 0.5 mm^2 shielded and paired
2) Cable 3 x 2 x 0.75 mm^2 shielded and paired
2a) Cable 2 x 2 x 0.5 mm^2 shielded and paired
3) Connection of the potential bonding according to ANSI / NFPA 70, Article 56 and ANSI / IA
It must be ensured that the housing of all units are at the same potential by means of EB connections.
No compensating current may flow across the shield of the intrinsically safe cables
4) PSUx/APS768x power supply connection in accordance with national regulations, see model plate for line voltage and frequency, $U_m \leq 250$ V
5) Lay cabling securely so that it does not move and effectively protect it it against damage
6) Via internal cables in APS768x

Temperature range: –10 °C ... + 40 °C

Edition	Revision	Date	Name
E	/	11/09	Schultz
D	/	11/03	Schultz
C	/	10/04	Schultz
B	/	08/05	Schultz
A	/	05/03	Schultz

	Date	Name
Prep.	05/02	Grandjean
Check.	05/02	Grandjean

Scale

Designation: Control drawing PSUx APS768x Sheet 3/3

Replaces: /

METTLER TOLEDO Mettler-Toledo GmbH Ch-8606 Nänikon

Code: 22006397

8 Connection modules, accessories and spare parts

8.1 Connection modules

The DeviceNet, EtherNet/IP, Profibus and Profinet modules allow connection of a WMH weighing platform to the corresponding field bus networks.

The following connection modules are available:

Picture	Name	Description	Order number
	**DeviceNet module**	Connection module in plastic housing, can be attached to DIN rail. For connection of WMH-Ex weighing platforms to a DeviceNet network (according to EN 50325-2). Dimensions L x W x H: 120 mm x 75 mm x 27 mm	42 102 810
	**Ethernet/IP module**	Connection module in plastic housing, can be attached to DIN rail. For connection of WMH-Ex weighing platforms to an Ethernet/IP network (according to EN 50325-2) Dimensions L x W x H: 120 mm x 75 mm x 27 mm	42 102 860
	**Profibus module**	Connection module in plastic housing, can be attached to DIN rail, with plug. For connection of WMH-Ex weighing platforms to a Profibus network (Profibus-DP slave according to EN 50170). Dimensions L x W x H: 120 mm x 75 mm x 27 mm	42 102 809
	**ProfiNet module**	Connection module in plastic housing, can be attached to DIN rail. For connection of WMH-Ex weighing platforms to a Profibus network (IO slave according to IEC 61784 (CPF-3/3)). Dimensions L x W x H: 120 mm x 75 mm x 27 mm	42 102 859

8.2 Accessories

Description	Order number
Standard accessories See operating instructions of the K line, i. e. documents [3] and [4] (→ 1.6, Page 8)	00 224 200
Calibration weights METTLER TOLEDO offers an extensive range of weights, both with and without calibration certificates. Contact us to request more detailed information.	
Ex cable on reel For connection of terminal box and APS768x, 3 x 2 x 0.75 mm^2, 100 m	00 504 638
Cable screw glands M16 1 set contains 6 pieces	22 006 708
Wire end ferrules H0.75 1 set contains 100 pieces	00 504 639

For building the connection between the terminal box and the APS768x, the following parts are needed:

- Cable 00 504 638
- Cable screw glands 22 006 708 2 pieces
- Wire end ferrules 00 504 639 12 pieces

8.3 Spare parts

Description	Order number
Measuring cell, complete WMH15sx-cl WMH32sx-cl	 42 102 045 42 102 046
WMH-Ex connection cable, complete for OEM cells	 42 102 830
Membrane set	00 056 410/V
Load plate for WMHA15sx and WMHA32sx When replacing the load plate, use 4 new load pins as well	 00 504 217
Pressure spring for WMHA15sx-cl for MWHA32sx-cl	 00 504 216 00 504 733
Load pin	00 504 218
Levelling foot for WMHA15sx and WMHA32sx	00 502 887
Level indicator	00 504 924
Tapped ring (for level indicator)	00 504 213
Instructions for installation and operation: WMH-Ex weighing platforms German English French	 42 909 026 42 909 027 42 909 028
Reference manual "Standard Interface Command Set for WM and WMH weighing modules" German English French	 42 101 965 42 101 959 42 101 966
CD-ROM With operating instructions in 3 languages and software for WMH	 42 102 828
MT-WTI adhesive labels Adhesive labels of various sizes reading "METTLER TOLEDO Weighing Technology Inside"	 42 102 702
Plug	00 504 215

Additional spare parts, especially for the heavy-load weighing platforms, are listed in detail in the service manual of the K line.

9 Glossary and Index

9.1 Glossary

Adaptive filter — Filter whose damping depends on the trend of the weight signal over time (compare fixed filter).

Adjustment — Adjustment of the → *sensitivity* to approach as close as possible to the ideal value.
Adjustment of the WMH weighing platform takes place at two points – at the current zero point and at the value of the adjustment weight.

Available maximum load — Maximum load which the weighing platform can still weigh with the given preload.
Available maximum load = nominal maximum load minus preload

Base load — Load which is necessary for the full → *weighing range* to be available after switching on the weighing platform (corresponds to the weight of the load plate).

Calibration — Now obsolete, incorrect designation for → *adjustment*.
Correct designation for determination of the deviation between the true and the measured value (→ *calibration factor*).

Calibration factor — Frequently used instead of adjustment factor (→ *initial adjustment*).
Correct designation for the factor by which a measurement value (weight value) must be multiplied to obtain the correct (true) value.

