SLP85xD

Load cells

METTLER TOLEDO
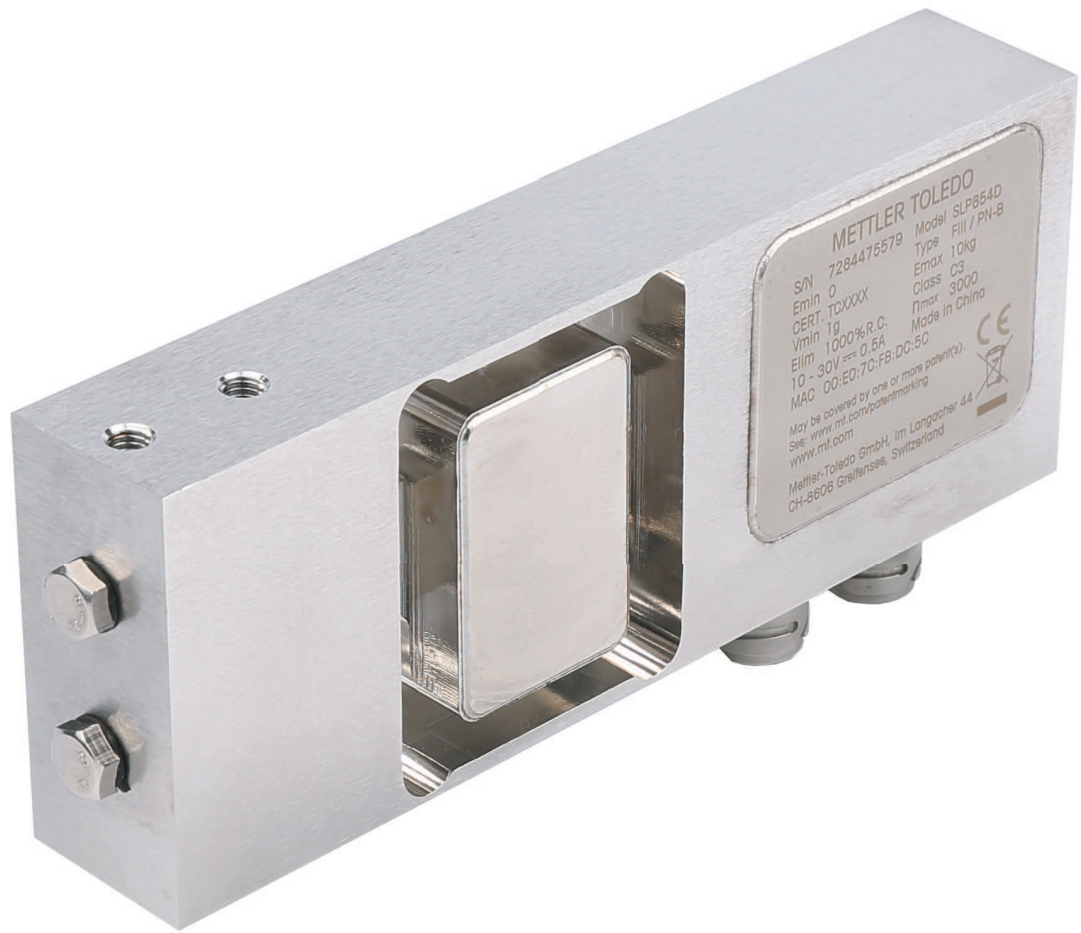
METTLER TOLEDO

METTLER TOLEDO Service

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use of your new equipment according to this Manual and regular calibration and maintenance by our factory-trained service team ensures dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget. Further information is available at

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There are several important ways to ensure you maximize the performance of your investment:

1   **Register your product**: We invite you to register your product at www.mt.com/productregistration
    so we can contact you about enhancements, updates and important notifications concerning your product.

2   **Contact METTLER TOLEDO for service**: The value of a measurement is proportional to its accuracy – an out of specification scale can diminish quality, reduce profits and increase liability. Timely service from METTLER TOLEDO will ensure accuracy and optimize uptime and equipment life.

    ⇨ **Installation, Configuration, Integration and Training**: Our service representatives are factory-trained weighing equipment experts. We make certain that your weighing equipment is ready for production in a cost effective and timely fashion and that personnel are trained for success.

    ⇨ **Initial Calibration Documentation**: The installation environment and application requirements are unique for every industrial scale so performance must be tested and certified. Our calibration services and certificates document accuracy to ensure production quality and provide a quality system record of performance.

    ⇨ **Periodic Calibration Maintenance**: A Calibration Service Agreement provides on-going confidence in your weighing process and documentation of compliance with requirements. We offer a variety of service plans that are scheduled to meet your needs and designed to fit your budget.

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1 Installation

1.1 Mechanical Installation

### 1.1.1 Support Interface (Support Surface)

Observe the following when designing he support interface for the load cell:

- Wherever possible, provide a vibration-free support surface for the load cell.
- The support surface has to be stiff because a stable mechanical base is mandatory for precise and fast weighing results.
- The support surface must be level to prevent the counterforce from twisting.
- The support surface must be cut out according to the template at the connector locations.

Mounting the Load Cell on the Support Surface

1 Provide a spacer plate (2) with the cut-outs for the connectors and the bottom mounting holes.

2 Place the spacer plate between the counterforce (1) and the support surface (3) in order to give room for the bending move of the counterforce in the loaded condition.

3 Use the 2 mounting holes (4) (M6 blind threaded holes) at the bottom to fasten the load cell to the support surface.
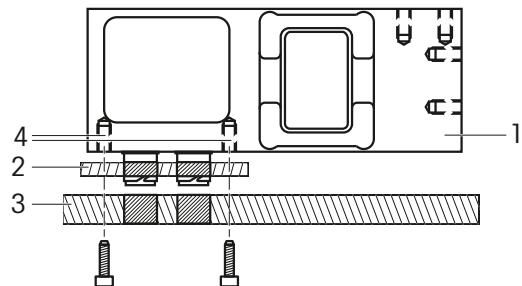
1.1.2 Weighing Interface (Weighing Platform)

When building the weighing platform, the following needs to be considered in order to achieve the best weighing performance.

Maximum Surface Area

The maximum surface area of the weighing platform has to be observed for reliable weighing results. The weighing results are compensated against eccentric loads for a maximum load plate size of 400 x 400 mm.

