Installation Manual

Weigh Modules

WMS/WMS Ex Zone 2

METTLER TOLEDO

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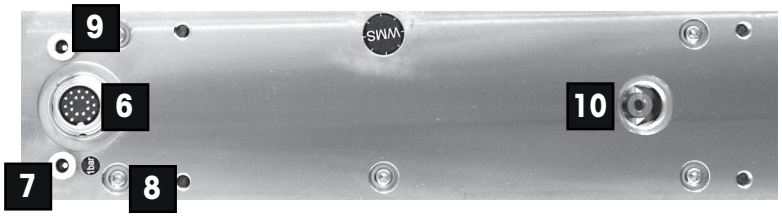

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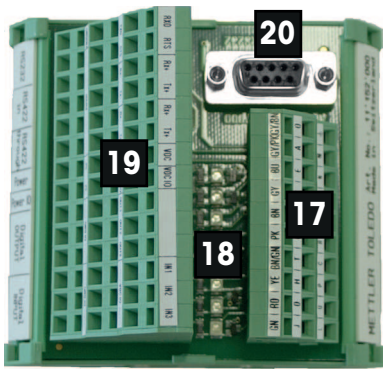		**17**	WMS weigh module connection terminals
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1.2 Assembling before commissioning

Before using the WMS weigh module for the first time, make sure that the labyrinth ring is attached to the housing and that a weighing platform has been mounted. An internal or external adjustment must be made before the first measurement.

1.2.1 Labyrinth ring

The module is protected by a labyrinth ring to prevent dust and liquids from penetrating the upper opening of the weigh module. The labyrinth is formed by 3 concentric rings below the weighing platform.

Note

The labyrinth ring, which points upwards, must always be attached during operation to guarantee protection.

1 Hold the labyrinth ring between your fingers in such a way that the groove inside the ring is downwards.

2 Gently press the ring together (see arrows in the illustration on the left).

3 Carefully push it onto the housing until it clicks into place.

1.2.2 Attaching the weighing platform

Round weighing platform

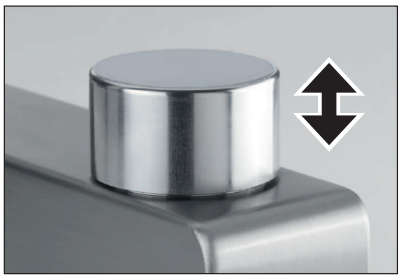
Note

This weighing platform is not locked against rotation. Remove the round weighing platform with care only in upper direction.

The round weighing platform can only be used on the WMS104C, WMS204, WMS403 and WMS404C weigh modules.

1 The round weighing platform can be locked onto the load applicator with gentle downward pressure.

2 Remove again by pulling it up gently.



⚠ CAUTION

Damage of the load cell

The load cell may be damaged if the approved tightening torque of 1 Nm is exceeded!

– Hold and press downward the square weighing platform while tightening the eccentric pin.

Square weighing platform

The square weighing platform is required for Ex Zone 2 models or if customer-specific configurations are implemented.

Customer-specific configurations on the square weighing platform must be assembled **before** being secured to the weigh module.

1 Ensure that the O-ring is attached to the eccentric pin (1) for "wash-down" application and that the marking of the eccentric pin points downwards.

2 Hold and gentle press downward the square weighing platform while tightening the eccentric pin with a torque wrench (1 Nm).

Tighten approximately 1/4 rotation (max 1 Nm).

lock open

- The sealing O-ring on the eccentric pin is needed for "wash-down" application.

3 Use the eccentric pin to fix the square weighing pan from both sides on the weigh module.

4 Use the hole in the eccentric pin to pull it out.

1.3 Initial commissioning

1.3.1 Connecting the WMS weigh module

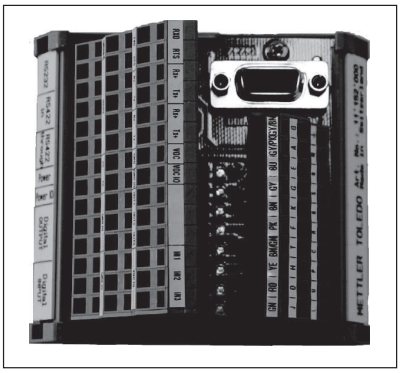
⚠ CAUTION

The power supply must be approved by the respective national test center of the country in which the WMS weigh module will be used.

METTLER TOLEDO recommends using the ConBlock #11152000 for initial commissioning. Alternatively, a cable as described in chapter [Electrical Connection ▸ Page 18] may be assembled.

1 Connect the 19-pin connecting cable to the ConBlock in accordance with the instructions in chapter [WMS ConBlock ▸ Page 53].
2 Connect a PC or a terminal to the ConBlock via the service connector.
3 Configure your terminal program (e.g. APW-Link™ **see** [Configuration tool ▸ Page 53]) such that the communications parameters of the RS232 interface are set to the factory settings of 9600 baud, 8 data bits, no parity, 1 stop bit and no flow control.

– Connect the power supply to the ConBlock.
➡ The power supply is sufficient for the WMS weigh module for initial commissioning.



1.3.2 Initial communication with the WMS weigh module

Once the power supply has been switched on, the response `I4␣A␣"0123456789"` is then output on the interface with the serial number corresponding to the respective cell. The WMS weigh module is then ready and weight values can be queried.

A summary of commands can be found in chapter [Weighing Operation ▸ Page 32].

1.4 Adjustment

Before the first measurement, an internal or external adjustment must be performed, **see** [Internal and external adjustment/test ▸ Page 27].

2 Mechanical Installation

The performance of your WMS weigh module is highly dependent on the environmental conditions, the methods used to support the object to be weighed (weighing platform and suspension device), and other external influences. This chapter contains valuable tips on how to create the best possible conditions to achieve maximum weighing performance.

2.1 Relationship between precision, weighing duration and environmental conditions

WMS weigh modules have been designed to record a weight very accurately and quickly under good conditions and to transmit the results via the built-in interfaces. It should be assumed that weighing duration and precision will play a certain role, if not the defining role, in your application; whether dispensing to a target weight or check weighing. To achieve the best possible results, it is important to be aware of the relationships that create ideal weighing conditions before initial mechanical installation.

The weighing duration, i.e. the time from applying the weight until the valid weighing result, is directly dependent on the desired measurement precision and external influences such as shaking, oscillations and vibrations affecting the module and on air movements in the vicinity of the weighing platform.

The greater the precision or repeatability required, the longer the weighing duration.

The greater the external influences, the more they need to be eliminated with appropriate filter damping.

This also extends the weighing duration. Only a carefully designed installation can guarantee quick and precise weighing results; especially if the module needs to be integrated into a production line or test system. The smaller the smallest weight change to be recorded, the more important it is to follow the instructions in the next section.

If the requirements for precision and weighing duration are particularly demanding, we recommend that you start by setting up a test system under real conditions; then take weight measurements as soon as possible with different settings in a step by step manner to optimize the mechanical installation.

More information can find in the chapter [Configuring ▸ Page 22].

2.2 General installation instructions

If you need to measure weight changes of 0.1 mg or 1 mg, you must note the following points.

2.2.1 Support surface

Wherever possible, provide a vibration-free support surface for the WMS weigh module that is mechanically isolated from the system. The maximum permissible slope must not be exceeded, **see** [General data ▸ Page 34]. A precision leveling bubble is available as an accessory to check the position at any time, **see** [WMS weigh module accessories ▸ Page 52].

Determine the floor properties in the location where the system is to be set up. Make sure that no building oscillations are transferred to the support surface via the floor. Use mechanical damping elements between the system and the support surface if they cannot be mechanically isolated.

Use the 4 attachment points in the base plate (short base plate: M5 × 6 mm blind threaded holes, long base plate: 5.2 mm holes) to screw the module to the support surface (torque 4 - 6 Nm). The surface must be absolutely level to prevent the base plate twisting.

The support surface must be cut out according to the template at the connector locations, **see** [WMS drill hole template ▸ Page 50]. Also take care that no vibrations are transmitted via the connecting cable.

If you are using a module with the "wash-down" option and want to clean it with a spraying device, read the installation instructions in chapter [Allowed load on the weighing platform ▸ Page 11].

2.2.2 Influence of air movements and electrostatic charges

The greater the surface area of the object being weighed or the weighing platform used, the greater the influence of the wind.

Prevent air turbulence and air movements around the weighing platform and the object to be weighed using an appropriate draft shield. Keep the draft shield as small as possible.

If parts of the draft shield move for opening and closing, design them such that the air is cut rather than moved.

Electrostatic charges generate unwanted forces which can influence the results. For example, a cylindrical plastic draft shield (ø 70 × 100 mm) can generate a measurement error of 0.1 g and more. Therefore do not use materials for the draft shield that could become electrically charged (e.g. acrylic glass).

To minimize the effect of electrostatic charges, the weighing platform on the WMS weigh module is connected electrically to the housing via the spring contact.

Note

The spring contact is an important element to minimize the influence of electrostatic charges.

2.2.3 Applying and removing the weighing object

Excessive additional forces or vibrations affecting the weighing platform as a result of applying or removing the weighing object can impair the weighing duration and the result.

Make sure that you keep additional forces and vibrations to a minimum when applying or removing the weighing object. the WMS weigh module is protected against overload but lateral impacts should be avoided.

The weighing object should come to rest on the weighing platform as quickly as possible once it has been applied.

If the weighing object is pushed sideways onto the weighing platform by a feed mechanism, height differences between the weighing platform and feed mechanism should be avoided. Ideally the height difference should be less than 0.3 mm.

Make sure that the object or its centre of gravity is as close to the centre of the weighing platform as possible during weighing or that it is always applied in the same way.

2.3 Installation round weighing platform

The round weighing platform fastens to the load applicator to create a connection with no play. Depending on the system, any application or removal of the weighing object may cause a slight gyration.

The rotary movement of the weighing platform with the weighing object must not affect the weight measurement. In particular, the object must sit free and still on the weighing platform during the weighing process.

Free access to the weighing platform makes cleaning easier. It should be possible simply to remove the weighing platform for cleaning without having to dismantle the feed for the weighing object.

2.4 Installation square weighing platform with excentric pin

Unlike the round weighing platform, the square weighing platform is fixed to the load applicator. Follow the instructions for securing the platform using the eccentric pin, **see** [Attaching the weighing platform ▸ Page 5].

The square weighing platform has four M3 threaded holes for customer-specific configurations. These must be made before assembly on the load applicator.

However, bear in mind the increased influence of air movements and turbulence as well as the weight of your platform which is considered to be pre-load.

2.5 Installation square weighing platform with ball catch

This design of the square weighing platform can be used for the WMS model types with a capacity range up to 410 g.

NOTICE

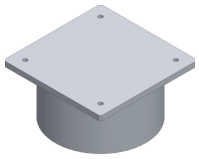
Impairment of the weigh module

1 Please pay particular attention to the safety instructions. Install and use your WMS weighing platform only exclusively in accordance with the specifications given in this installation manual; otherwise, the performance of the weigh module may be impaired. Please do not hesitate to call your METTLER TOLEDO contact person, should any information be unclear.

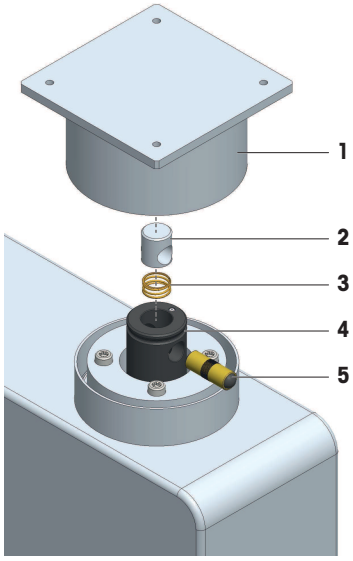
2 Please also be aware that your accessory set contains some small loose components which might easily vanish from sight if particular attention is not paid during the installation work. The spring can store some energy which can make some of he components bounce and get lost easily. Therefore, please be careful when placing and removing the weighing platform and always press with one finger on the fixing of the ball catch in order to keep the spring in place.

Scope of delivery

Before starting with the installation work, please check the scope of delivery.

Square weighing platform with ball catch	
	WMS square weighing pan (not included in the spare part set)
	Latch for the ball catch
	Ball catch
	Pressure spring

Installation

Installation		
	**1**	WMS weighing pan
	2	Latch for the ball catch
	3	Pressure spring
	4	Load receptor
	5	Ball catch

To install the weighing pan, proceed as follows.

1 If it is a new installation: remove the protective cover from the weigh module.
If only the weighing pan will be replaced: remove the old weighing pan from the weigh module.

2 Place the pressure spring (3) inside the black load recepto (4).

3 Place the latch for the ball catch (2) at the top of the pressure spring (3) inside the load receptor (4). Hold a finger continuously on the top of the latch to prevent the spring from releasing its stored energy.

4 Insert the ball catch (5) through the hole of the load receptor (4) and through the hole of the latch (2). Make sure that it sits tightly in its place. Remove your finger from the top of the latch.

5 Place the new square weighing pan (1) on the top of the load receptor (4). Make sure that it sits well on its position.

2.6 Weighing with pre-load

Remember that the available weighing range of the WMS weigh module is reduced by the pre-load, i.e. by the weight of the holder, the configuration or the larger platform.

The effect of air movements may increase as a result of the larger surface area, **see** [Influence of air movements and electrostatic charges ▸ Page 8].

The WMS weigh module can be adjusted or checked automatically with no manual intervention providing the pre-load does not exceed the permitted weight range, **see** [Internal and external adjustment/test ▸ Page 27].

Follow the general installation instructions when applying the weighing object to the holder or weighing platform, **see** [Applying and removing the weighing object ▸ Page 8]. Free access to the weighing platform makes cleaning easier.

2.7 Allowed load on the weighing platform

WMS weigh modules have a built-in overload protection. Tensile loads of greater than 20 N on the fixed, square weighing platform can lead to damage and should be prevented.

