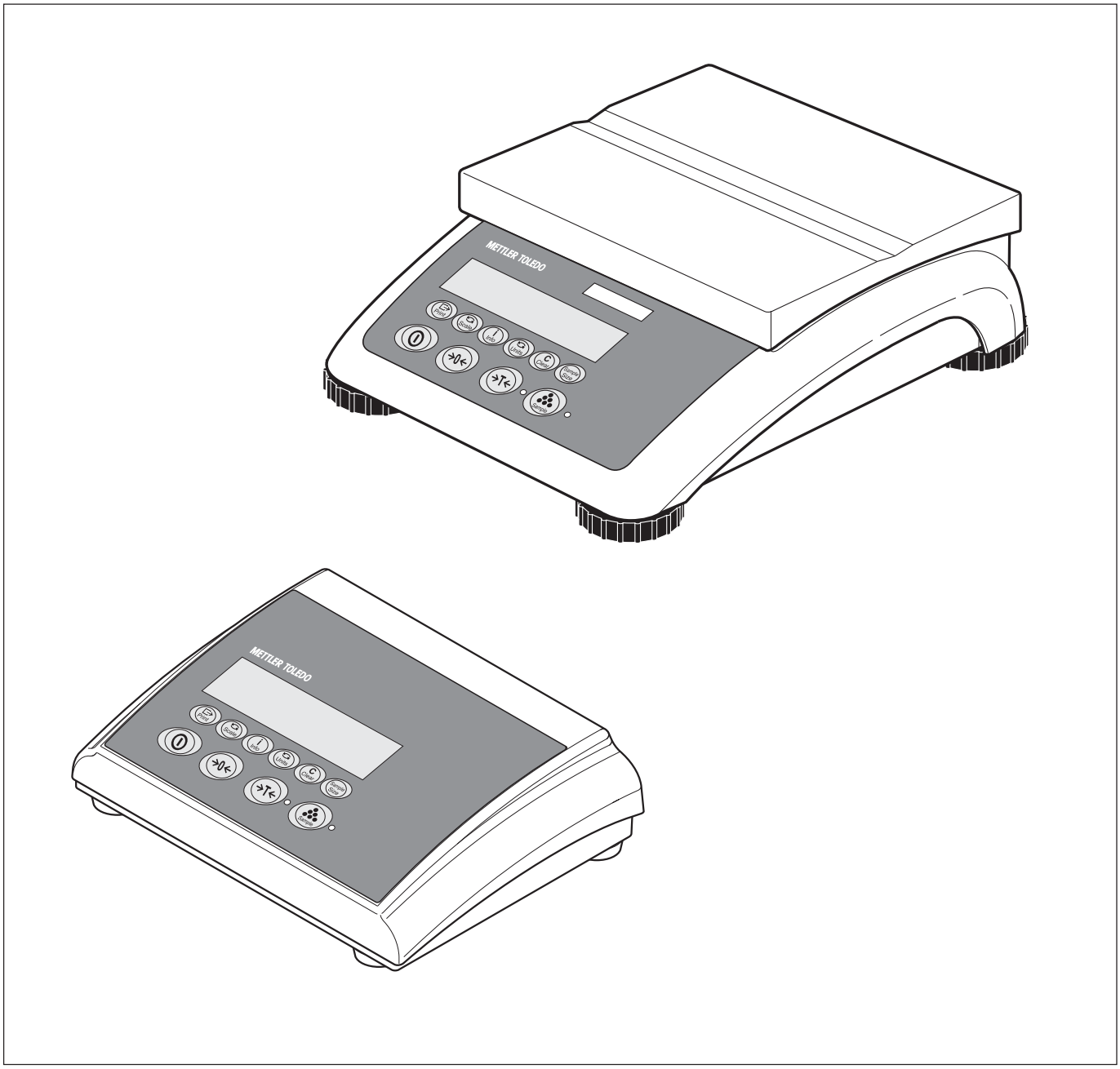
Service manual

METTLER TOLEDO

METTLER TOLEDO
BBA4.. / BBK4.. compact scales
IND4.. terminals



Contents Page

1 General

1.1 How to use this service manual?

This service manual contains instructions for the repair and maintenance work to be performed by service engineers.

It is assumed that the reader is familiar with the operation of the scale and can refer to the relevant operating instructions when necessary.