Eccentricity

A weighing platform has to be designed so that its center of gravity lies at the primary loading axis or as close as possible.

The primary loading axis goes through the center point of the strain gauge cover (1).
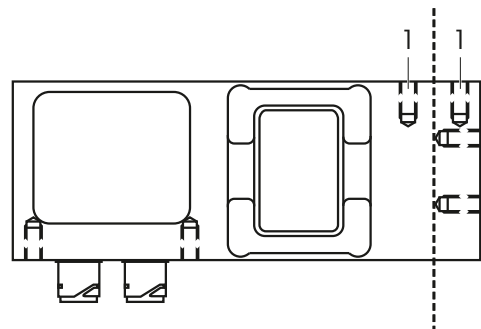
Mounting the Weighing Platform

1   Provide a spacer plate (2) with the cut-outs for the top or front mounting holes.

2   Place the spacer plate between the counterforce and the weighing platform (1) in order to give room for the bending move of the counterforce in the loaded condition.

3   Use the 2 mounting holes in the top loading interface or in the front loading interface (3) (M6 blind threaded holes) to fasten the weighing interface to the load cell.

4   Use the sealing screws delivered with the load cell to seal the weighing interface that is not used by the application.
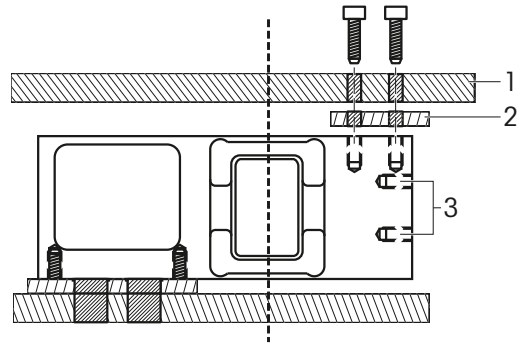
1.1.3 Spacer Plate

The spacer plate should have sealing on top and bottom sides where it is connected to another metal surface such as he load cell or weighing interface. Flat sealing rubbers can prevent metal-to metal connection and seal the weighing interface against foreign materials. This is especially important for the hygienic design guidelines, which apply to the manufacturing of equipment for food production.

The spacer plat should be made of a hard material such as stainless steel in order to transfer the loading force directly onto the mounting surface of the load cell.

Recommended Dimensions of the Spacer Plate

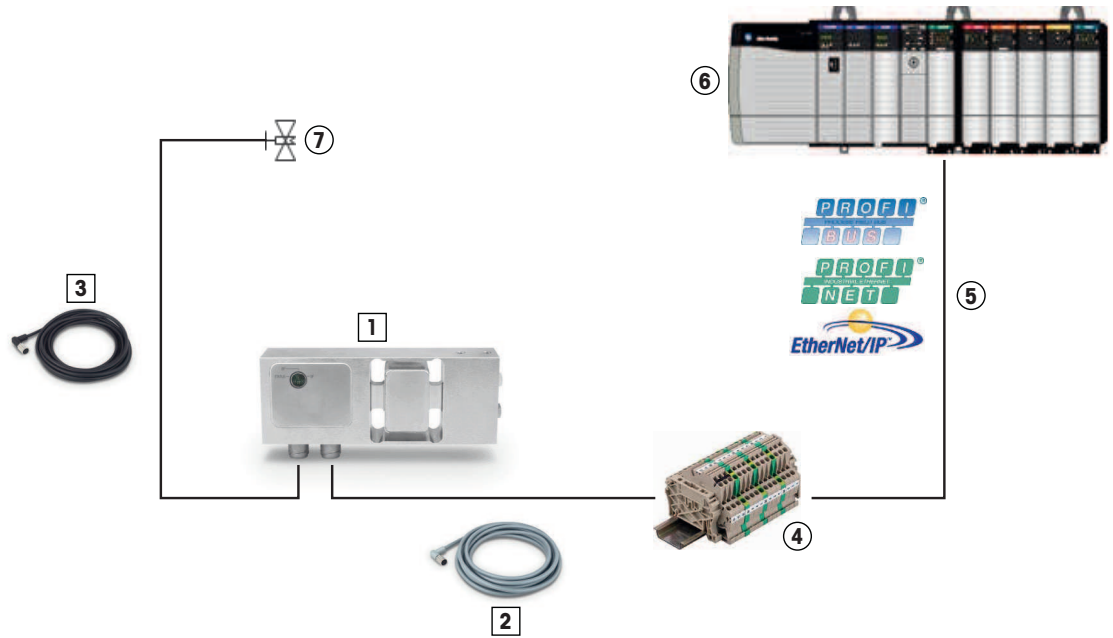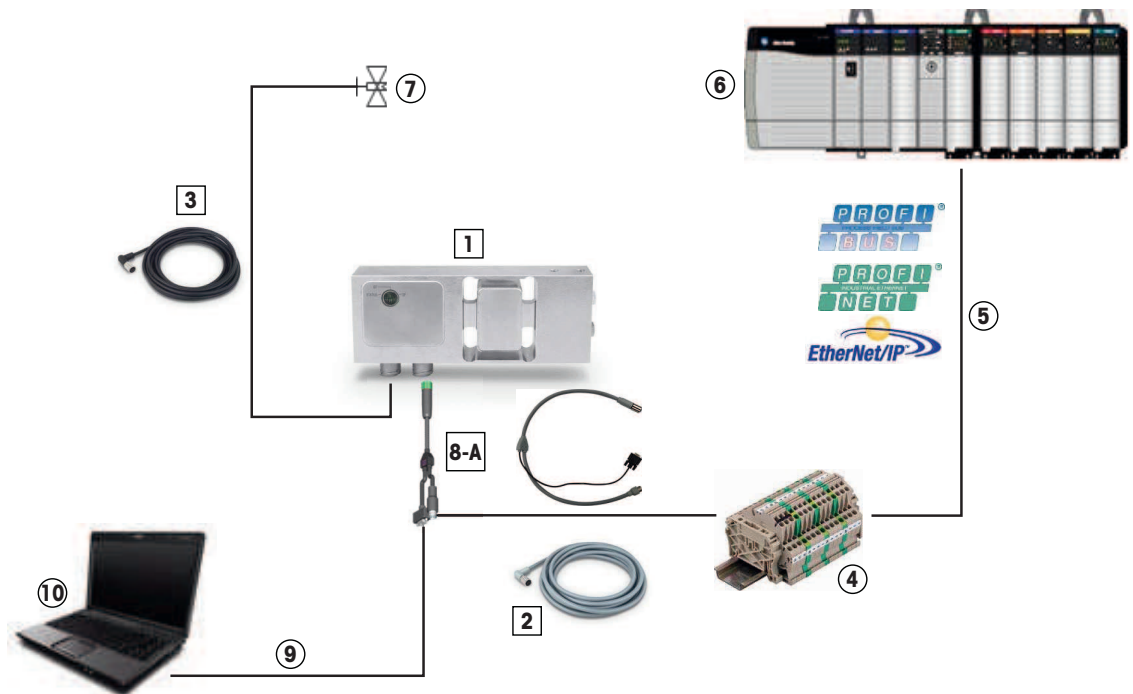|	
Height	at least 5 mm
Width	30 mm (same as the load cell)
Length	25 to 40 mm, should be centered on the mounding holes and should **not** contact the strain gauge area