Installations with an eccentric center of gravity produce bending moments which can destroy the WMS weigh module. Calculate a bending moment affecting the load application as follows:

$$M_{Bend} = F \cdot m \text{ [Nm]}$$

Example
An eccentrically applied load of 100 g (1 N), 50 mm off the center,
results in a bending moment of $M_{Bend} = 1 \text{ N} \cdot 0.05 \text{ m} = 0.05 \text{ Nm}$

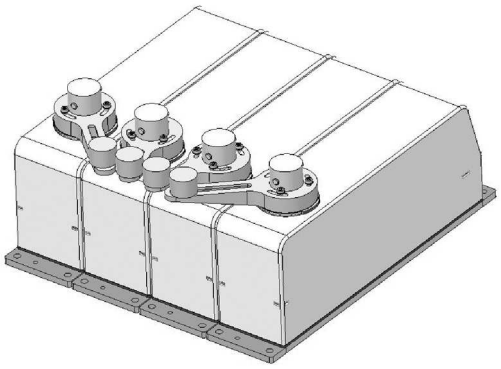
Make sure not to exceed the following loads:

WMS weigh module	Maximum load	Allowed maximum bending moment
WMS104C	120 g	0.07 Nm
WMS204	220 g	
WMS403	410 g	
WMS404C	410 g	
WMS803	820 g	0.25 Nm
WMS1203C	1220 g	
WMS4002	4200 g	1.26 Nm
WMS6002C	6200 g	

2.8 Installation WMS extension arm

The WMS extension arms are built to enable a smaller weighing point distance for multiline applications, **see** [WMS weigh module accessories ▸ Page 52].

Example

Arrangement with a pitch distance from 24 mm	List of Material		
	Pcs	Part No.	Description
	4	30095946	WMS adapter pan (including sealing and screws with washers)
	2	30069348	WMS adapter 55 mm
	2	30069347	WMS adapter 80 mm
	4	—	Customer weighing pan (not as accessory available)

Configurations from four WMS weigh module with a weighing point distance of 24 mm, up to 48 mm with eight weigh modules are possible. The flexible and 360° rotational arms allow a variety of configurations. There is no additional overload protection integrated into the WMS extension arms. It is recommended to build an external overload protection to protect the WMS weigh module as much as possible.

Maximum allowed weight on the extension arm:

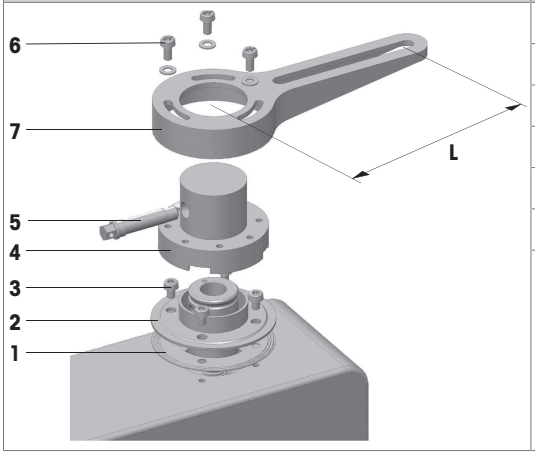
WMS Weigh module	Extension arm 55 mm	Extension arm 80 mm
WMS104C – WMS404C	100 g	70 g
WMS803 – WMS1203C	400 g	300 g

The extension arm accessory cannot be used in Ex Zone 2. Additionally no wash down function is possible.

Note

Do not exceed the maximum bending moment, **see** [Allowed load on the weighing platform ▸ Page 11].

2.8.1 Install the extension arm

Extension arm on the weigh module	Part	Description	Part No.
	**1**	Sealing	30095946
	2	Flange	
	3	Screw M3 × 4 mm	
	4	Pan adapter	
	5	Eccentric pin	
	6	Screw M3 × 6 mm with washer	
	7	Extension arm, L = 55 mm	30069348
		Extension arm, L = 80 mm	30069347

To install the adapter pan on the weigh module the Labyrinth ring and holder must be completely removed.

Place the new sealing and make sure, that the five holes are on the correct position. The flange must be careful placed on the sealing and fixed with the four M3 × 4 mm screws. Before the pan adapter together with the extension arm is fixed on the weighing platform support the correct angle must be adjusted. Use the three M3x6 mm screws with washer to fix the extension arm on the adapter weighing pan. Finally the eccentric pin is needed to fix the adapter pan on the weigh module, **see** [Attaching the weighing platform ▸ Page 5].

Note

- Make sure that nothing can fall into the weigh module.
- Do not adjust the extension arm directly on the weigh module.

2.8.2 Adjustment with extension arm

Before the first weighing an adjustment at the new weighing point must be performed. For WMS weigh modules without internal adjustment the command `C2` must be used, **see** [Internal and external adjustment/test ▸ Page 27].

For weigh modules with internal adjustment, the command `C4`, must be used to map the external weight to the internal weight, **see** [Internal and external adjustment/test ▸ Page 27]. After the adjustment, the command `C3` can be used for easy adjust with the internal weight.

2.9 Installation for weighing below the weigh module

2.9.1 When is weighing below used?

Weighing below the module is an alternative to weighing from above. The weighing object is not placed on the weighing platform, instead it is held by an application-specific supporting device that is located below the module and permanently connected to the weigh module. There is not weighing platform, and hence no basic load. The upper opening is closed with the cover accessory so that no extraneous objects or dirt can penetrate into the interior of the module. If your supporting device is the same weight as the basic load, the entire weighing range is available to you with no restrictions.

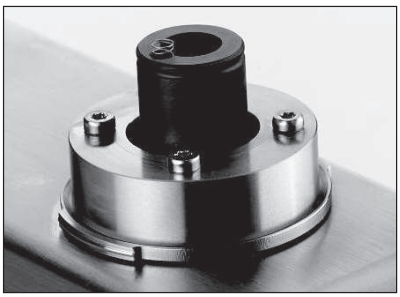
Weighing below the module is used if, for example, it is difficult or inappropriate to feed the weighing object onto the weighing platform or there is not enough space to permit weighing from above.

2.9.2 Converting the module for weighing from below

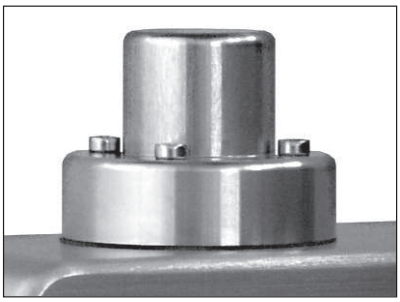
- To convert the weigh module, you will need the optional cover (weighing below set, **see** [WMS weigh module accessories ▸ Page 52]) and a T10 Torx screwdriver.

– Remove the labyrinth ring by squeezing it together gently on the broad side of the weigh module and lifting it off.

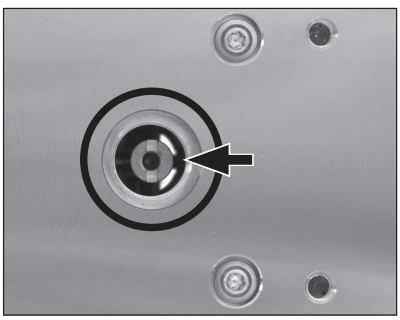
– Remove the labyrinth ring holder.



– Attach the cover and secure it with the 4 M3 × 20 screws (max. torque 0.8 Nm).



– Remove the screw plug from the bottom of the WMS weigh module to access the attachment point (M4 thread) for your supporting device.



Note

The attachment point is protected against overload. However, avoid any excessive vertical or lateral forces on the supporting device.

2.9.3 Design and assembly of the supporting device for weighing below the module

If you need the entire weighing range for the weighing object, your supporting device should be the same weight as the basic load, **see** [Querying the residual ranges ▸ Page 27]. Bear the following in mind when designing the supporting device:

- Try to position the center of gravity of the supporting device as close to and vertically below the attachment point.
- The supporting device must hang freely from the attachment point without touching any fixed parts of the module or the system (max. diameter or cross section of the supporting device immediately next to the attachment point: ≤ 8 mm).
- If possible, restrict the vertical and horizontal movement of the supporting device with mechanical stops so as to avoid overloading the module
- Avoid oscillations and vibrations in the supporting device and the weighing object to achieve a short weighing duration. **see** [Relationship between precision, weighing duration and environmental conditions ▸ Page 7].
- Use the M4 thread to attach the supporting device (max. penetration: 8 mm, max, torque: 1 Nm).

2.10 Installation and operation of a weigh module with “Wash-down” option

2.10.1 Benefits of the "Wash-down" option

The factory-installed "wash-down" option is a unique seal set below the weighing platform that is activated by air pressure. The "wash-down" option allows the module to be cleaned with a water jet and at the same time protects the weighing sensor from dynamic overload because, when activated, it blocks the weighing platform.

You can identify whether your WMS weigh module is fitted with the "wash-down" option from its type designation (WMS...-**W**).

2.10.2 Instructions for installing the module with "Wash-down" option

The seal set consists of a rubber bellows made from FDA-compliant material which, when inflated, is pressed against the inner ring of the weighing platform or support to create a seal. Weighing is not possible in this state. The seal bellows returns to its original shape by simply deflating.

Note

- The seal set has been precisely centered in relation to the load applicator in the factory so that only minimal lateral forces occur when it is activated. Therefore do not attempt to dismantle the seal module under any circumstances.
- The seal bellows, which is normally protected by the labyrinth ring, must not be damaged.
- The bellows should remain easily accessible for cleaning.

Note

Never activate the seal set without the weighing platform or weighing adapter fitted!

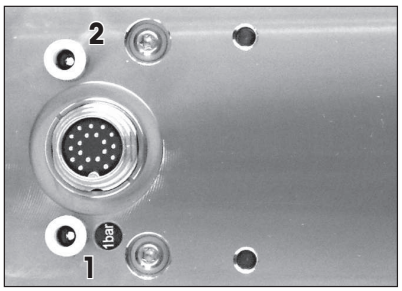
2.10.3 Operating the weigh module with “Wash-down” option

After activation, a heat build-up in the weigh module due to the sealing is possible. To get accurate weighing results, it is recommended to continue the weight measurement only 15 minutes after pressure release and after having performed an internal or external adjustment.

In order to guarantee a perfect seal every time, the seal bellows must be replaced by a specialist trained by METTLER TOLEDO after a maximum of 2 years under normal environmental conditions.

2.10.4 Air connection

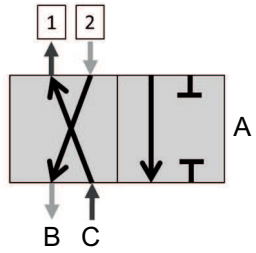
On the underside of the WMS weigh module there are two air connections for plastic tubes outer diameter 4 mm (5/32 inch) / inner diameter 2.5 mm (1/10 inch).



Air connection (1) for the activation of the „wash-down" option is labeled with a marking.

- Use constant air pressure of 1 bar (± 0.1 bar). The second air connection (2) is used for deaeration.
  - ➡ So in case of a leak no overpressure can build up in the weigh module.

Make sure this connection remains closed during operation to prevent air circulation. We recommend to use a 4/2 way valve as picture show.



A 4/2 way valve
B deaeration
C 1 bar

Note

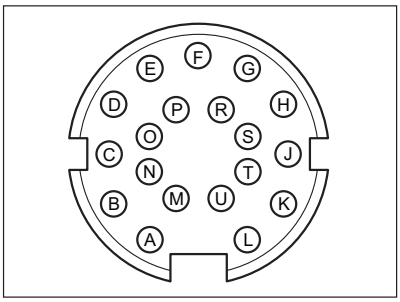
The deaeration connector must be closed during weighing.

3 Electrical Connection

The electrical connection is made via the 19-pin Binder series 423 connector. Various cable models are available as accessories, **see** [Accessories and Spare Parts ▸ Page 52]. The connector is shown from the soldering side.

The following groups of cables are fed to/from the device via the 19-pin electrical connector:

- Load cell power supply (2 lines)
- Power supply for digital inputs and outputs (2 lines)
- Digital inputs (3 lines) and Digital outputs (3 lines)
- RS232 data interface (5 lines)
- RS422 data interface, bus-capable (4 lines)



Note

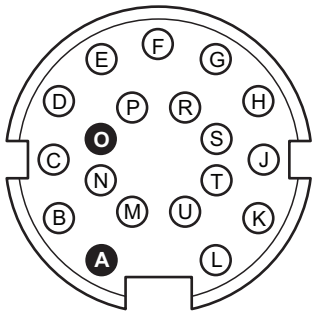
A shielded cable must be used to prevent faults in the weighing results and data transmission. The shield, which is connected to the weigh module housing via the connector housing, should be connected to the system ground. Under some circumstances, it may only be possible to determine the most appropriate grounding concept by experiment.

The ConBlock accessory is available to simplify the connection to the system - this is a DIN rail module that can be used to distribute the lines by function, **see** [WMS ConBlock ▸ Page 53]. There is also a SubD 9f RS232 connector on the module for service purposes or for connecting an external weight display.

3.1 Power supply

- Power supply: 12 - 24 V DC nominal (10 - 29 V DC)
- Power consumption at a nominal voltage of 24 V: < 4 W

The power supply is provided via the following contacts in the 19-pin connector or conductors in the optional connecting cable. Built-in shielding prevents damage to the WMS weigh module if the positive and negative terminals are inverted.

Signal	Designation	Contact	Conductor color	Pinout
VDC	12-24 V DC nom. (10 - 29 V DC)	"A"	grey/pink	
GND	0 Volt	"O"	grey/brown	

3.2 Data interfaces

Apart from the fact that multiple modules can only be networked via a bus-capable interface (RS422), the functionalities of the two interfaces differ in the following ways.

Functions	RS422	RS232
Weigh modules can be networked, individually addressable	✓	–
Download new firmware (program)	–	✓
Configure module, query configuration	✓	✓
Transmit individual weighing results, execute weighing functions	✓	✓
`I4` after a restart/reset	✓	✓

3.2.1 RS232 interface

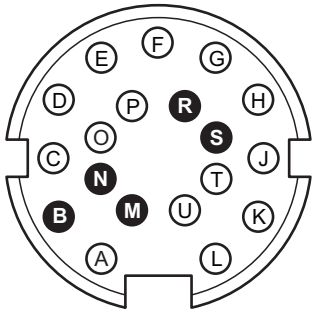
The WMS weigh module has an RS232 data interface. The maximum permissible cable length for RS232 is defined as 15 m (up to 19200 baud transmission speed). If you use the WMS ConBlock, you can use either the SubD9f connector or the terminal strip. The RS232 is also required for any software updates.