1.1.1 Layout of this service manual

This manual comprises nine main sections:

- **General**: This section which you are looking at now gives instructions on using the service manual, and also provides an overview of the scales covered by it.
- **BBA4.. P (small platform)**: This section contains the exploded view drawings and spare parts lists for compact scales with the small platform (weighing pan 7.9" x 9.5" (200 x 240 mm) or 6.5" x 6.5" (165 x 165 mm)).
- **BBA4.. S (large platform)**: This section contains the exploded view drawings and spare parts lists for compact scales with the large platform (weighing pan 9.5" x 13.8" (240 x 350 mm).
- **IND4..**: This section contains the exploded view drawings and spare parts lists for terminals.
- **Replacing components with compact scales**: This section describes all repair work and the replacement of components for compact scales with large and small platforms. It also contains a list of the tools and working aids required.
- **Replacing components with terminals**: This section describes all repair work and the replacement of components for terminals. It also contains a list of the tools and working aids required.
- **Scale definition, settings and diagnostics**: This section describes how to enter scale setup data, make various settings and use the diagonstic functions.
- **Additional information**: This section contains certification tolerances and other technical information plus an overview of all weighing cells and preloads and a table of geographical adjustment values.
- **Software**: This section contains information on the various software versions and their compatibility. It also describes typical error messages that can appear following service work and provides troubleshooting instructions.

1.1.2 Working with the service manual

The exploded view drawings are provided as a guide for disassembly and assembly work and for identifying the order numbers for spare parts.

When ordering spare parts, please use the information given in the spare parts lists. The item numbers in the first column "Item" correspond to those on the exploded view drawing opposite.

1.2 Service concept

The scales have been designed so that defective components can be replaced with just a few simple tools. Technician mode and supervisor mode will already be familiar to you, since this concept has already been used in other METTLER TOLEDO products. The LC-PT45 printer for service is not required, as almost all parameters can be configured with the keyboard of the scale (in special cases temperature compensation data of the MonoBloc weighing cell may need to be entered using a PC). As you can see, we have kept it simple for efficient servicing.

1.3 Introducing the BBA4.. / BBK4.. / IND4.. product group

The BBA4.. / BBK4.. / IND4.. product group comprises the following models, which are all covered by this manual:

BBA422 / BBA425 / BBK422 / Terminal IND425 (Basic)

The BBA422 / BBA425 / BBK422 scales and the IND425 terminal possess basic weighing functions for simple weighing duties. BBA425 and IND425 are IP65 versions.

BBA432 / BBK432 / Terminal IND435 (Count)

In addition to basic weighing functions, counting scales also have built-in functions for piece counting. An extended keypad and a display with a visual weighing-in aid are available in order to use these additional functions.

BBA442 / BBK442 / Terminal IND445 (Count+)

In addition to the simple piece counting functions these scales have a numeric keypad, accumulation, checking and ID functions.

BBA462 / BBK462 / Terminal IND465 (Smart+)

The compact scales and terminals type Smart+ are the top-of-the-range models in the product group. These scales are available for various applications (piece counting, SQC 16, Remote). They have a dot matrix display with graphics capability and a numeric keypad. The various menu functions are controlled by soft keys in the display, i.e. context-sensitive screen buttons which change according to the momentary status of the menu.

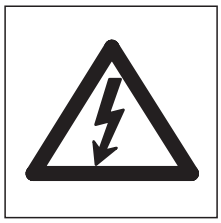
Common features

Apart from the differences with regard to functions and operating and display elements, all models have the following common features:

- Depending on the weighing range, some models are only available with the small platform, some only with the large platform and some with both. The essential difference between the two platform sizes is in their external dimensions, the size of the weighing cell and the weight of the scale, small models having a 7.9" x 9.5" (200 x 240 mm) or a 6.5" x 6.5" (165 x 165 mm) weighing pan, large models a 9.5" x 13.8" (240 x 350 mm) weighing pan.
- All models are designed either for direct connection to the AC power line or contain a built-in rechargeable battery. Rechargeable battery scales are connected to the AC power line via an AC adapter.
- All models are also available as certifiable instruments.
- The weighing cells are either of the strain gauge or MonoBloc type.

1.4 Safety

When carrying out service or repair work, always observe the following:

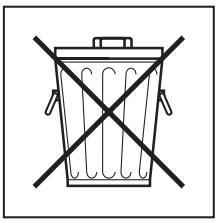


- Before opening the scale, isolate it from the AC power line (pull out the plug).

- The scales contain precision electronic components that are sensitive to **electrostatic discharge**. We recommend that you wear a grounding wrist strap when doing any work in the interior of the scale, in order to prevent any electrostatic charge building up. Grounding wrist straps are commercially available from electronic component suppliers.

- **Servicing work in explosion hazard zones is strictly prohibited!** Ignition power could inadvertently be generated, causing an explosion. **Servicing work should therefore only be undertaken in secure areas.** Please also observe all special instructions in this service manual relating to work on instruments that are approved for use in potentially explosive environments. Such instructions are indicated by the adjacent symbol.