1.2 Electrical Installation

1.2.1 Typical Configuration

Direct communication with control system, e.g. PLC

Simultaneous communication with control system and PC or laptop

Service with PC or laptop
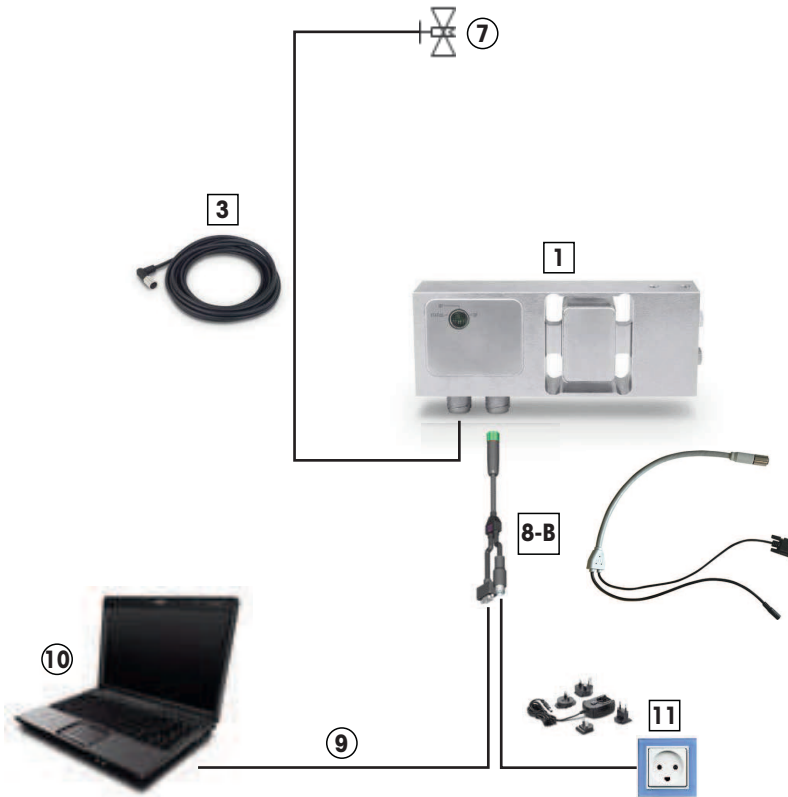
Pos.	Item	Description
1	Load cell	Various models available
2	Communication cable	6 pin / 6 m cable for the communication with the control system
3	Input/Output cable	10 pin / 6 m cable for the digital inputs/outputs, only available for SLP854
4	Terminal strip	To make the wiring of the load cell and to connect to a network
5	Customer cable	Fieldbus cable
6	PLC	Control system
7	Actuator device, e.g. filling valve	To control actuator devices based on binary input, only available for SLP854
8-A	Online adapter cable	To enable simultaneous communication with the control system and PC
8-B	Offline adapter cable	For service/(configuration of the load cell when it is not connected to the control system.
9	Standard RS232 cable	DSUB 9 male / female
10	PC or laptop	For configuration or service purposes
11	Power adapter	12 V DC power adapter. Country specific power plug needs to be ordered separately.

1.2.2 Pin Assignment

The load cells have an RS232 interface for service purposes (1) and an IO bus interface (2) with the following options:

- Profibus DP
- Ethernet IP
- Profinet IO

2 1

* Cable color of the METTLER TOLEDO standard cables, see [Accessories ▶ Page 24].

Communication Connector (2)	Pin	Signal		Cable color *
		Industrial Ethernet	Profibus DP	
	A	UB1	UB1	Red
	B	GND1	GND1	Black
	C	RS232-RxD	RS232-RxD	Blue
	D	RS232-TxD	RS232-TxD	White
	E	RX−	RxD/TxD − P	Green
	F	TX−	ISO GND	Orange
	G	TX+	ISO VCC	White/orange
	H	RX+	RxD/TxD − N	White/green

IO Connector (1)	Pin	Signal	Cable color *
		Profinet IO	
	A	OUT1	White
	B	OUT2	Blue
	C	OUT3	Brown
	D	OUT4	Yellow
	E	IN3	Green
	F	IN1	Gray
	G	GND2	Black
	H	UB2	Red
	J	OUT5	Purple
	K	IN2	Orange

1.2.3 Power Supply

The load cells work with 12 V DC nominal range (10 to 30 V DC). input current: 0.84 A

1 Use a stable power supply with no voltage fluctuations.
2 If voltage fluctuations cannot be prevented, use a voltage regulator to deliver a constant voltage value to the load cell.
3 The power supply must be approved by the respective national test center of the country in which the load cell will be used.

1.2.4 Digital Inputs/Outputs

Digital inputs	Number		3
	Permissible input voltage	VDC	0 to +30
	Low-level	V	< 1.5
	High-level	V	>10
	Input resistance	kOhms	> 1.2
	Interference suppression		Yes
Digital outputs	Number		3
	External supply voltage	V DC	+11 to +30
	Max. current of one output	A	< 0.5
	Accumulated current of all outputs	A	< 1.2
	Voltage drop	V	< 1
	Short circuit protection		Yes
	Protection against excess temperature		Yes

1.2.5 Tips on Cables and Wiring

- METTLER TOLEDO recommends using standard cables and advises against tailoring cables to extend the cable range. Electromagnetic behavior and the reliability of the data communication are only tested for standard cables. Therefore, no guarantee can be given for longer tailor-made cables.