Note

With the WMS ConBlock, either the SubD9f connector or the terminal strip can be used. Parallel operation is not possible with an RS232.

Connecting the RS232 interface

The RS232 interface is connected via the following contacts in the 19-pin connector or conductors in the optional connecting cable:

Signal	Designation	Contact	Conductor color	Pinout
TXD	Transmit signal from the module to the system	"M"	red/blue	
RXD	Receive signal from the system to the module	"N"	white/pink	
GNDINT	Ground ("digital ground") [1)]	"B"	purple	
CTS	Flow control (control signal from the system)	"R"	yellow/brown	
RTS	Flow control (control signal to the system)	"S"	white/yellow	

[1)] This connection is connected internally to the shielding and the negative terminal of the power supply (contact "O") via the EMC filter.

Note

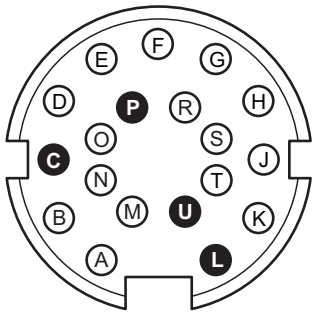
For downloading of new firmware (software) to work, you need to connect the RTS and CTS lines even if flow control is not controlled by a hardware handshake, **see** Software (firmware) Upgrade.

3.2.2 RS422 interface

The bus-capable RS422 interface, on which data is transmitted via a transmit and receive pair of conductors, is used to network multiple weigh modules and to address them individually via a configurable address.

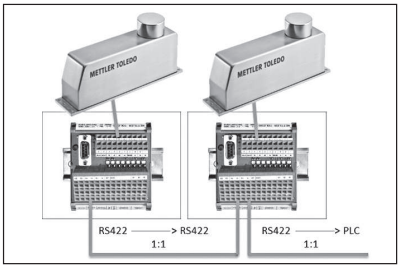
Connecting the RS422 interface

The connection is directly via the 19-pin connector or the connecting cable that is available as an accessory.

Signal	Designation	Contact	Conductor color	Pinout
TX+	Transmit signal from the module to the system	"L"	white	
TX–	Inverted transmit signal from the module to the system	"P"	white/grey	
RX+	Receive signal from the system to the module	"U"	white/green	
RX–	Inverted receive signal from the system to the module	"C"	black	

Networking modules

The weigh modules are networked by means of a simple parallel connection between the individual transmit and receive lines so that up to 31 modules can be controlled by the system via a single RS422 interface. The maximum permissible cable length and transmission speed correspond to the standard for the RS422 interface (1200 m at 100 kbps). The internal terminator on the first and last WMS weigh modules must be switched on with the command `M45`, **see** [Interface and communications protocols ▸ Page 23].

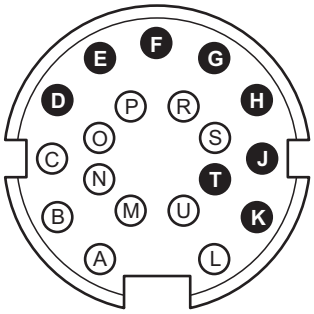


Note

The ConBlock makes it much easier to network the WMS weigh modules since additional terminals for further connections are available. Make sure, that all weigh modules are on the same ground level. Each WMS weigh module needs an individual note identification (command `NID`) and the addressed mode (Command `PROT`) must be enabled. Only sequential communication is possible, **see** [Interface and communications protocols ▸ Page 23].

3.3 Digital inputs/outputs

The WMS weigh module has three digital inputs and three digital outputs as well as the associated separate power supply. The signals are galvanically isolated from the potential of the load cell. If you use the WMS ConBlock, the states of the digital inputs/outputs and the presence of the power supply are indicated by LEDs.

Signal	Designation	Contact	Core color	Pinout
VDCIO	Power supply to digital inputs/outputs	"G"	grey	
GNDIO	Power supply to digital inputs/outputs	"E"	blue	
DIN1	Digital input 1	"H"	yellow	
DIN2	Digital input 2	"D"	red	
DIN3	Digital input 3	"J"	green	
DOT1	Digital output 1	"K"	brown	
DOT2	Digital output 2	"F"	pink	
DOT3	Digital output 3	"T"	brown/green	

Digital inputs

The digital inputs have the following features:

- Input voltage range: 10 – 30 V DC
- Nominal input voltage: 24 V DC
- Typical input current at 24 V: 5 mA
- Interference suppression
- Protection against polarity reversal
- Inactive when inputs are open

Digital outputs

The digital outputs have the following features:

- Output voltage range: 10 – 30 V DC
- Maximum output current: 0.5 A
- Surge protection 45 V
- Short circuit protection
- Protection against polarity reversal
- Protection against deactivation of inductive loads up to 0.7 J deactivation energy (inductivity of up to 1.5 H)
- Protection against excess temperature

4 Configuring

The optimum WMS weigh module settings for your application depend on the requirements and the environmental conditions. To define these settings, make sure that your WMS weigh module is correctly connected in accordance with chapter [Commissioning ▸ Page 3] and is connected to a computer via one of the two interfaces. You will also need the MT-SICS Reference Manual (11781363) which describes the relevant commands in detail.

4.1 Selecting the filter properties using the weighing type

MT-SICS command: `M01`

WMS weigh modules have an adaptive filter in which filter damping is automatically adapted to a change in weight. Linear filters with fixed, configurable damping are also available.

Adaptive filter – Check weighing

MT-SICS command: `M01␣0`

The purpose of check weighing is to determine the current weight of the weighing object with reproducibility as quickly as possible after it is applied and to transmit the measurement value. It therefore involves determining a single weight set.

Adaptive filters, whose damping depends on the change in weight over time, are ideal for this job. When the weighing object is applied, the change is large but the damping is very weak. As the change in weight reduces in the stabilization phase, damping increases which leads to increased repeatability since the external influences have little effect. Adaptive filters, set with the command `M01␣0` therefore enable you to determine a weight very quickly yet with reproducibility.

Dispensing to a specified target weight

MT-SICS command: `M01␣2`

In this application, the job of the WMS weigh module is to measure the increase in weight with as little delay as possible and to forward it to the dispensing system. This information allows the system to regulate the dispensing flow such that the target weight is achieved as quickly and precisely as possible.

Filters with fixed damping (linear filters) are suitable for this type of weighing application, also called gravimetric dispensing. Since it involves determining the weight increase, the weigh module must respond immediately to even the smallest weight change.

4.2 Preparations

Before defining the settings on the WMS weigh module, the following points should be clarified:

- What sort of weighing process is involved (check weighing, dispensing to a specified target weight)?
- What level of precision (expressed in display increments) must be achieved?
- What level of repeatability is required?
- What weighing rate (e.g. 100 per minute) is required?
- How often must the WMS weigh module be checked/adjusted during operation to meet the precision requirements?
- How heavy is the load supporting device (pre-load)?
- What weight (built-in or external) will be used for checking/adjustment?
- What unit should be used to express the weight set?
- What sort of interference might be present (oscillations, vibrations, air movements, static charges)?
- How will the weighing object be applied?
- What type of weighing object is involved (solid, liquid etc.)?
- To which interface will your system (PC, PLC etc.) be connected?

4.3 Interface and communications protocols

The WMS weigh module has an RS232 interface and an RS422 interface. METTLER TOLEDO recommends keeping the RS232 interface free as a service and configuration interface. The respective parameters for the MT-SICS commands can be found in the MT-SICS Manual #11781363.

Note

- that commands affecting the interface or its means of communication have an immediate effect.
- each setting you have defined so that you can access the WMS weigh module.

Defining the interface parameters (RS232 and RS422)

MT-SICS command: `COM`

The interface parameters can be defined with the `COM` command.

Note

Note that you can change both interfaces; therefore you must record the settings so that you can access the WMS weigh module again.

Defining the communication protocol (RS422)

MT-SICS command: PROT

The bus-capable RS422 data interface supports the following communications protocols as standard:

- Default protocol (point-to-point connection) without addressing (terminal mode)
- Address resolution protocol for network applications
- Frame protocol (DIN 66348 measuring bus)

In addressed operation with the frame protocol, every module must be assigned its own address, **see** [Setting the module address (node identification, RS422) ▸ Page 24]. If you operate the WMS weigh module in an RS422 network, you need to switch the terminator), **see** [Terminator (RS422) ▸ Page 24].

Setting the module address (node identification, RS422)

MT-SICS command: NID

If the WMS modules are to be networked, every module must be assigned a unique address. The default factory setting for the module address is 15 (decimal), which corresponds to the ASCII character "?".

Terminator (RS422)

MT-SICS command: M45

The first and last module in an RS422 network must be connected via a terminator. This is integrated into the WMS weigh module and is switched using the command M45.

4.4 Setting the readability

MT-SICS command: RDB and M23

The readability is the smallest weight difference that the weigh module can display and transmit via the interface. The WMS404C-L weigh module, for example, can record differences to 0.1 mg, so the readability d (digit) is 0.1 mg.

Appropriate environmental conditions must be achieved and maintained to measure precisely to 0.1 mg in practice, **see** [Relationship between precision, weighing duration and environmental conditions ▸ Page 7]. Also, strong filter damping is usually required, which in turn reduces the weighing rate.

The command RDB can be used to reconfigure the readability of the WMS weigh module, for example from 4 figures (1d = 0.0001 g) to 3 figures (1d = 0.001 g). These settings are then effective for all commands, in particular adjustment. If you confirm RDB␣A, the WMS weigh module will perform a restart.

The display increments for the weight query can be changed with the command M23, **see** [Transmission of Weight Value ▸ Page 32]. The existing configuration is then retained but the display increments are rounded accordingly.

4.5 Defining stability criteria

MT-SICS command: `USTB`

If a weighing result meets the stability criterion, the measured value is regarded as stable. The stability criterion is defined by two key figures: The maximum permissible difference (1st key figure) between the largest and smallest weight set measured during a particular observation period (2nd key figure).

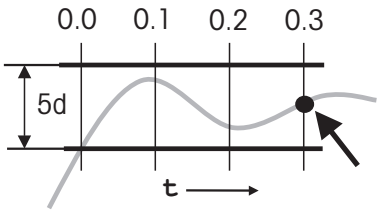
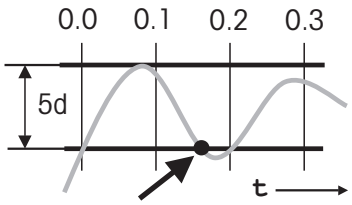
Separate stability criteria can be defined for:

- weighing (e.g.: Command: `S`)
- the taring function (e.g.: command `T`)
- reset (e.g.: command `Z`)

If the difference remains below the defined value throughout the observation period, the last measured value is regarded as stable and is transmitted via the interface if required. The difference/tolerance is specified in readability increments (digits) and the observation period in seconds, **see** [Setting the readability ▸ Page 24].

Note

The permissible tolerance determines the inaccuracy with which a weighing result is regarded as stable; the observation period in turn defines the minimum possible stabilization time after a change in weight. The greater the tolerance and the shorter the observation period selected, the quicker, but more imprecisely, a stable value will be determined. Whether the stability criterion can be met depends on the filter damping setting and the current environmental conditions, **see** [Setting filter damping ▸ Page 26].

Criterion met	Criterion not met
	
The value measured at the end of the observation period is transmitted as a stable value. (`t` = Time [s])	Tolerance exceeded. Wait until stability criterion is met. (`t` = Time [s])

4.6 Setting filter damping

MT-SICS command: M02 and FCUT

Filter damping determines how quickly the weigh module responds to a change in weight, as well as how sensitive it is to external interference. The stronger the filter damping you set, the more slowly the module will respond to a small weight change and the less sensitive it will be environmental influences such as air movements and vibrations. This also increases the measurement precision that can be achieved (repeatability). You can also influence the effective measurement precision and the weighing time by setting the stability criteria, **see** [Defining stability criteria ▸ Page 25].

Setting filter damping

MT-SICS command: M02

The following filter damping options are available on the WMS weigh module:

Damping	Adaptive filter (M01_0)	Fixed filter (M01_2)
Weakest damping M02␣0	Check weighing in (very) quiet environment	Dispensing, own signal post-processing, limit frequency 3.07 Hz
Weak damping M02␣1	Precise check weighing in quiet environment	Dispensing in quiet environment, limit frequency 2.07 Hz
Average damping M02␣2	Check weighing in normal environment	Dispensing in normal environment, limit frequency 1.49 Hz
Strong damping M02␣3	Check weighing in busy environment	Precise dispensing in normal environment, limit frequency 0.59 Hz
Strongest damping M02␣4	Precise check weighing in busy environment	Dispensing in busy environment, limit frequency 0.41 Hz

You must determine the level appropriate to your situation empirically by carrying out tests.

We advise you to start with the strongest damping M02␣4 and to reduce it gradually based on repeatability measurements. Note the influence of the stability criteria. In principle you will achieve greater repeatability in check weighing with weak damping and adaptive filters than with fixed filters.

Setting the limit frequency

MT-SICS command: M01␣2 and FCUT

Use the command FCUT to set any cut-off frequency of the fixed filter in a range from 0.001 Hz to 20 Hz. If FCUT is < 0.001 (is interpreted as 0), the predefined values according to the command M02 are used.

4.7 Internal and external adjustment/test

MT-SICS command: C0 to C4 and TST0 to TST3

The built-in adjustment weight (in WMS...C models), which is used to automatically check (test) and adjust the module with no manual intervention, has been compared with a traceable weight in the factory. The resulting adjustment factor is stored in the permanent memory of the weigh module (initial adjustment).

The installation location, use of a supporting device (pre-load), or intensive use of the module over a prolonged period can lead to adjustment with the built-in weight failing to achieve the expected precision. You can check whether this is the case at any time using an external weight whose exact value is known (e.g. using a certified weight).