1.5 Environmental protection



Disposal of rechargeable batteries

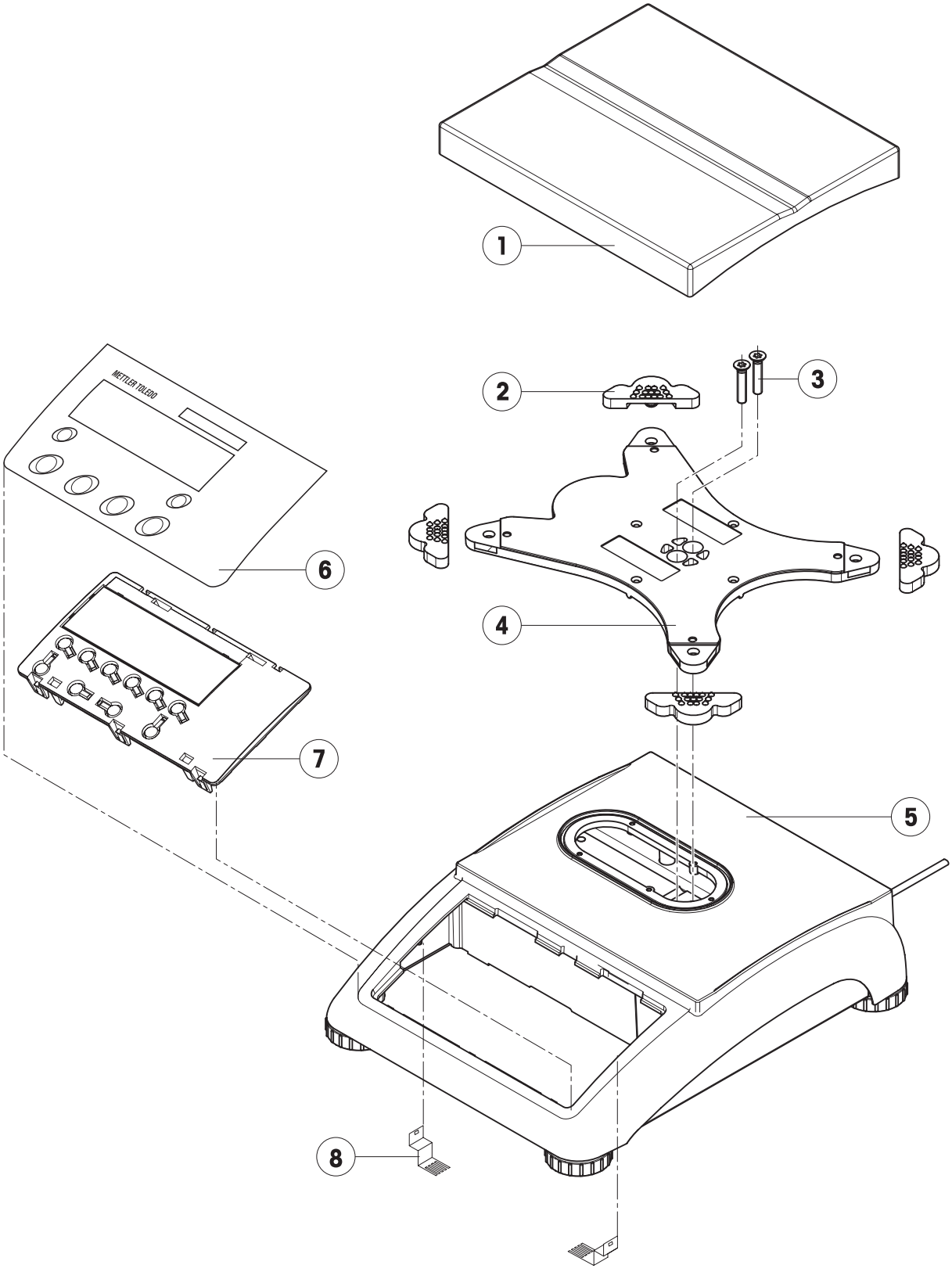
Please note all current environmental directives when **disposing of the terminal**. If the terminal is equipped with a **rechargeable battery**: The nickel-metal-hydride (NiMH) storage battery may not be disposed of in the normal refuse. Please observe local regulations when disposing of environmentally harmful materials.

Disposal of electronic components

Dispose of defective components in strict compliance with all local and national regulations! In many countries electronic components are classified as hazardous waste for whose disposal there are special regulations. In some countries electronic components are collected separately for recycling. If necessary, find out the applicable regulations from the local authorities!