- However, if it is inevitable to build a tailor-made cable, 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 (load cell conterforce) on one side and to the system ground on the other side to avoid ground loops. The best grounding scheme may only be determined by trial and error on site.

- It is important to observe the maximum allowable cable length of the physical transmission medium. Long transmission cables should be isolated against electro-magnetic interference by using shielded cables and twisted pairs. Data cables should be separated and isolated from power lines.

- Wiring must be made correctly on terminal strips before powering up the load cell. Confusing the power pins with data pins might damage the load cell. Wires should not be plugged in or out when the load cell is under voltage.

1.2.6 Status LEDs

Position of the status LEDS
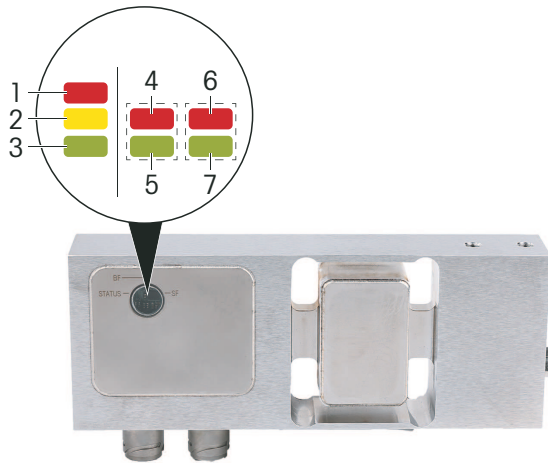
Meaning of the status LEDs (1, 2, 3)

Status LED	Action	Possible reason	Error Code	Corrective action
Red	Constant light	EEPROM error	10	– Replace the load cell.
	Blinking	Voltage level > 31 V	103	– Check the correct functioning of the load cell and replace it, if it is defective
		Mainboard temperature > 80 °C	104	– Replace the load cell.
Yellow	Blinking	Strain gauge temperature out of tolerance (−10 °C to +40 °C)	200	– Stop weighing and wait until the temperature returns back to permissible values.
		Strain gauge temperature changing very rapidly (>1 °CD / 60 s)	201	
		Mainboard temperature >70 °C but ≤80 °C	202	
		Supply voltage out of tolerance (10 V to 30 V)	203	1 Check power source and wiring. 2 Bring the voltage level back to the operating range
		Overload	205	– Remove the weight causing the overload.
Green	Constant light	Healthy working status	–	–

Meaning of the status LEDs (4, 5) – COM 0

EtherNet/IP		
Color	**State**	**Meaning**
Green	Solid	**Device operational**: If the device is operating correctly, he module status indicator shall be steady green.
	Blinking	**Standby**: If the device has not been configured, the module status indicator shall be flashing green.
Red	Solid	**Major fault**: If the device has detected a non-recoverable major fault, the module status indicator shall be steady red.
	Blinking	**Minor fault**: If the device has detected a recoverable minor fault, the module status indicator shall be flashing red.
		Note: An incorrect or inconsistent configuration would be considered as minor fault.
Red/green	Blinking	**Self-test**: While the device is performing its power up testing, the module status indicator shall be flashing green/red.
–	Off	**No power**: If no power is supplied to the device, the module status indicator shall be steady off.

PROFINET IO RT		
Color	**State**	**Meaning**
Red	Solid	No valid Master license.
	Blinking cyclic at 2 Hz	**System error**: Invalid configuration, watchdog error or internal error.
–	Off	No error.

Meaning of the status LEDs (6, 7) – COM 1

EtherNet/IP		
Color	**State**	**Meaning**
Green	Solid	**Connected**: If the device has at least one established connection, the network status indicator shall be steady green.
	Blinking	**No connections**: If the device has no established connections, but has obtained an IP address, the network status indicator shall be flashing green.
Red	Solid	**Duplicate IP**: If the device has detected that its IP address is already in use, the network status indicator shall be steady red.
	Blinking	**Connection timeout**: If one or more of the connections in which this device is the target has timed out, the network status indicator shall be flashing red. this shall be left only if all timed out connections are reestablished or if the device is reset.
Red/green	Blinking	**Self-test**: While the device is performing its power up testing, the network status indicator shall be flashing green/red.
–	Off	**No power, no IP address**: If no power is supplied to the device, or if the device does not have an IP address, the network status indicator shall be steady off.

| PROFINET IO RT		
Color	**State**	**Meaning**
Red	Solid	**No connection**: No link **No valid Master license**
	Blinking cyclic at 2 Hz	**Configuration fault**: not all configured IO devices are connected
–	Off	No error

1.2.7 Communication Cable Termination

For models with PROFINET IO and EtherNet/IP interface, it is possible to terminate the end of the communication cable with certain accessories in order to enable an easier network interface. You can find more details regarding the order information in [4.5 Accessories section ▶ Page 24].

Accessories

Following accessories can be used for this purpose:

Picture	Accessory	Description
	RJ45 jack	To terminate load cell communication cable with an easy interface for network connection. This accessory can be used for EtherNet/IP and PROFINET IO interfaes
	DIN rail mounting module with 2 side covers	To install the RJ45 jack on a DIN rail in an easy way