The pre-load must not exceed 50% of the nominal maximum capacity; otherwise the internal weight cannot be used because of the excessive total load, **see** [Querying the residual ranges ▸ Page 27].

Note

METTLER TOLEDO recommends that you have the WMS weigh module regularly checked or adjusted by a qualified METTLER TOLEDO service engineer.

Performing the internal and external test function

MT-SICS command: TST0 to TST3 and M20

The test function consists of two steps. In the first step, the built-in or external weight of a known value (target value) is applied. the module then calculates the difference between the measured value and the target value and transmits the discrepancy via the interface. Run the command TST0␣0 if you are using the built-in weight for the test function and TST0␣1 if you want to use an external weight. The weight of the external weight must be entered with the command M20.

Setting the adjustment weight

MT-SICS command: C0 to C4 and M19

Adjustment compensates the WMS weigh module in such a way that the measured weight corresponds exactly to the target value of the adjustment weight. This therefore involves compensation in two measurements points, the zero point and the adjustment point. The external adjustment weight must be entered with the command M19.

Querying the residual ranges

MT-SICS command: I50

Use the command I50 to query the current available weighing ranges (residual ranges).

4.8 Update rate for continuous weight transmission

MT-SICS command: `UPD`

For weighing applications such as dispensing to a specified target weight, the dispensing system must record the weight change continuously so as to regulate the dispensing process. In this case, you can define the number of weight values to be transmitted per second via the interface in what is known as "send continuous" mode.

Note

Note that you must also adjust the baud range of the interface for a high update rate.

Baudrate	update rate
2400	< 5 values / s
4800	< 10 values / s
9600	< 20 values / s
from 19200	all settings

4.9 Programming tips and aids

Weigh module identification

MT-SICS command: `I10`

There are a series of commands to enable the higher-level system to uniquely identify the weigh module. You can query the serial number, model name of the module and other information using the relevant commands. You can use the command `I10` to give each module a unique name.

List of settings

MT-SICS command: `LST`

The `LST` command allows you to list all the current settings that you can change by means of your module configuration. This enables you to check and log the configuration.

Reset settings (factory settings)

MT-SICS command: `FSET`

All values, parameters, name and the adjustment factor that can be defined can be reset to factory settings with the `LST` command. The settings you have defined will be lost.

List of implemented interface commands

MT-SICS command: `I0`

Command `I0` lists all the commands currently implemented in the module.

Date and time

MT-SICS command: DAT and TIM

The DAT and TIM commands can be used to set the internal clock in the weigh module and the same commands can be used to query the current time and date. Note that the data is lost if there is a prolonged interruption in the power supply and the clock must be reset.

Commissioning

MT-SICS command: MONH

The entire communications between a control unit (SPS) and the weigh module, for example, is monitored during commissioning or in the event of a fault. The entire communications of the RS422 are mirrored on the RS232, for example.

Cancelling a running command

MT-SICS command: @

Recurring commands such as SIR or processes such as C3 can be cancelled with the command @.

Weight unit

MT-SICS command: M21 and M22

The weight unit can be changed with command M21. The following units are possible, depending on the weight range: g, kg, mg, µg and the user unit M22.

Timeout

MT-SICS command: M67

The general timeout on the weigh module can be set with command M67. This affects all commands with a timeout criterion such as the S and C commands.

Zero point after restart

MT-SICS command: M35

The current stable zero point can be stored with command M35. After a power failure, the weigh module will start up with the stored zero point.

Command after a restart

MT-SICS command: M44

The weigh module can run a command automatically on any interface once the weigh module is ready after a restart.

4.10 Digital inputs/outputs

MT-SICS command: DIN, DOT, DOTC, WMCF and DOTP

The WMS weigh module has three digital inputs and three digital outputs.

Commands can be triggered via the digital inputs DIN. The response is then output on the defined RS232 or RS422 interface. The digital outputs DOT are used to implement automatic processes with no additional control.

The commands DOTC and WMCF are used to implement weight monitoring functions and the respective outputs are activated.

The DOTP command responds to a defined response on the interface.

4.11 Diagnostic mode / fully automatic adjustment "FACT"

MT-SICS command: M18 and CO

The WMS weigh module has "FACT" functionality (Fully Automatic Calibration Technology) which performs an adjustment automatically or manually in the event of a defined temperature change (command M18).

"FACT" functionality is configured as manual in the factory settings and this setting can be configured using the MT-SICS command CO. Automatic adjustment is only possible in a WMS weigh module with an internal adjustment weight.

4.12 Additional display character

MT-SICS command: MOD

The WMS weigh module has the option of displaying an additional character. The guaranteed performance (reproducibility, linearity etc.) of the WMS weigh module with activated MOD command remains unchanged. Please contact METTLER TOLEDO customer service if you require this functionality. This command is not available in the default configuration!

4.13 FastHost

MT-SICS command: B00 to B08

"FastHost" provides advanced functionality that allows customer-specific output formats to be created, such as a weight value with a corresponding counter that can be used as time information.

4.14 Error messages

The WMS weigh module transmits an appropriate error code if an internal error is detected.

METTLER TOLEDO recommends that you forward the error number to METTLER TOLEDO if an error occurs so that the cause can be clarified and problem-free operation can be ensured.

If one of the errors below occurs, no more weight values will be transmitted via the interface. The weight value will be overwritten by the respective error code (e.g. `S␣S␣Error␣2b`).

Error code	Description
`Error 1b`	Error in the boot monitor
`Error 2b`	Error in the load cell
`Error 3b`	Error in the flash memory
`Error 4b`	Error in the communications interface
`Error 5b`	Error in the EEPROM memory

5 Weighing Operation

The actual weighing operation involves weight measurement and transmission of the results to the system via the interface. Depending on the applications, there are various ways of performing a weighing function and transmitting weight values. This section only describes the most important commands you need to use during weighing operations.

For more information refer to the Reference Manual for MT-SICS Interface Commands, #11781363 (English). This can be downloaded from:

Documentation WMS ▶ www.mt.com/ind-wms-support

or

Documentation WMS Ex2 ▶ www.mt.com/ind-wms-ex-support

5.1 Operation limits

When operating WMS weighhing module, the following operation limits have to be observed:

- The maximum permissible load on the weighing module is defined by the maximum capacity specification of the weighing module, **see** [Model-specific Data ▸ Page 37]. This range includes the custom weighing platform (preload) plus the weighed object and the container.
- For environmental conditions, **see** [Model-specific Data ▸ Page 37]. The specified metrological performance of the weighing module is ensured for the compensated temperature range (10 … 30 °C).

5.2 Transmission of weight value

The weight values that are transmitted relate either to the zero point or to the point derived from the tare command, depending on whether the previous function executed was a reset to zero or taring.

Note

Commands that are normally only completed when a stability criterion is met respond with an abort if the stability has not been achieved within the defined time limit (Timeout, command `M67`).

Functions for transmitting the weight values

MT-SICS command	Description
`S`	Transmit stable weight value
`SC`	Transmit stable weight value or dynamic weight value after timeout
`SI`	Transmit weight value immediately (stable, not stable)
`SIR`	Transmit weight value immediately and repeat (stable, not stable)
`SIS`	Transmit net weight value with unit and weight status
`SNR`	Transmit next stable weight value and repeat
`SR`	Transmit weight value and repeat when weight changes

5.3 Taring functions

In taring, the weight value that relates to the current zero point is regarded as the tare weight and is transferred to the tare memory. At the same time, the current weight value is reset to zero.

Note

The taring functions cannot be executed if the current weight value is negative relative to the current zero point.

Available commands

MT-SICS command	Description
T	Adopt current stable weight value as tare weight
TA	Set / query tare weight
TAC	Delete tare weight
TC	Adopt stable weight value within time limit otherwise a dynamic weight value as the tare weight.
TI	Adopt weight value as tare weight immediately.

5.4 Reset functions

The reset function defines a new zero point (reference point), the current weight value is reset to zero and the tare memory is cleared. Depending on the configuration, the reset is performed automatically whenever the module is switched on or the stored value is used.

Note

Make sure that a new zero point or a stored zero point is used, depending on the setting when the device is switched on.

The WMS weigh module can be reset with the following commands

MT-SICS command	Description
Z	Adopt current stable weight value as zero point
ZC	Adopt stable weight value within time limit otherwise a dynamic weight value as the zero point
ZI	Adopt the current weight value as the zero point immediately

6 Technical Data

6.1 General data

Power supply	12 to 24 V DC nominal (10 - 29 V DC) The power supply must be approved by the respective national test center of the country in which the WMS weigh module will be used.
Power consumption	< 4 W
Electrical connection	19-pin, male, Binder series 423
• Recommended cable cross-section of the supply lines	0.25 mm^2 24 AWG
• Recommended cable cross-section of the data lines	0.14 mm^2 26 AWG
Interfaces	RS232C, bidirectional, full duplex RS422, bidirectional, full duplex, bus-capable
"Wash-down" option	
• Air connection	External hose diameter: 4 mm (5/32 inch) Internal hose diameter: 2.5 mm (1/10 inch)
• Air pressure	nominal: 1.0 bar (14.5 psi)
IP protection rating	in operational state with weighing platform in place
• During weighing (labyrinth)	IP54 (standard version); IP44 (Ex Zone 2 version)
• "Wash-down" during cleaning (seal set activated with 1 bar air pressure)	IP66 (only for standard version, Ex Zone 2 version has no wash-down protection)
Typical service life of the seal sets	2 years
Maximum tilt	Deviation from horizontal
• Longitudinal axis	0.5%
• Lateral axis	0.5%
Permissible environmental conditions	WMS weigh modules may only be used in enclosed indoor areas.
• Temperature range	5 to 40 °C (40 to 105 °F)
• Height above mean sea level	up to 4000 m (13330 feet) The power supply unit must comply with the relevant standards for altitudes over 2000 m above sea level
• Humidity (at 30 °C / 85 °F)	up to 85% relative humidity
• Warm-up time	at least 30 minutes after the WMS weigh module has been connected to the mains.

Materials

• Casing, base plate, cover, flange	Stainless steel X2CrNiMo17-12 (1.4404 or 316L)
• Round weighing platform	Aluminum, chrome plated
• Square weighing platform	Aluminum, chrome plated or Stainless steel X2CrNiMo17-12 (1.4404 or 316L)
• Seal between flange and upper part of housing	FPM 50 Shore A, black, FDA-compliant
• Seal between housing and base plate	FPM 65° Shore A, black FDA-compliant
• Inflatable bellows in "wash-down" model	NBR 50 Shore, black, anti-static
Surface roughness of the housing	N7 or better

6.2 Additional technical data for Ex Zone 2 WMS weigh module

Overvoltage category	II	
Degree of pollution	2	
Electrical data	**Power supply:**	
	12…24 V DC +20% / -15% (min. 10…max. 29 V DC)	
	Input current (normal weighing):	≤ 150 mA
	Max. input current (calibration):	≤ 350 mA
	Nom. power (normal weighing):	≤ 1.5 W
	Max. power (calibration):	≤ 3.0 W
	RS422:	
	RX+, RX-:	
	Abs. max. input voltage:	-7…+12 V (termination switched off)
	Abs. max. differential input voltage range:	± 6 V (termination switched on)
	Min. input resistance:	44 kΩ (termination switched off)
	TX+, TX-:	
	Abs. max. output voltage:	-7…+12 V (termination switched off)
	Max. output short-circuit current:	-250…+300 mA
	RS232:	
	RxD, CTS:	
	Abs. max. input voltage:	±25 V
	Min. input resistance:	3 kΩ
	TxD, RTS:	
	Abs. max. output voltage:	±13.2 V
	Max. output short-circuit current:	±60 mA
	Short-circuit duration:	continuous
	Digital I/O:	
	DIN1, DIN2, DIN3:	
	Abs. max. input voltage:	±31 V
	Abs. max. differential voltage between GNDIO and GND:	60 V AC or ±85 V DC
	Min. input resistance:	8.2 kΩ
	VDCIO:	

	Abs. max. input voltage:	±31 V
	Min. input voltage:	+12 V
	Abs. max. differential voltage between GNDIO and GND:	60 V AC or ±85 V DC
	DOUT1, DOUT2, DOUT3:	
	Abs. max. output current (normal operation):	≤ 0.7 A
	Max. output current (reversed polarity operation):	≤ 2.5 A
	Abs. max. output voltage:	±31 V DC (= VDCIO)

Grounding/earthing

The weighing module does not require safety earthing due to the low voltage power supply input (SELV, PELV). Therefore no extra connection facilities for earthing are provided. However, if the customer decides to earth the module anyway there are several options:

- grounding/earthing through the machine frame,
- using one of the threads in the base plate or
- grounding/earthing via the cable shield of the connection cable.

In any case avoid forming ground loops!