Dataflow control — Also "handshake". Method by which data transmission across an RS-232 interface is controlled by the receiver in order to avoid data overflow.

Dead load — At METTLER TOLEDO, dead load usually means the → *base load*.
Dead load can also mean the → *preload* (including the base load).

Dynamic weight value — Weight value which has not fulfilled the stability criterion.
A dynamic weight value is transmitted with status "D" (dynamic),
e. g. "S/D//101.01234/g" (compare *stable weight value*).

FDA — **F**ood and **D**rug **A**dministration. American health authorities

Fixed filter — A filter with fixed, defined damping which is independent of the change in weight over time.

Gross weight — Weight of an item including its container or packaging.

Hardware handshake — Dataflow control (handshake) using separate control wires whose status is controlled by the receiver.
The wires used on WMH weighing platforms are CTS (clear to send) and RTS (request to send).

Initial adjustment — During production of the weighing platform, the built-in weight is compared by means of a software routine with an exactly known (traceable) adjustment weight. The resulting adjustment factor is written to a permanent memory. The adjustment factor is responsible for the accuracy of the → *adjustment* with the built-in weight.
After adjusting with C4 (→ 4.1, Page 16), the newly resulting adjustment factor is used instead of the adjustment factor set at the factory, until the settings of the weighing platform are reset with the FSET command.

IPC — Abbreviation for **I**n-**P**rocess **C**ontrol
In-process control means automatic quality control during the production process – i. e. quality control with no manual intervention. IPC may be based on random samples, take place at fixed intervals, or comprise a 100 % check.

Linearity — Deviation of a measurement value (weight value) from the ideal straight line between zero and the maximum load.

Long term stability — Defines the sensitivity drift after a specified period of time, e. g. one year.

Maximum load — Maximum load which the weighing platform can still just measure (compare *overload*).

Net weight — Weight of an item without container or packaging.
Net weight = gross weight minus tare weight (→ *gross weight, tare weight*).

Numerical increment Alternative designation for readability (→ 4.3, Page 18).

Overload A load which exceeds the → *available maximum load*.
At overload, the weighing platform replies with status "+", for example "S/+".

Preload The load which is present in addition to the base load when the weighing platform is switched on or zeroed (→ *available maximum load*).

Primary calibration Term used at METTLER TOLEDO for → *initial adjustment*.

Repeatability (s) Determines the accuracy of the weight measurement.
The value of the repeatability is the same as the value of the statistical standard deviation s.
At METTLER TOLEDO, the standard deviation is calculated from ten consecutive measurements of one and the same weight under identical environmental conditions.

Reproducibility Obsolete designation for → *repeatability*.
Correct designation for "accuracy", with which a measurement can be repeated under similar environmental conditions after any period of time.

Resolution Alternative designation for readability (→ 4.3, Page 18).
At METTLER TOLEDO, the resolution is specified as the number of weight increments (points) which a weighing sensor (scale/balance, weighing platform) is capable of differentiating.
This number is calculated by dividing the maximum load by the readability.
Example WMHA15: Maximum load 15 kg and readability 0.1 g gives 150,000 points resolution.

Sensitivity At METTLER TOLEDO, the designation for the relationship between the true and the measured (transmitted) weight value.
Ideally, the sensitivity of a weighing sensor (scale/balance, weighing platform) is one.

Sensitivity deviation Deviation of the sensitivity from the ideal value of 1 (→ *adjustment*).

Sensitivity drift Deviation of the sensitivity in relation to temperature and/or time (→ *long-term stability*).

Software handshake Dataflow control (handshake) by sending a "Stop" or "Start" control character from the receiver to the transmitter. The characters are usually the Xoff and Xon characters.

Stable weight value Weight value which has fulfilled the specified criterion for stability.
A stable weight value is transmitted with status "S" (stable),
e. g. "T/S/////23.123/kg" (compare *dynamic weight value*).

Stabilization phase The phase after loading or unloading during which the weight value has not yet reached stability.

Stabilization time The time from loading or unloading until the first stable weight value is reached.

Switch-on zero point Point of zero weight which is defined after switching on the weighing platform and to which weight values are relative until a new zero point is determined with the zero-setting function or the weighing platform has been tared.

System zero point Zero point which is defined during manufacture of the weighing platform at the factory.
Refer to → *weighing range*, → *available maximum load*, → *underload* and → *overload*.

Tare memory Memory of weight values which is overwritten after every tare function and cleared after every zero setting.

Tare weight Weight of the container or packaging.
The weight, relative to the current zero point, which is present on the weighing platform during the taring function is regarded as the tare weight and written to the tare memory.

Timeout Period of time within which the weight value must meet the specified stability criterion. If this is not possible because of the settings and/or the current environmental conditions, the weighing platform responds with status "I", e. g. "S/I" or "C3/I" (command currently Impossible).

Underload Load less than the base load.
If this limit is gone below, e. g. if the load plate is not present, the weighing platform returns status "–", e. g. "Z/–"

Weighing range	Range within which the weight to be measured must lie for the weighing platform to be able to measure it. The range between the zero point and maximum load.
Weighing time, weighing duration	Period of time from loading or unloading the weight (weight change) to formation of a weighing result, usually a → *stable weight value*.
Zero point drift	Deviation of the zero point from the zero value (0.0 g) in relation to temperature and/or time.

9.2 Index

For the future benefit of your METTLER TOLEDO product, and to preserve its value, METTLER TOLEDO service assures its quality and measuring accuracy for years to come.

Please request full details of our attractive terms of service.

Thank you.

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Subject to technical changes.

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