System configuration after installation of the communication cable termination
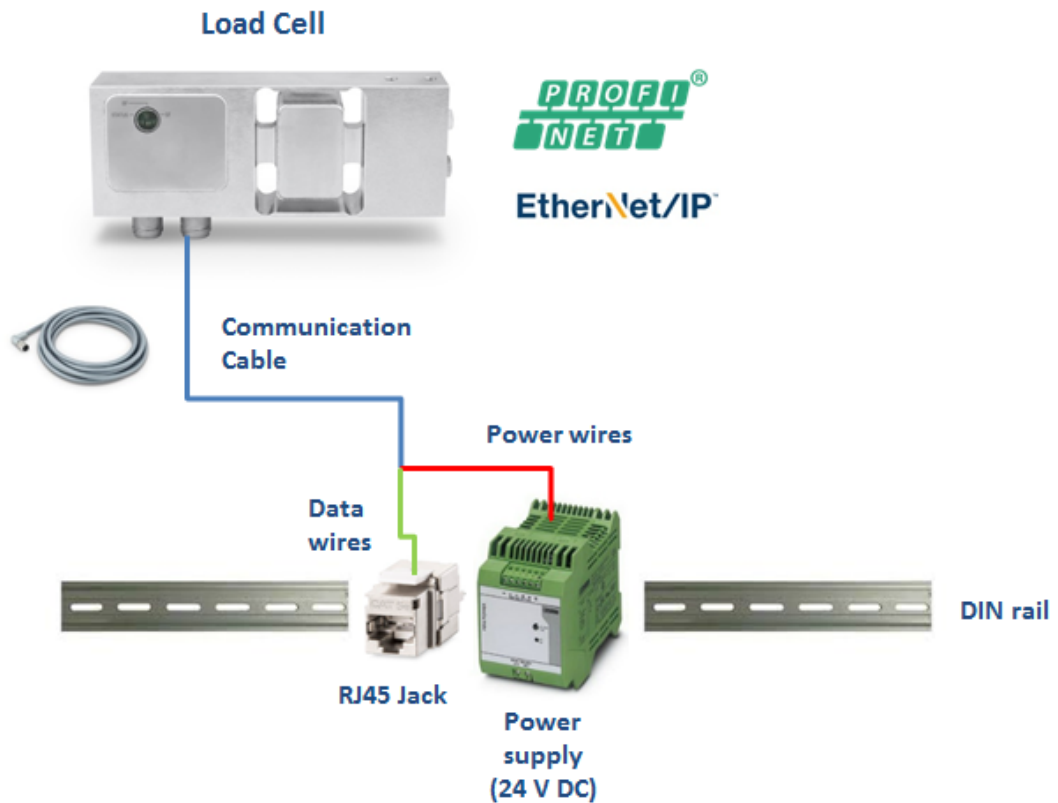
Installing the communication cable termination


Important Safety Note

The power for the load cell needs to be supplied separately via the 2 distinct wires (red and black).

A DIN rail power supply can be installed next to the RJ45 jack for this purpose.

Connection to the RJ45 jack

1 Strip the wires of the communication cable open for connecting to the RJ45 jack.
2 Connect the stripped wires to the back side of the RJ45 jack according to the adjacent drawing.
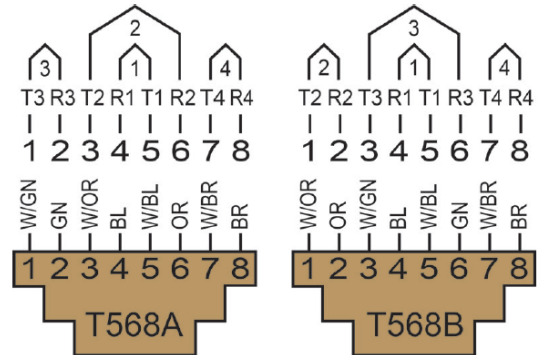
### Connecting the RJ45 jack to the DIN rail mounting module

1 To open the DIN rail mounting module, force apart the shoulders (1) of the fork holder at the top of the module to release the swinging bracket (2).
2 Pull the bracket open.
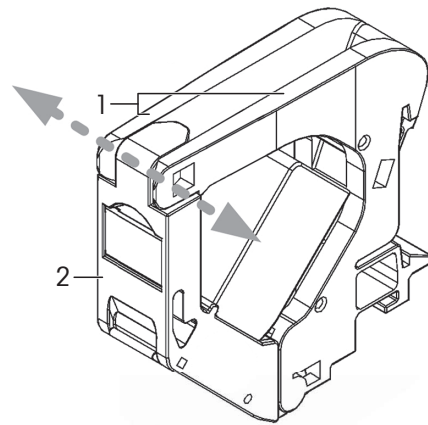
3   Insert the RJ45 jack (3) into the opening of the
    swinging bracket (2), starting with the lower
    part of the RJ45 jack and catch the edge of the
    opening between two tabs on the bottom part of
    the RJ45 jack.

4   Push the RJ45 jack firmly until it snaps
    securely in the opening. The jack's latch shall
    snap behind the upper edge of the opening.
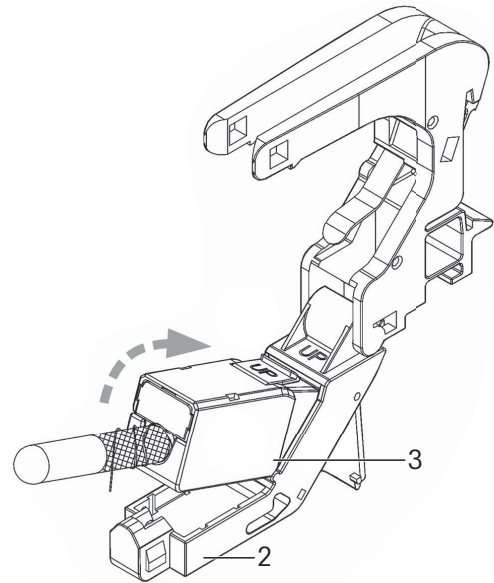
5   Lock the swinging bracket (2) in place.
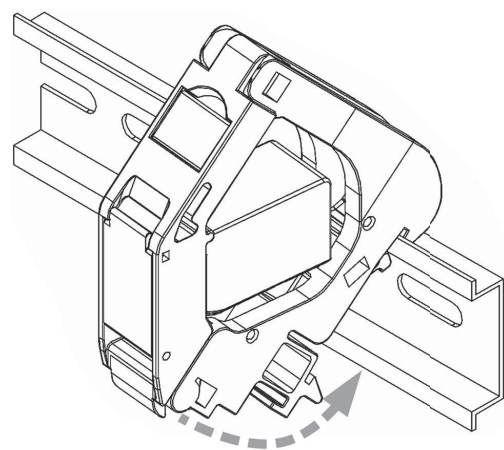
6   If you are using a screened RJ45 jack, make
    sure that the grounding spring (4) contacts the
    jack's metal housing providing grounding
    connection.
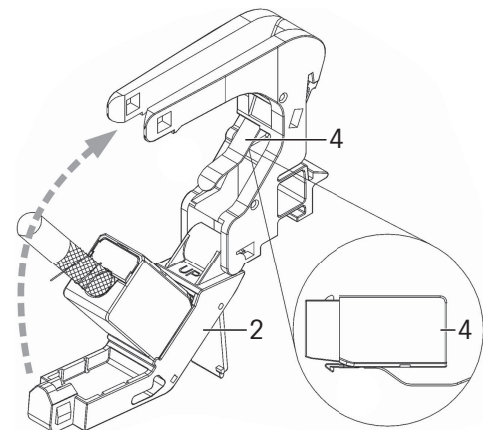
Mounting the DIN rail mounting module on the DIN rail