Applied standards

- IEC EN 61010-1
- CAN/CSA-C22.2 No. 61010-1
- UL Std No. 61010A-1
- EN 61326+A1+A2+A3 (Class B + Industrial environments)
- FCC Part 15 (Class A),
- AS/NZS 4251.1
- AS/NZS 61000 4252.1

ATEX:

- EN 60079-0 (IEC 60079-0)
- EN 60079-15 (IEC 60079-15)

Classification

II 3G Ex nA ic IIC T6 Gc

Degree of protection

IP44

Application range

- For use only in closed and clean interior rooms
- Ex hazardous area, Zone 2 Gas Groups IIA, IIB and IIC, T6

6.3 Model-specific Data

6.3.1 WMS weigh modules with internal adjustment

Parameter		WMS104C	WMS404C
Nominal			
Maximum capacity		120 g	410 g
Readability		0.1 mg	0.1 mg
Measuring properties			
Temperature range		10 … 30 °C	
Humidity range		20 … 80% rH	
Limit values			
Repeatability (at nominal load)	sd	0.12 mg (100 g)	0.1 mg (400 g)
Linearity deviation		0.25 mg	0.4 mg
Eccentric load deviation (test load)		0.5 mg (50 g)	1 mg (200 g)
Sensitivity offset (test load)		0.5 mg (100 g)	2 mg (400 g)
Sensitivity temperature drift [1]		0.00015%/°C•R_{nt}	0.00015%/°C•R_{nt}
Sensitivity stability		0.00025%/a•R_{nt}	0.00025%/a•R_{nt}
Typical values			
Repeatability	sd	0.08 mg	0.08 mg
Differential linearity deviation	sd	0.08 mg	0.25 mg
Differential eccentric load deviation (measured at)	sd	0.2 mg (100 g)	0.6 mg (200 g)
Sensitivity offset (measured at)		0.24 mg (100 g)	0.95 mg (400 g)
Minimum weight (acc. to USP)		160 mg	160 mg
Minimum weight (U=1%, k=2)		16 mg	16 mg
Typical uncertainties & more			
Repeatability		0.12 mg	0.08 mg
Differential linearity deviation	sd	$\sqrt{(8 \times 10^{-8}\ mg \cdot R_{nt})}$	$\sqrt{(4 \times 10^{-8}\ mg \cdot R_{nt})}$
Differential eccentric load deviation	sd	0.0003%·R_{nt}	0.00015%·R_{nt}
Sensitivity offset		0.00012%·R_{nt}	0.00012%·R_{nt}
Dynamics			
Settling time, typ. [2]		0.8 s	
Interface update rate max.		92/s	
Dimensions of WMS weigh modules			
Height (incl. weighing platform) × width × length of short (long) base plate		126 × 59 × 238 (268) mm	
Diameter of round weighing platform		54 mm	
Square weighing platform		58 × 58 mm	
Weight with square weighing platform		2.8 kg	

Legend

[1] Temperature range 10 … 30 °C.

[2] The time between placing the weighed object on the weigh module and indication of a stabilized weight value under optimal environmental conditions.

Parameter		WMS1203C	WMS6002C
Nominal			
Maximum capacity		1220 g	6.2 kg
Readability		1 mg	10 mg
Measuring properties			
Temperature range		10 … 30 °C	
Humidity range		20 … 80% rH	
Limit values			
Repeatability (at nominal load)	sd	1 mg (1200 g)	10 mg (6 kg)
Linearity deviation		3 mg	30 mg
Eccentric load deviation (test load)		5 mg (500 g)	50 mg (2 kg)
Sensitivity offset (test load)		10 mg (1200 g)	80 mg (6 kg)
Sensitivity temperature drift [1]		0.00015%/°C•R_{nt}	0.00015%/°C•R_{nt}
Sensitivity stability		0.00025%/a•R_{nt}	0.00025%/a•R_{nt}
Typical values			
Repeatability	sd	0.8 mg	6 mg
Differential linearity deviation	sd	2 mg	19 mg
Differential eccentric load deviation (measured at)	sd	3 mg (500 g)	32 mg (2 kg)
Sensitivity offset (measured at)		2.9 mg (1200 g)	24 mg (6 kg)
Minimum weight (acc. to USP)		1600 mg	12000 mg
Minimum weight (U=1%, k=2)		160 mg	1200 mg
Typical uncertainties & more			
Repeatability		0.8 mg	6 mg
Differential linearity deviation	sd	$\sqrt{(8 \times 10^{-7}\ mg \cdot R_{nt})}$	$\sqrt{(1.5 \times 10^{-5}\ mg \cdot R_{nt})}$
Differential eccentric load deviation	sd	0.0003%·R_{nt}	0.0008%·R_{nt}
Sensitivity offset		0.00012%·R_{nt}	0.0002%·R_{nt}
Dynamics			
Settling time, typ. [2]		0.8 s	
Interface update rate max.		92/s	
Dimensions of WMS weigh modules			
Height (incl. weighing platform) × Width × Length of short (long) base plate		126 × 59 × 238 (268) mm	
Diameter of round weighing platform		54 mm	
Square weighing platform		58 x 58 mm	
Weight with square weighing platform		3.2 kg	

Legend

[1] Temperature range 10 … 30 °C.

[2] The time between placing the weighed object on the weigh module and indication of a stabilized weight value under optimal environmental conditions.

6.3.2 WMS weigh modules without internal adjustment

Parameter		WMS204	WMS403
Nominal			
Maximum capacity		220 g	410 g
Readability		0.1 mg	1 mg
Measuring properties			
Temperature range		10 … 30 °C	
Humidity range		20 … 80% rH	
Limit values			
Repeatability (at nominal load)	sd	0.2 mg (200 g)	1 mg (400 g)
Linearity deviation		0.4 mg	2 mg
Eccentric load deviation (test load)		1 mg (100 g)	2 mg (200 g)
Sensitivity offset (test load)		1 mg (200 g)	2 mg (400 g)
Sensitivity temperature drift [1)]		0.00015%/°C•R_{nt}	0.00015%/°C•R_{nt}
Sensitivity stability		0.00025%/a•R_{nt}	0.00025%/a•R_{nt}
Typical values			
Repeatability	sd	0.12 mg	0.5 mg
Differential linearity deviation	sd	0.25 mg	1.3 mg
Differential eccentric load deviation (measured at)	sd	0.6 mg (100 g)	1 mg (200 g)
Sensitivity offset (measured at)		0.24 mg (100 g)	0.95 mg (400 g)
Minimum weight (acc. to USP)		240 mg	1000 mg
Minimum weight (U=1%, k=2)		24 mg	100 mg
Typical uncertainties & more			
Repeatability		0.12 mg	0.5 mg
Differential linearity deviation	sd	$\sqrt{(8 \times 10^{-8}\ mg \cdot R_{nt})}$	$\sqrt{(1 \times 10^{-6}\ mg \cdot R_{nt})}$
Differential eccentric load deviation	sd	0.0003%·R_{nt}	0.00025%·R_{nt}
Sensitivity offset		0.00012%·R_{nt}	0.00012%·R_{nt}
Dynamics			
Settling time, typ. [2)]		0.8 s	
Interface update rate max.		92/s	
Dimensions of WMS weigh modules			
Height (incl. weighing platform) × width × length of short (long) base plate		126 × 59 × 238 (268) mm	
Diameter of round weighing platform		54 mm	
Square weighing platform		58 × 58 mm	
Weight with square weighing platform		2.8 kg	

Legend

1) Temperature range 10 … 30 °C.

2) The time between placing the weighed object on the weigh module and indication of a stabilized weight value under optimal environmental conditions.

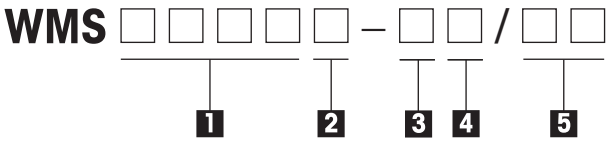
Parameter		WMS803	WMS4002
Nominal			
Maximum capacity		820 g	4.2 kg
Readability		1 mg	10 mg
Measuring properties			
Temperature range		10 … 30 °C	
Humidity range		20 … 80% rH	
Limit values			
Repeatability (at nominal load)	sd	1 mg (800 g)	10 mg (4 kg)
Linearity deviation		3 mg	30 mg
Eccentric load deviation (test load)		5 mg (500 g)	50 mg (2 kg)
Sensitivity offset (test load)		7 mg (800 g)	50 mg (4 kg)
Sensitivity temperature drift [1)]		0.00015%/°C•R_{nt}	0.00015%/°C•R_{nt}
Sensitivity stability		0.00025%/a•R_{nt}	0.00025%/a•R_{nt}
Typical values			
Repeatability	sd	0.8 mg	8 mg
Differential linearity deviation	sd	2 mg	20 mg
Differential eccentric load deviation (measured at)	sd	3 mg (500 g)	32 mg (2 kg)
Sensitivity offset (measured at)		0.24 mg (100 g)	0.95 mg (400 g)
Minimum weight (acc. to USP)		1600 mg	16000 mg
Minimum weight (U=1%, k=2)		160 mg	1600 mg
Typical uncertainties & more			
Repeatability		0.8 mg	8 mg
Differential linearity deviation	sd	$\sqrt{(1.2 \times 10^{-6}\ \text{mg} \cdot R_{nt})}$	$\sqrt{(2.5 \times 10^{-5}\ \text{mg} \cdot R_{nt})}$
Differential eccentric load deviation	sd	0.0003%·R_{nt}	0.0008%·R_{nt}
Sensitivity offset		0.00012%·R_{nt}	0.00012%·R_{nt}
Dynamics			
Settling time, typ. [2)]		0.8 s	
Interface update rate max.		92/s	
Dimensions of WMS weigh modules			
Height (incl. weighing platform) × width × length of short (long) base plate		126 × 59 × 238 (268) mm	
Diameter of round weighing platform		54 mm	
Square weighing platform		58 × 58 mm	
Weight with square weighing platform		3.2 kg	

Legend

1) Temperature range 10 … 30 °C.

2) The time between placing the weighed object on the weigh module and indication of a stabilized weight value under optimal environmental conditions.

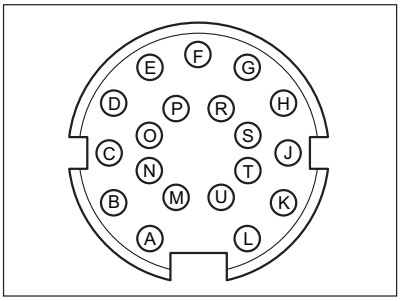
6.4 Type designation code



#	Designation	Configuration
1	**Capacity and resolution**	104, 204, 403, 404, 803, 1203, 4002, 6002
2	**Internal calibration**	(blank): no internal calibration **C:** with internal calibration
3	**Seal**	**L:** Labyrinth **W:** "Wash-down"
4	**Special versions**	(blank): Standard Software **S:** Enhanced Software **X:** Ex Zone 2 weigh module
5	**Options**	(blank): below connection, long base plate **01:** rear connection, long base plate **10:** below connection, short base plate **11:** rear connection, short base plate

6.5 Connector assignment

Assignment of the Binder series 423 19-pin connector (viewed from the solder side)



The conductor colors relate to the accessory connecting cable.
Dataflow: "→" signal from / "←" signal to the weigh module.

PIN	Signal		Conductor colour	Description	Data flow
A	VDC	12-24 V DC	grey/pink	Positive terminal of the supply voltage 12-24 V DC nom. (10 - 29 V DC)	
B	GNDINT	RS232	purple	Earth for RS232	
C	RX-	RS422	black	RS422 receive line	←
D	DIN2	IO	red	Digital input	
E	GNDIO	IO	blue	Negative terminal of the digital inputs/outputs	
F	DOUT2	IO	pink	Digital output	
G	VDCIO	12-30 V DC	grey	Positive terminal of the digital inputs/outputs	
H	DIN1	IO	yellow	Digital input	
J	DIN3	IO	green	Digital input	
K	DOUT1	IO	brown	Digital output	
L	TX+	RS422	white	RS422 transmit line	→
M	TXD	RS232	red/blue	RS232 transmit line	→
N	RXD	RS232	white/pink	RS232 receive line	
O	GND	0 V DC	grey/brown	Negative terminal of the supply voltage	
P	TX-	RS422	white/grey	RS422 transmit line	→
R	CTS	RS232	yellow/brown	RS232 flow control	←
S	RTS	RS232	white/yellow	RS232 flow control	→
T	DOUT3	IO	brown/green	Digital output	
U	RX+	RS422	white/green	RS422 receive line	←

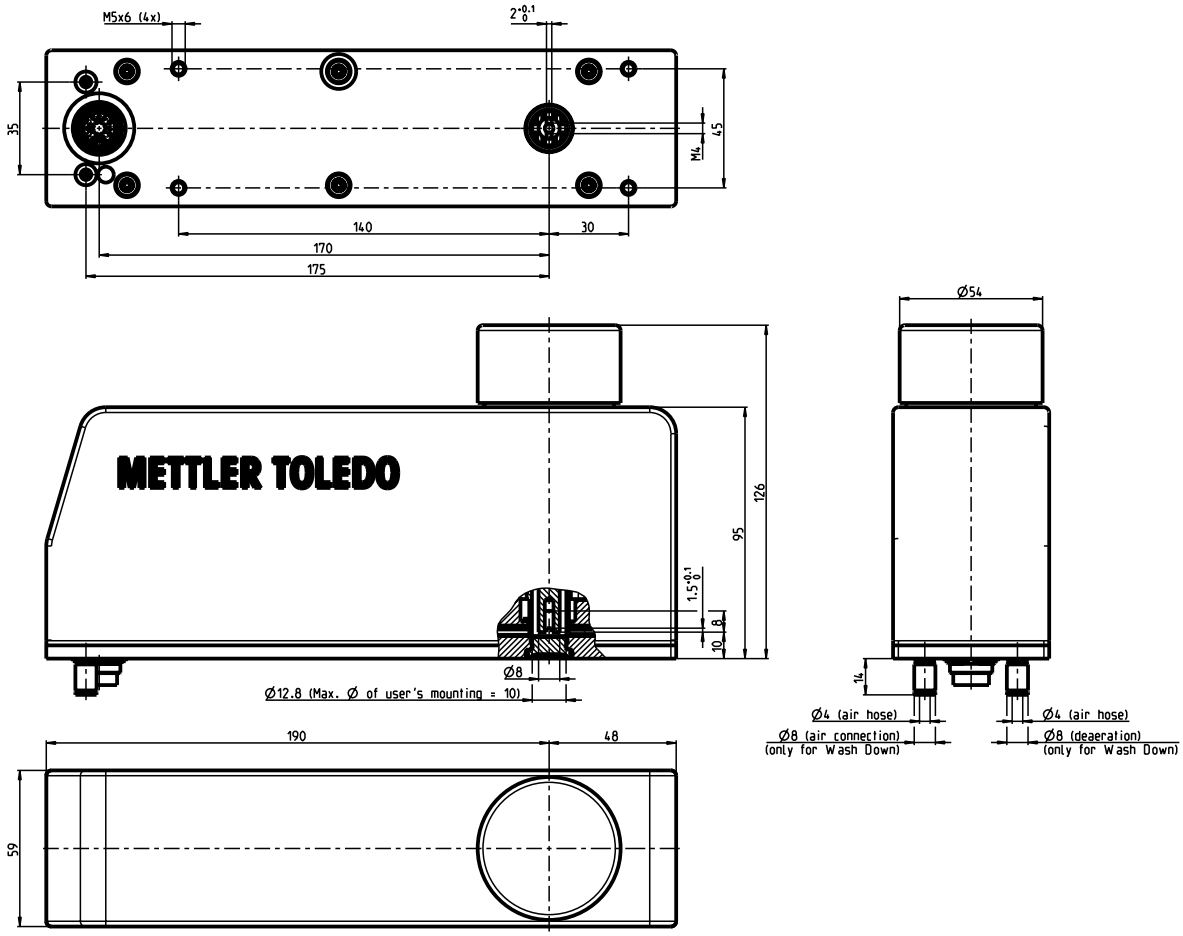
Note

A shielded cable must be used to prevent faults in the data transmission and/or weighing results. The shield must be connected to the connector housing (WMS weigh module housing) on one side and to the system ground on the other side; avoid ground loops. The best grounding scheme may only be determined by trial and error on site.

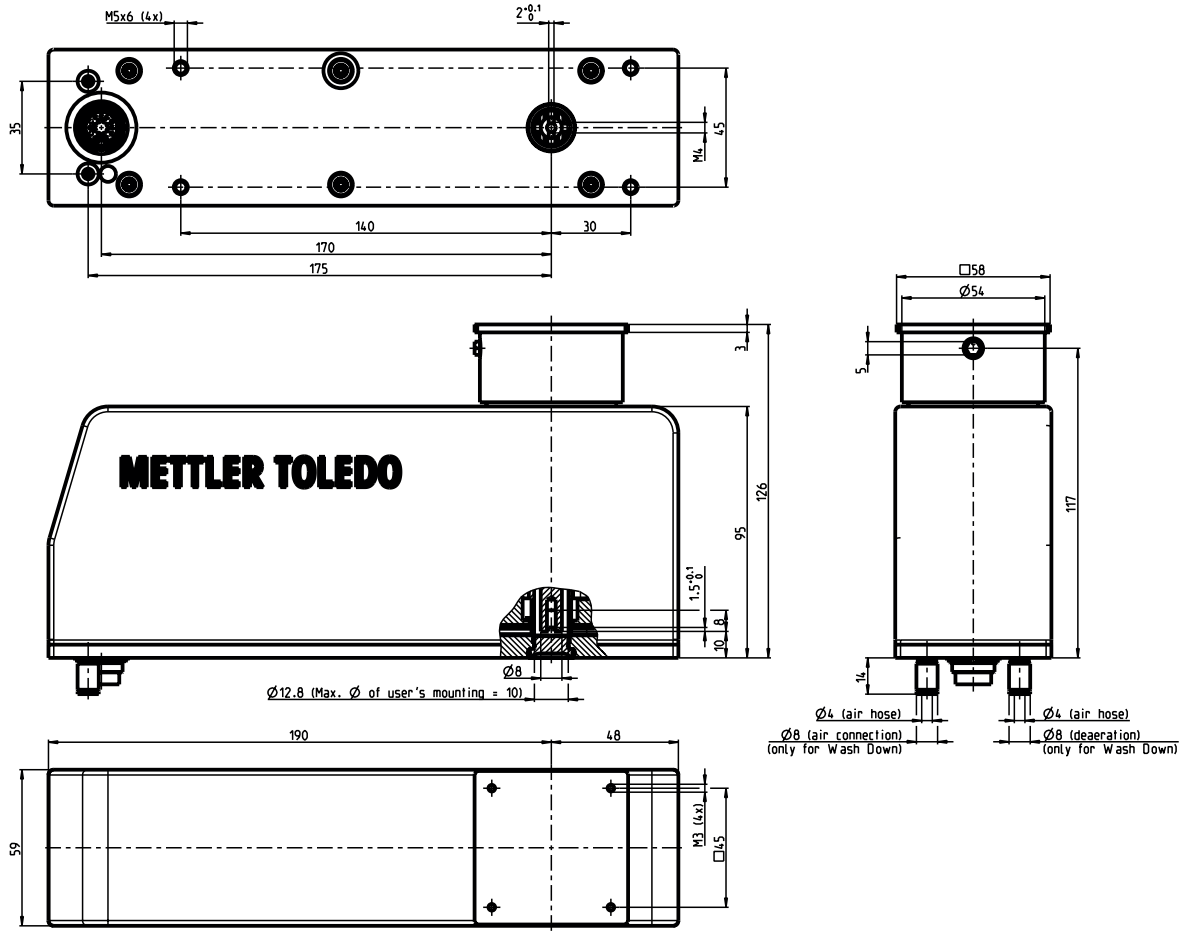
6.6 Dimension diagrams of the WMS weigh modules

The dimension diagrams all show the "wash-down" configuration. The only difference between these and the labyrinth variant is that the latter does not have the air connections on the bottom of the WMS weigh module.

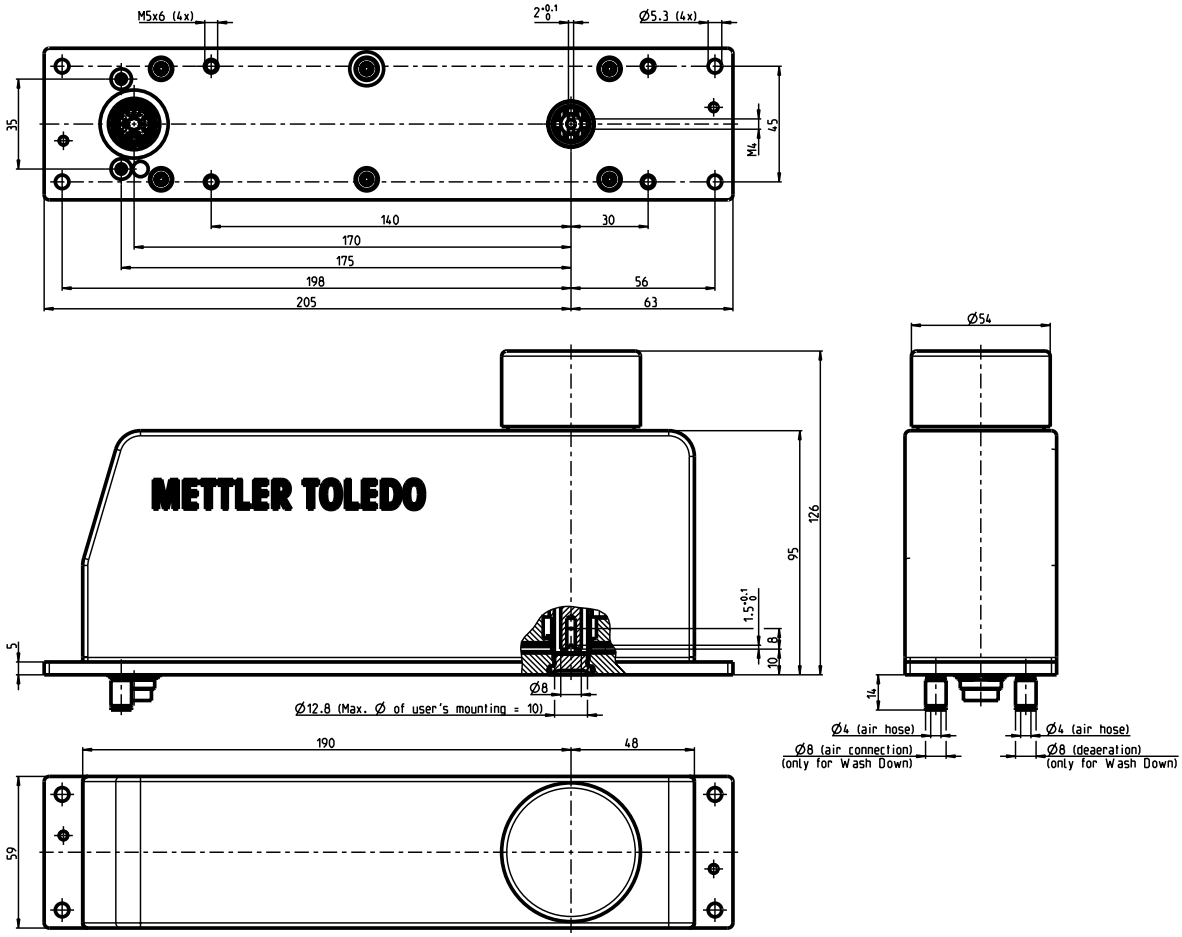
Short base plate and round weighing platform, connector bottom



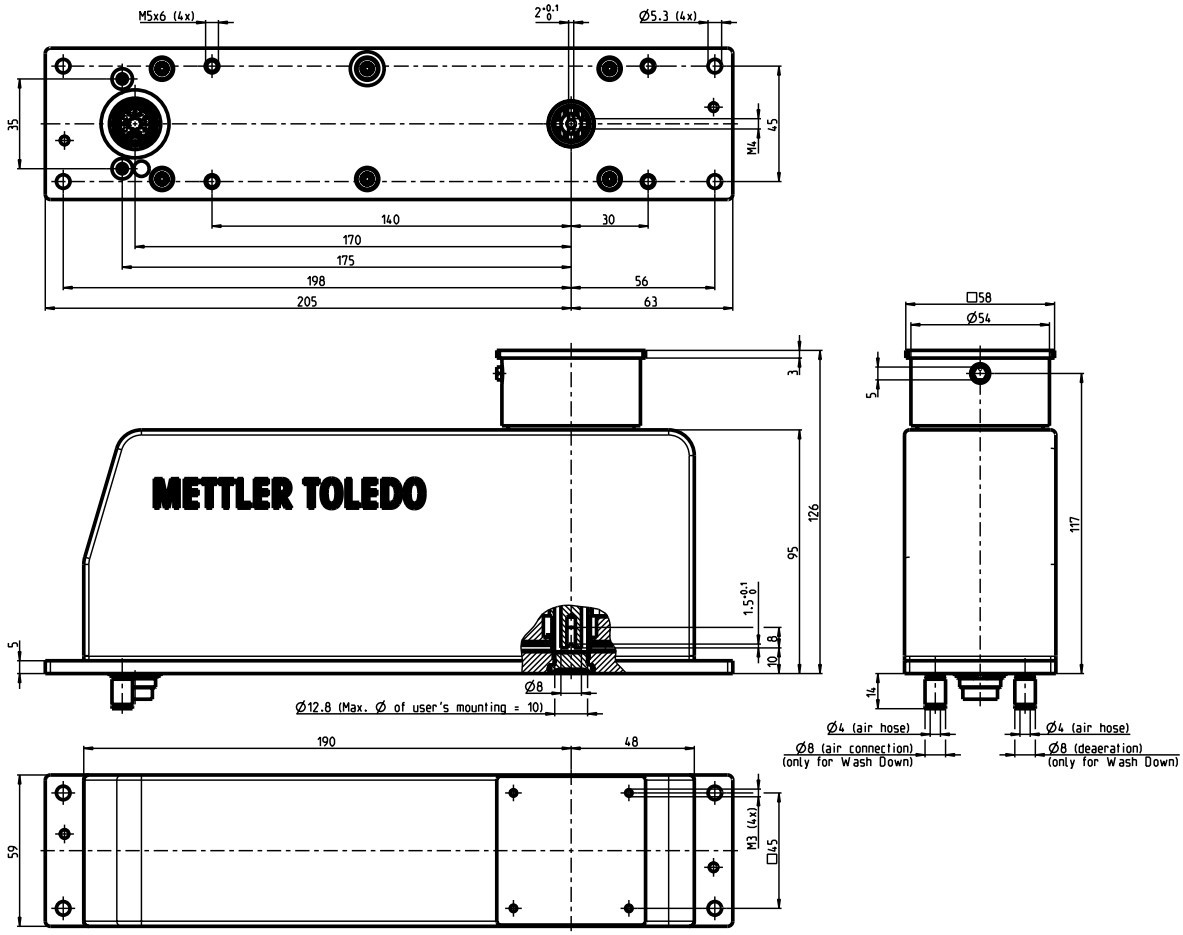
Short base plate and square weighing platform, connector bottom



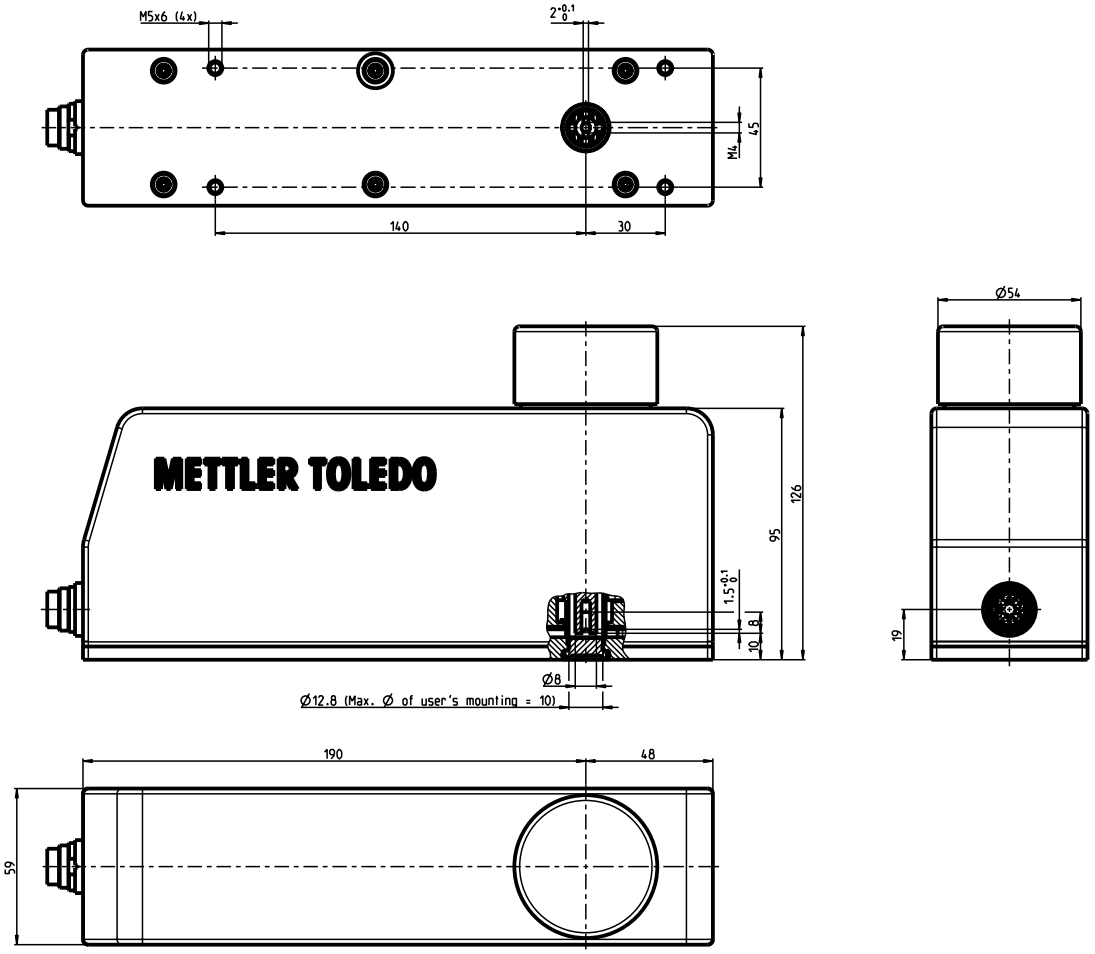
Long base plate and round weighing platform, connector bottom