1   Install the DIN rail mounting module on a DIN
    rail starting with its upper part.

2   Rotate the module and snap on the DIN rail
    until you hear a click.

3   When necessary, place side lids (5).
    When using DIN rail mounting modules in
    series, side lids may be installed on the end
    modules only.
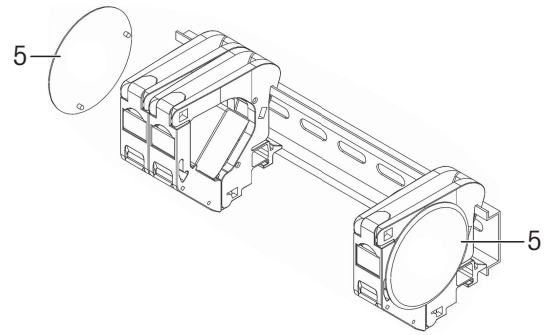
Removing the DIN rail mounting module from the DIN rail

–   Insert a screwdriver into the opening (6) at the
    bottom of the module and use it as a lever to
    pull out the module.

2 Configuration

There are two interfaces to configure the SLP85xD load cells, either via RS232 or fieldbus interface.

2.1 Fieldbus Interface

SLP85xD load cells use the SAI protocol to communicate with the control system. SAI

SAI stands for **S**tandard **A**utomation **I**nterface and is defined by METTLER TOLEDO.
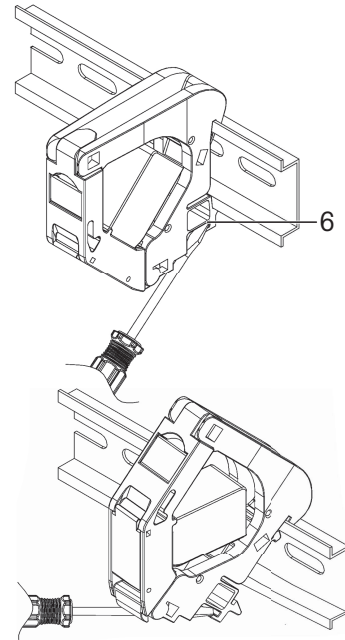
SAI is tailored for cyclic and acyclic communication. For more information refer to the SAI Reference Manual for APW products.

SLP85xD load cells can be fully configured via PLC. The steps required to configure the load cell via PLC are explained in more detail in the PLC Integration Guide for SAI.

2.2 RS232

SLP85xD load cells use the MT_SICS protocol to communicate with a PC or laptop.

MT-SICS stands for **M**ETTLER **T**OLEDO **S**tandard **I**nterface **C**ommand **S**et.

MT-SICS is an ASCII-based communication protocol with string-type data format. For more information refer to the Reference Manual for MT-SICS Interface Commands

to configure the load cell with MT-SICS commands, the APW-Link™ software from METTLER TOLEDO can be used. APW-Link™ can be downloaded from the following link free of charge:

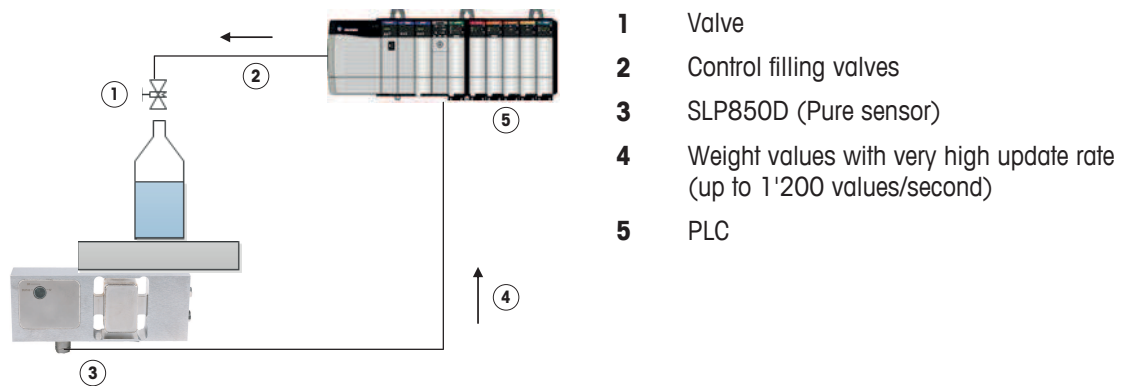APW-Link Download Link   ▶ http://www.mt.com/apw-link

2.3 Use Modes

2.3.1 Overview

SLP85xD load cells offer the following use modes:

Parameter	Pure sensor (SLP850D)	Soft control (SLP852D)	Hard control (SLP854D)
Digital IOs	–	Soft IOs	Hard (physical) IOs
Filling application	–	Yes	Yes
Filling valve control	No	No	Yes
Communication to control system	Weight values	Status of the cut-off points	Status of the filling application
Update rate	Up to 1'200 Hz	approx. 20 Hz	approx. 20 Hz
Weight values	Unfiltered	Filtered	Filtered

2.3.2 Pure Sensor Mode (SLP850D)

In the pure sensor mode, the load cell sends continuously fast unfiltered weighing data to the control system, which controls the filling valves based on this data. Post-processing of the received data takes place in the control system.

1	Valve
2	Control filling valves
3	SLP850D (Pure sensor)
4	Weight values with very high update rate (up to 1'200 values/second)
5	PLC

In this mode, weight values are sent via the bus interface. In addition, status and error messages are also sent via the same bus.

The filling application is programmed in the control system (PLC) and the full application control is also at the PLC.

2.3.3 Filling Application Control (SLP852D and SLP854D)

In this use mode, the filling application is programmed in the load cell and the full application control is also at the load cell. There are 2 different use modes for the filling application control:

Soft Filling Control (SLP852D)

The load cell informs the PLC via virtual software output ports when a cut-off point is reached. The PLC controls the filling valves according to this information. The PLC is responsible for placing/removing the container on/from the weighing platform and controlling the filling valves.