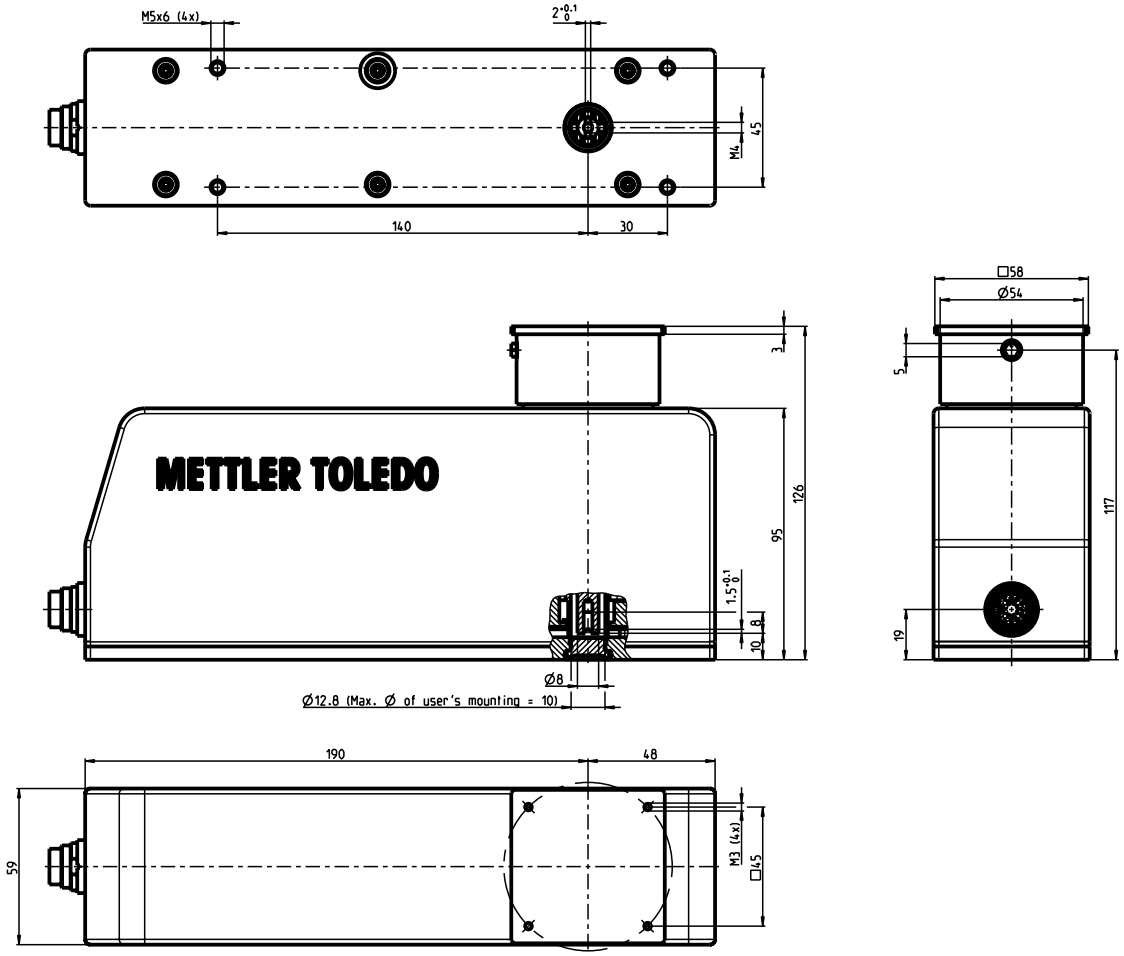
Long base plate and square weighing platform, connector bottom



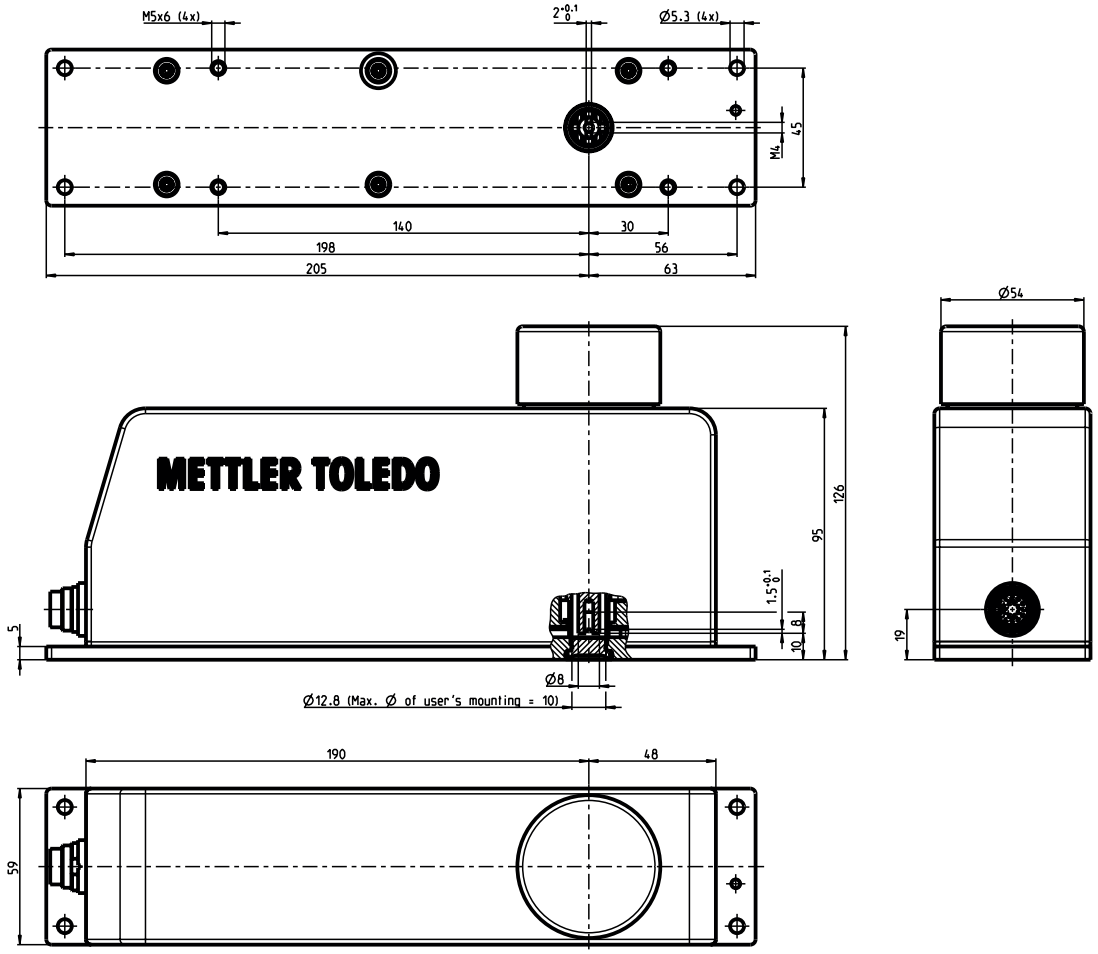
Short base plate and round weighing platform, connector rear



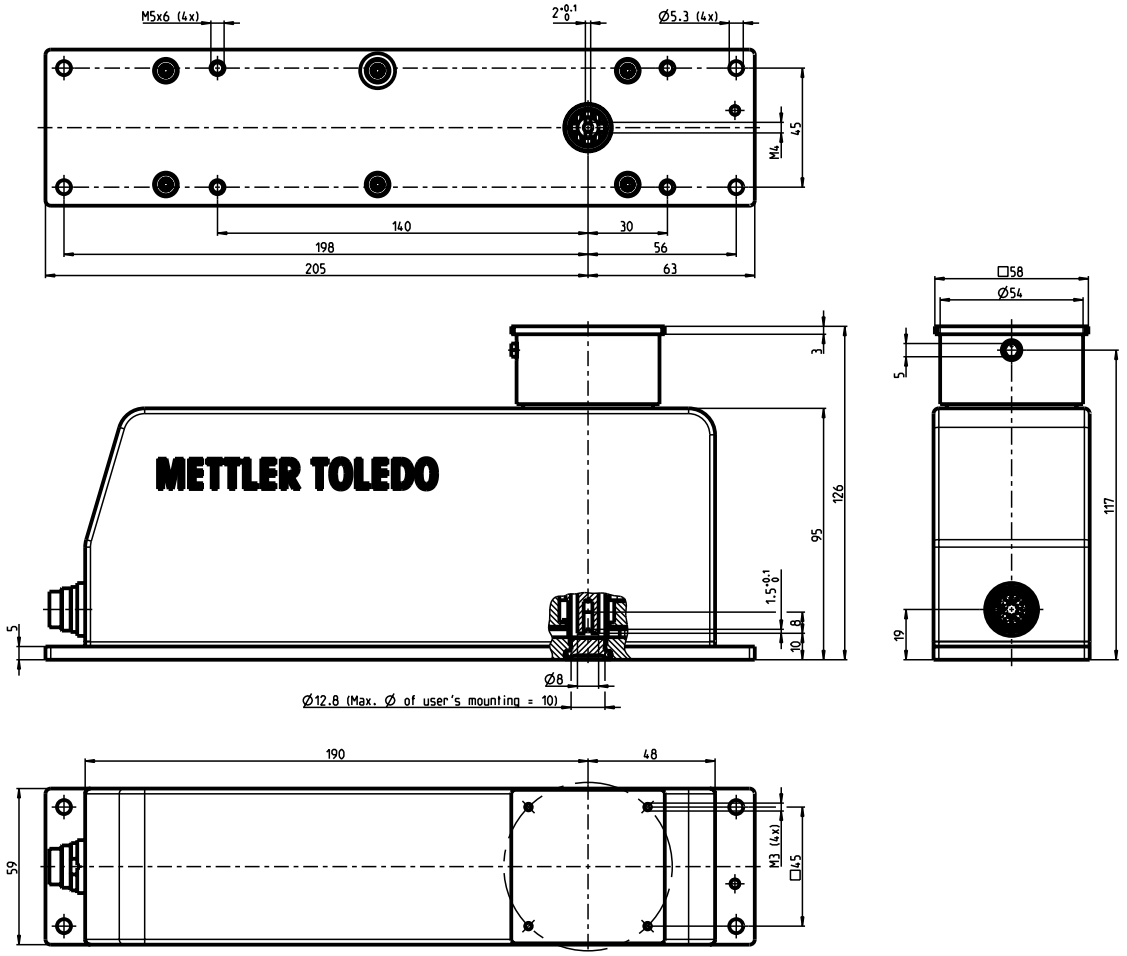
Short base plate and square weighing platform, connector rear



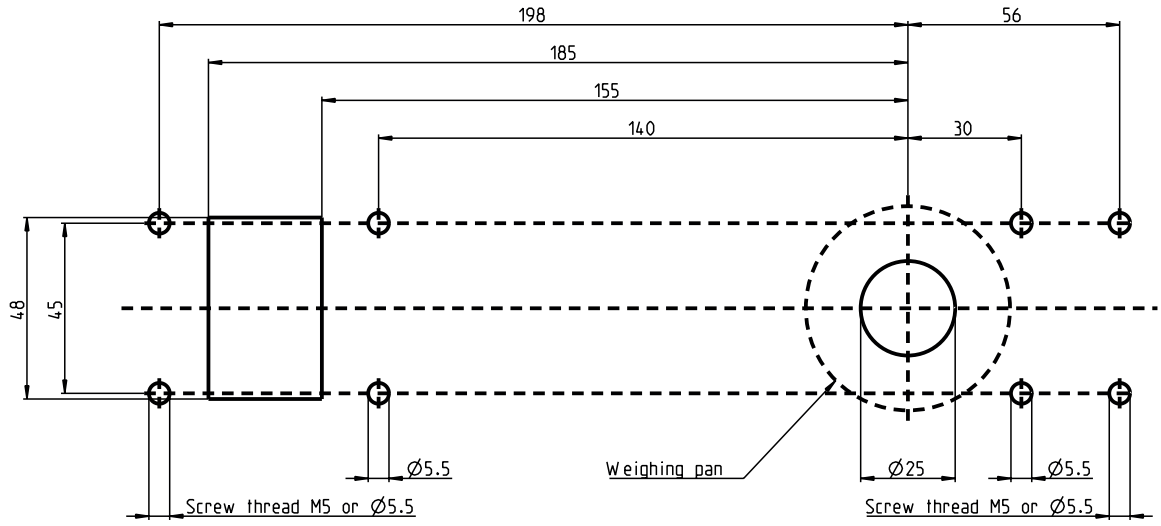
Long base plate and round weighing platform, connector rear



Long base plate and square weighing platform, connector rear



WMS drill hole template



6.7 Interface specifications

RS232 interface (service interface)

For the pin assignment see [Connector assignment ▸ Page 42].

Interface type:	Voltage-controlled interface in accordance with EIA RS-232C/DIN 66020 (CCITT V.24/ V.28)	
Max. cable length:	15 m	
Signal level:	Outputs: +5 V…+15 V (RL = 3 – 7 kOhm –5 V…–15 V (RL = 3 – 7 kOhm	Inputs: +3 V…25 V –3 V…25 V
Type of operation:	full duplex	
Type of transmission:	bit serial, asynchronous	
Transmission code:	ASCII	
Baud rates:	600, 1200, 2400, 4800, 9600, 19200, 38400	
Bits/parity:	7 Bit/Even, 7 Bit/Odd, 7 Bit/None, 8 Bit/None	
Stop bits:	1 stop bit	
Handshake:	None, XON/XOFF, RTS/CTS	
Line break:	<CR><LF>	

RS422 interface (data interface)

For the pin assignment see [Connector assignment ▸ Page 42].

Interface type:	Voltage-controlled interface in accordance with EIA RS422 standard (CCITT V.11, DIN 66259 Part 3)	
Max. cable length:	1200 m	
Signal level:	Outputs: ±6 V	Inputs: ±3 V
Type of operation:	full duplex	
Type of transmission:	bit serial, asynchronous	
Transmission code:	ASCII	
Baud rates:	600, 1200, 2400, 4800, 9600, 19200, 38400	
Bits/parity:	7 Bit/Even, 7 Bit/Odd, 7 Bit/None, 8 Bit/None	
Stop bits:	1 stop bit	
Handshake:	None, XON/XOFF, RTS/CTS	
Line break:	<CR><LF>	

7 Accessories and Spare Parts

Accessories from the METTLER TOLEDO range improve the functionality of your WMS weigh module and open up additional uses. This chapter contains a list of options that are currently available and a list of available spare parts.

7.1 WMS weigh module accessories

Description			Part No.
Weighing platforms			
Round weighing platform ø 54 mm			30007732
Square weighing platform 58 x 58 mm, aluminum, chrome plated			30007731
Square weighing platform 58 x 58 mm, stainless steel X2CrNiMo17-12-2 (1.4404 or 316L)			30090567
Square weighing platform 58 x 58 mm with ball catch set, aluminum, chrome plated			30394320
Square weighing platform 58 x 58 mm with ball catch set, stainless steel (1.4404 or 316L)			30394321
Extension arms			
WMS Adapter pan, stainless steel X2CrNiMo17-12-2 (1.4404 or 316L)			30095946
WMS Adapter 55 mm, aluminum, chrome plated			30069348
WMS Adapter 80 mm, aluminum, chrome plated			30069347
Connecting cables			
	(Back view) Connector on the rear	(Top View) Connector on the bottom	
WM Cable 180M/10 (10 m)			11138861
WM Cable 180M/5 (5 m)			11138860
WM Cable 90M/10 (10 m)			11138863
WM Cable 90M/5 (5 m)			11138862
WM Cable 90H/10 (10 m)			11138864
WM Cable 90B/10 (10 m)			11138865
DSub9 m - open ends			11141979
Connection module			
WMS ConBlock			11152000
ConBlock-X			30374066
Leveling aid			
WM levelling bubble for weigh modules with long base plate			42102807
Stainless steel cover (to seal the top interface when weighing from below)			30005924

7.2 Optional accessories

Field bus modules

Description	Part No.
Profibus DP	42102809
ProfiNet IO	42102859
DeviceNet	42102810
EtherNet/IP	42102860
CC-Link	30038775

Adjusting weights

Description	CarePacs®	Part No.	Individual weights	Part No.
WMS104C	100 g F2 / 5 g F2	11123002	100 g E2	00158457
WMS204	200 g F2 / 10 g F1	11123001	200 g E2	00158467
WMS403	200 g F2 / 20 g F1	11123000	200 g E2	00158467
WMS404C			200 g F1	00158677
WMS803	500 g F2 / 20 g F1	11123007	500 g F1	00158687
WMS1203C	1000 g F2 / 50 g F2	11123008	1000 g F1	00158697
WMS4002	2000 g F2 / 200 g F2	11123010	2000 g F1	00158707
WMS6002C	5000 g F2 / 200 g F2	11123011	5000 g F1	00158717

7.3 Spare parts

Description	Part No.
Eccentric pin for square weighing platform	11152022
Ball catch set: Ball catch, latch and pressure spring	30394322
WMS packaging – foam material	30295645
WMS packaging – cardboard box	30295646

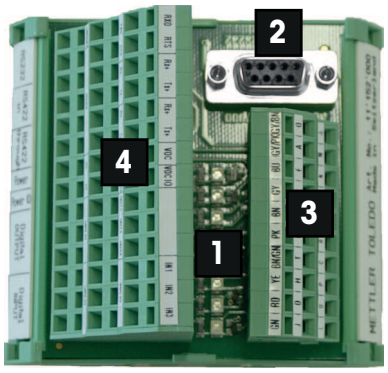
7.4 Configuration tool

APW-Link™ software configuration tool for weigh modules.

Free download after registration:

▶ www.mt.com/APW-Link

7.5 WMS ConBlock



The WMS ConBlock is designed for DIN rail mounting, easing connection of the WMS weigh module to its environment.

The WMS ConBlock has green and yellow LEDs (1) to display the digital inputs and outputs and the power supplies. There are also built-in protective elements to protect the WMS weigh module against surges and reversed polarity.

The built-in service connector (2) (RS232 interface) facilitates access to the WMS weigh module for servicing.

The terminals (closed by a tension spring) for connecting the WMS weigh module (3) and the data cables and digital inputs and outputs (4) can be opened with a "0" size screwdriver.

The grounding point should be located at the switching cabinet power supply. The WMS ConBlock is also grounded via the DIN rail.

7.5.1 Connecting the WMS weigh module

All signals are delivered from the WMS weigh module to the WMS ConBlock by a cable. The corresponding terminals are identified with the respective pin designation in the Binder connector and by the conductor color.

PIN	J	D	H	T	F	K	G	E	A	O
Conductor color	green	red	yellow	brown green	pink	brown	grey	blue	grey pink	grey brown
	GN	RD	YE	BN/GN	PK	BN	GY	BU	GY/PK	GY/BN
Signal	DIN3	DIN2	DIN1	DOUT3	DOUT2	DOUT1	VDCIO	GNDIO	VDC	GND

PIN	L	U	P	C	R	B	S	N	M	O
Conductor color	white	white green	white grey	black	yellow brown	purple	white yellow	white pink	red blue	Shielding
	WH	WH/GN	WH/GN	BK	YE/BN	PP	WH/YE	WH/PK	RD/BU	
Signal	TX+	RX+	TX-	RX-	CTS	GNDINT	RTS	RXD	TXD	shield

7.5.2 System connection side

The connection terminal strip is grouped according to the following functions: RS232 and RS422 interface, input voltages and digital inputs and outputs.

RS232		RS422 (in)		RS422 (through)		Power	Power IO	Digital outputs	Digital inputs
RXD	RTS	Rx+	Tx+	Rx+	Tx+	VDC	VDCIO	Unassigned	IN1, IN2, IN3
TXD	CTS	Rx-	Tx-	Rx-	Tx-	GND	GNDIO	Out1, Out2, Out3	VDC IO
GNDINT	shield	shield		shield		PE	PE	GND IO	GND IO

RS232

The signals from the service interface (RS232 interface) are delivered in parallel to the DSUB9 connector and to the terminals.

Note

Only one RS232 interface can be connected at any one time. METTLER TOLEDO recommends that the RS232 should be kept free for service and configuration use.

RS422

The RS422 interface is switched in parallel on the connection terminals (RS422 in and through) to make it easy to build an RS422 network.

Digital inputs/outputs

The WMS weigh module has three digital inputs and outputs. The associated VDC IO and GND IO are available on the terminal strip.

Power supply

The power supplies for the WMS weigh module and the digital inputs and outputs can have different voltages.

Note

The permissible voltage range must be complied with. In addition, the power supply must be approved by the respective national test center of the country in which the WMS weigh module will be used.

Status LEDs

The status is displayed by green LEDs for the power supplies and yellow LEDs for the digital inputs and outputs. The status "ON" means that the power supply is available and that the input/output is "High". Correspondingly, "OFF" means that the power is off or the input/output is "Low".

7.6 ConBlock-X

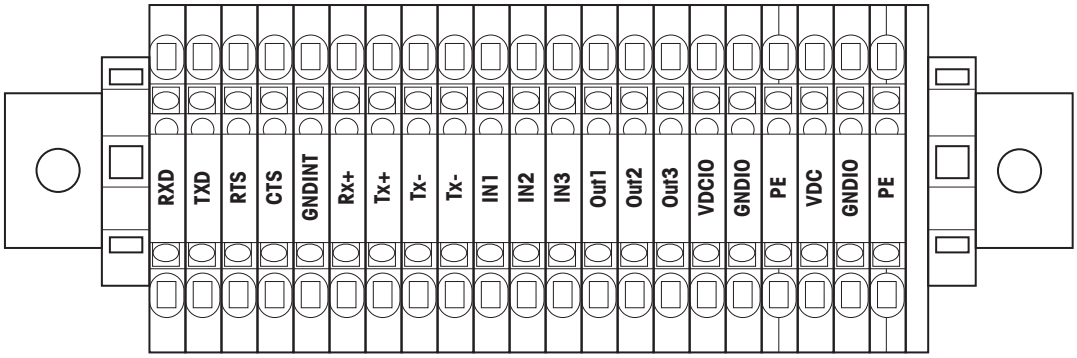
ConBlock-X is designed for efficient and straightforward wiring of the connection cable in hazardous areas. It can be used with WMS Ex Zone 2 models.

All contacts are clearly labelled and easy to identify to avoid wiring errors during installation. These contacts make use of a spring mechanism for easy installation.

ConBlock-X has a protective housing (IP66) which enables its usage in wash-down applications. It can be used in the hazardous area, since it has the following hazardous area approvals:
II 2G Ex eb IIC t6 Gb
II 2D Ex tb IIIC T 85°C Db

ConBlock-X is grounded via the DIN rail.

Below you will find the drawing of the ConBlock-X with the designation of the spring contacts.



7.6.1 Connecting the WMS Ex Zone 2 weigh module

All signals are delivered from the WMS Ex Zone 2 weigh module to the ConBlock-X by a cable. The corresponding terminals are identified with the respective pin designation in the Binder connector and by the conductor color.

Color	green	red	yellow	brown green	pink	brown	grey	blue	grey pink	grey brown
	GN	RD	YE	BN/GN	PK	BN	GY	BU	GY/PK	GY/BN
Signal	DIN3	DIN2	DIN1	DOUT3	DOUT2	DOUT1	VDCIO	GNDIO	V DC	GND

Color	white	white green	white grey	black	yellow brown	purple	white yellow	white pink	red blue	Shielding
	WH	WH/GN	WH/GY	BK	YE/BN	PP	WH/YE	WH/PK	RD/BU	
Signal	TX+	RX+	TX-	RX-	CTS	GNDINT	RTS	RXD	TXD	shield

7.6.2 System connection side

The connection terminal strip is grouped according to the following functions: RS232 and RS422 interfaces, input voltages and digital inputs and outputs.

RS232		RS422		Power	Inputs	Digital inputs
RXD	RTS	Rx+	Tx+	V DC	IN1	OUT1
TXD	CTS	Rx-	Tx-	GND	… IN3	… OUT3
GNDINT	shield	shield		PE	GND IO	V DC IO

Power supply

The power supplies for the WMS Ex Zone 2 weigh module and the digital inputs and outputs can have different voltages.

Note

The permissible voltage range must be complied with. In addition, the power supply must be approved by the respective national test center of the country in which the WMS Ex Zone 2 weigh module will be used.

8 Certificates

8.1 Ex Zone 2 certificate

SEV Verband für Elektro-, Energie- und Informationstechnik

electrosuisse

(1) **Conformity Statement**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) Test certificate number: **SEV 12 ATEX 0134 X**

(4) Equipment: Weighing module Type $WMS_{xy}C\text{-}LX/_z$

(5) Manufacturer: METTLER-TOLEDO AG

(6) Address: Heuwinkelstrasse 3, CH-8606 Nänikon

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) Electrosuisse SEV certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The results of the examination are recorded in confidential report no. 11-IK-0597.01

(9) Compliance with the essential health and safety requirements has been assured by compliance with:
EN 60079-0:09 **EN 60079-15:10**

(10) If the sign «X» is placed after the certificate number, it indicates that the equipment is subjected to special conditions for safe use specified in the schedule to this certificate.

(11) This Conformity Statement relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this directive apply to the manufacture and the placing on the market of this equipment.

(12) The marking of the equipment shall include the following:
II 3G Ex nA ic IIC T6 Gc
5°C ≤Tamb ≤+40°C, IP44

Electrosuisse
Notified Body ATEX

Martin Plüss
Product Certification

Fehraltorf, 2012-07-02

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(13) # Appendix

(14) **Conformity Statement**

(15) Description of the equipment

Description
Weighing module Type WMS
For the use in the automation industry and direct integration into installations there is the WMS family of weighing modules available. It features various communication ports, digital I/O and software with a broad range of useful special commands.
For ease of calibration an internal calibration mechanism with a calibration weight and a small DC motor is built in.

Ratings:
Uin: 12…24 VDC +20 %/-15 % (10…29 VDC)
Pnom: ≤1.5 W
Pmax: ≤3.0 W

(16) Test Report 11-IK-0597.01

(17) Special conditions for safe use

1. To ensure an unintended separation before commissioning the weighing module the port connector must be plugged in fully and the retaining ring has to be screwed in completely on this module.
2. The weighing modules may only be operated in a normal or a clean environment. They must not be used in dirty environments.
3. The weighing modules must be positioned so that the port connector of the weighing modules is located in an area where this is adequately protected against mechanical impact.

(18) Fundamental essential health and safety requirements

Fulfilled by the standards applied

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Product Certification

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