1	Valve
2	Control filling valves
3	SLP852D (Soft filling control)
4	Status of the cut-off points
5	PLC
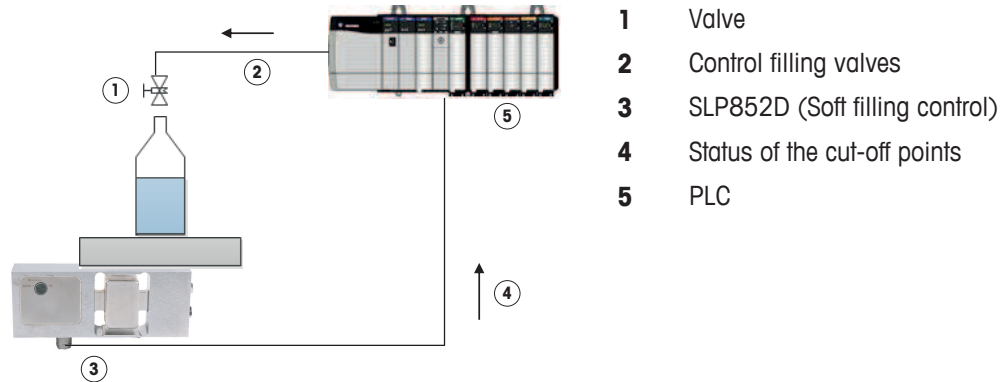
Hard Filling Control (SLP854D)

The load cell controls the filling valves via physical/hardware output ports. The PLC is only responsible for placing the container onto the weighing platform and starting the filling cycle. At the end of the filling cycle, the PLC is informed about the filling result and removes the container from the weighing platform. Between the start and the end of the filling cycle, the PLC only intervenes if there is an application or load cell specific error.

1	Control filling valves
2	Valve
3	SLP84D (Hard filling control)
4	Status of the filling cycle
5	PLC
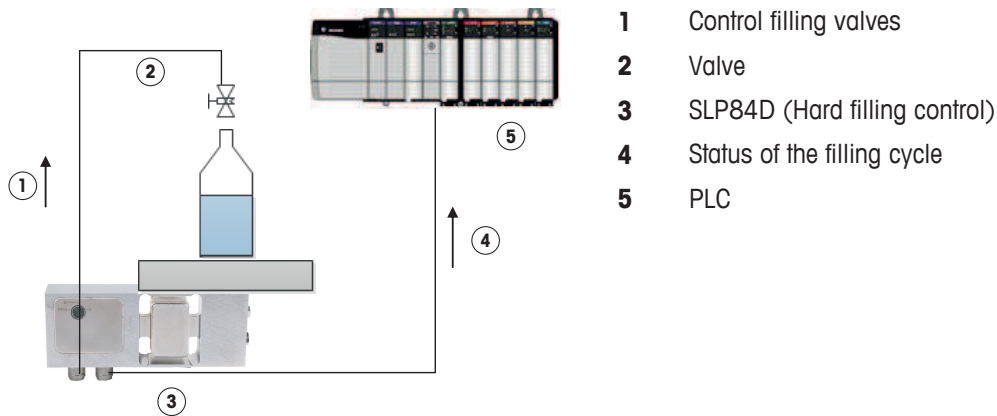
3 Operation

3.1 Operating Limits

When operating SLP85xD load cells, the following operating limits have to be observed:

- The maximum permissible load on the load cell is defined by the rated capacity of the load cell, see Specifications in the User Manual. this load corresponds to the weighing platform (preload) plus the weighed object and its container.
- Overload protection of the load cell:
  - Maximum static safe central load: 100 kg
  - Maximum static safe side load (measured with max. platform size 400 x 400 mm): 150 % of the rated capacity
- For environmental conditions refer to the User Manual. Weight results are relieable only for the compensated temperature range of −10 °C to +40 °C.

3.2 Applying/Removing the Weighing Object

When applying or removing the weighing object on/from he weighing platform, observe the the following important rules:

- Avoid falling loads, shocks and lateral impacts.
- Avoid abrasive and wear processes.
- To achieve best weighing results place the wighing sample always on the same position on the weighing platform.

4 Technical Data

4.1 General Data

Parameter		Unit of measure	Specification	
Model no.			SLP850D / SLP852D / SLP854D	
Rated capacity (R.C.)		kg	10	20
Zero load output		ppm R.C.	≤1000	
Combined error [1] [2]		ppm R.C.	≤180	
Repeatability error		ppm A.L.[3]	≤122.5	
Eccentric loading error according to OIML R76		ppm A.L.	≤200	
Creep error, 30 minutes		ppm A.L.	≤230	
Zero return deviation from R.C.		ppm A.L.	≤167	
Temperature effect on	min. dead load output	ppm R.C./°C	≤16	
	Sensitivity [2]	ppm A.L./°C (ppm.A.L./°F)	≤13.3	
Temperature range	Compensated	°C	−10 to +40	
	Operatin		−10 to +50	
	Safe storage		−20 to +80	
OIML / Europoean approval [4]	Class		C3	
	nmax		3000	
	V_{min}	g	1	2
	Apportionment factor P_{LC}		0.8	
	Humidity classification		CH	
	min. dead load	kg	0	
	Z		3000	
Approvals			OIML R60	
Input voltage requirements		V DC	+10 to +30	
Power consumption		W	≤2	
Material	Spring element		Stainless steel 17-4 PH	
	Connector		Stainless steel SUS304	
	Cable		PU	
Protection	Type		sealed	
	IP rating		IP68/IP69k	
Maximum static safe central load		kg	100	
Maximum static safe side load [5]		% R.C.	150	
Direction of loading			Beam	
Deflection at R._C., nominal		mm	0.05	
Cable	Length	m	6	
	Diameter	mm	7.8/10	
Overload protection			Integrated internally	
Max. platform size		cm x cm	40 x 40	

Parameter		Unit of measure	Specification
Mounting screw	Size/thread	mm	M61
	Engaged length	mm	12
	Torque, nominal	Nm	10
Maximum interface update rate		Values per second	1200
Data interfaces			Profibus DP EtherNet/IP PROFINET IO RT
Data interface protocol			SAI
Service interface			RS-232C
Service interface protocol			MT-SICS
Digital inputs	Number		3
	Permissible input voltage	V	0 to +30
	Low level	V	<1.5
	High level	V	>10
	Input resistance	kOhms	>1.2
Digital outputs	Number		5
	External supply voltage	V	+11 to +30
	Max. current of one output	A	<0.5
	Accumulated current of all outtputs	A	<1.2
	Voltage drop	V	<1

[1] Error due to the combined effect of non-linearity and hysteresis

[2] Typical values only. The sum of errors due to "Combined error" and "Temperature effect on sensitivity" comply with the requirements of OIML R60 and NIST H844
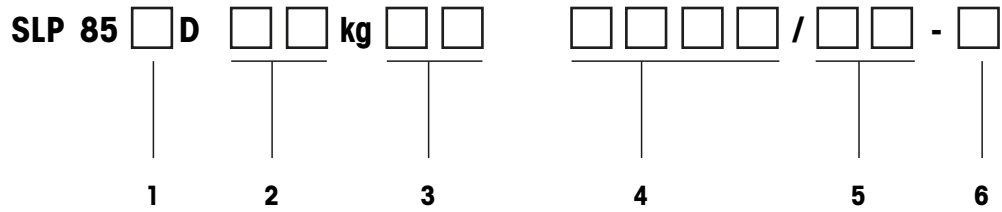
[3] A.L. = Applied Load

[4] See certificate for complete information

[5] Measured with maximum platform size 400 x 400 mm

4.2 Type Designation Code

Your load cell is uniquely identified by the type designation. The type designation can be found on the laser label on your load cell.

#	Designation	Values
1	Use mode	**0** (None) **2** (Filling application) **4** (Filling application and physical IOs)
2	Capacity in kg	**10**, **20**
3	Accuracy class	**C3**
4	Type of the integrated applications	**Fill** (integrated filling application)
5	Interface type	**EI** (Ethernet IP) **PN** (Profinet IO) **PB** (Profibus DP)
6	Position of the connectors	**B** (connectors at the bottom of the load cell)

4.3 Dimensions
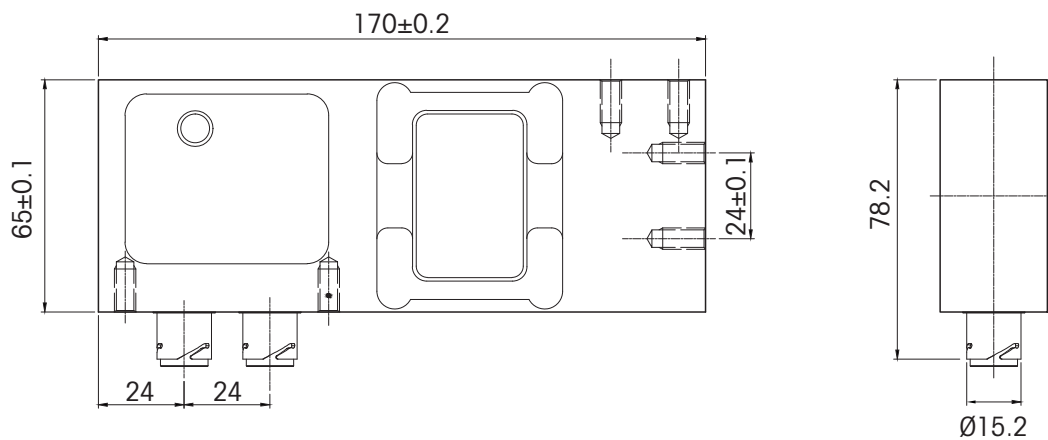
Dimensions in mm

4.4 Interface Specifications

Parameter	RS232	Profibus DP	PROFINET IO RT	EtherNet/IP
Interface type	EIA RS-232C/DIN 66020 (CCITT V.24/ V.28)	Profibus DP slave ((DPV0) according to EN 50170	PROFINET IO slave according to IEC 61784 /CPF-3/3)	EtherNet/IP adapter according to EN 50325-2
Max. cable length	15 m	100 m		
Max. number of nodes / segments	1	127	Limited by the IP address	
Type of operation	full duplex	half duplex	full duplex	
Type of trans- mission	bit serial, asynchronous		asynchronous, synchronous	
Transmission code	ASCII string	Binary		
Baud rates	600, 1200, 2400, 48ß00, 9600, 19200, 38400	9.6 kbit/s to 1.5 Mbit/s	100 Mbit/s	10 ... 100 Mbit/s
Default address	None	Node ID: 125	IP address:192.168.0.2	
Port number	None		80	
DHCP	None		Not available	On

4.5 Accessories

Accessories from the METTLER TOLEDO range improve the functionality of your SLP85xD load cell and open up additional uses.

Accessories	Description	Version	Order number
Data cables			
Data cable (8-pin, 6m)	For communication with the control system (PLC or PC)	Straight connector	30219421
		Right angled connector	30219417
IO cable (10-pin, 6 m)	For connecting digital inputs/outputs	Straight connector	30219422
		Right angled connector	30219418
Adapter cable			
With power socket Off-line (8-pin, 1 m)	Provides an RS232 interface (DSUB9) and a socket for connecting the power adapter. No connection possible with the control system. See position 4b in [Typical Configuration ▶ Page 5].	Straight connector	30219420
		Right angled connector	30219416
Without power socket On-line (8-pin, 1 m)	Provides an RS232 interface (DSUB9) and a bus-capable data interface. Connection possible with the control system. See position 4a in [Typical Configuration ▶ Page 5].	Straight connector	30219423
		Right angled connector	30219419
Power adapter			
Power adapter	AC adapter • Input: 100 to 240 V, 50 to 60 Hz, 0.3 A • Output: 12 V, 0.84 A		46001802
Power plug	Power plug EU: Valid for Europe		46001774
	Power plug AU: Valid for Australia, New Zealand and China		46001775
	Power plug US: Valid for USA, Canada and Japan		46001776
	Power plug UK: Valid for UK		46001777
Communication cable termination			
	RJ45 jack To terminate load cell communication cable with an easy interface for network connection. This accessory can be used for EtherNet/IP and PROFINET IO interfaes		30425963

Accessories	Description	Version	Order number
	DIN rail mounting module with 2 side covers To install the RJ45 jack on a DIN rail in an easy way		30425964

To protect your product's future:

METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of this product for years to come.

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For more information

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