2 Compact scales, small platform

2.1 Scales with strain gauge weighing cells

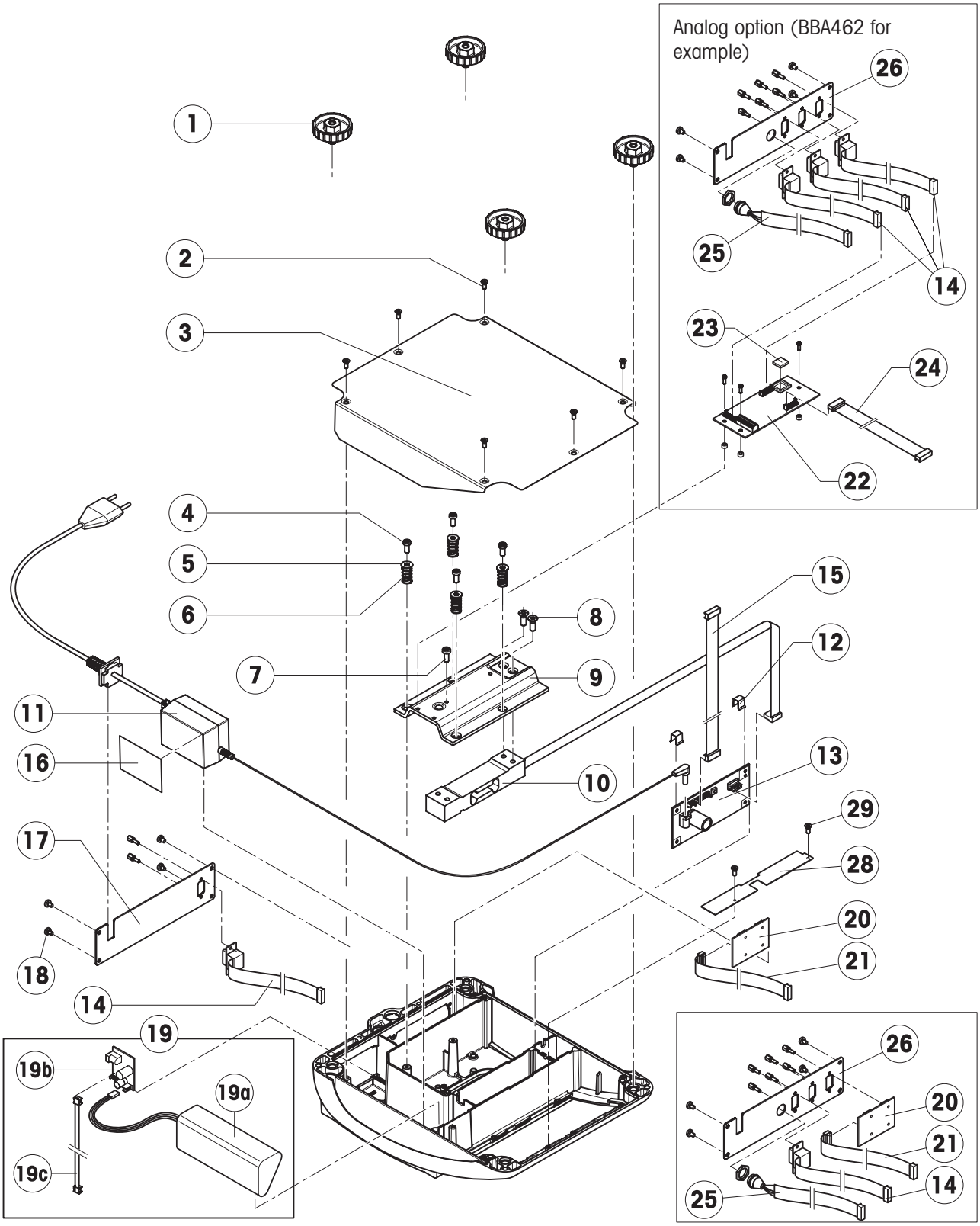


Item	Qty.	Description	Order No.
1	1	weighing pan 7.9" x 9.5" (200 x 240 mm)	21203071
2	4	rubber cushions [1)]	21203073
3	2	countersunk Torx screw M6 x 30	*
4	1	pan support plate 7.9" x 9.5" (200 x 240 mm)	–
5	1	housing, with small platform	–
6	1	keypad overlay	Chap. 2.4 – 2.7
7	1	mounting plate and display unit (digital PCB with LCD and backlighting unit)	Chap. 2.4 – 2.7
8	2	EMV clamp	21203480

* included in the small parts set (Chapter 4.6)

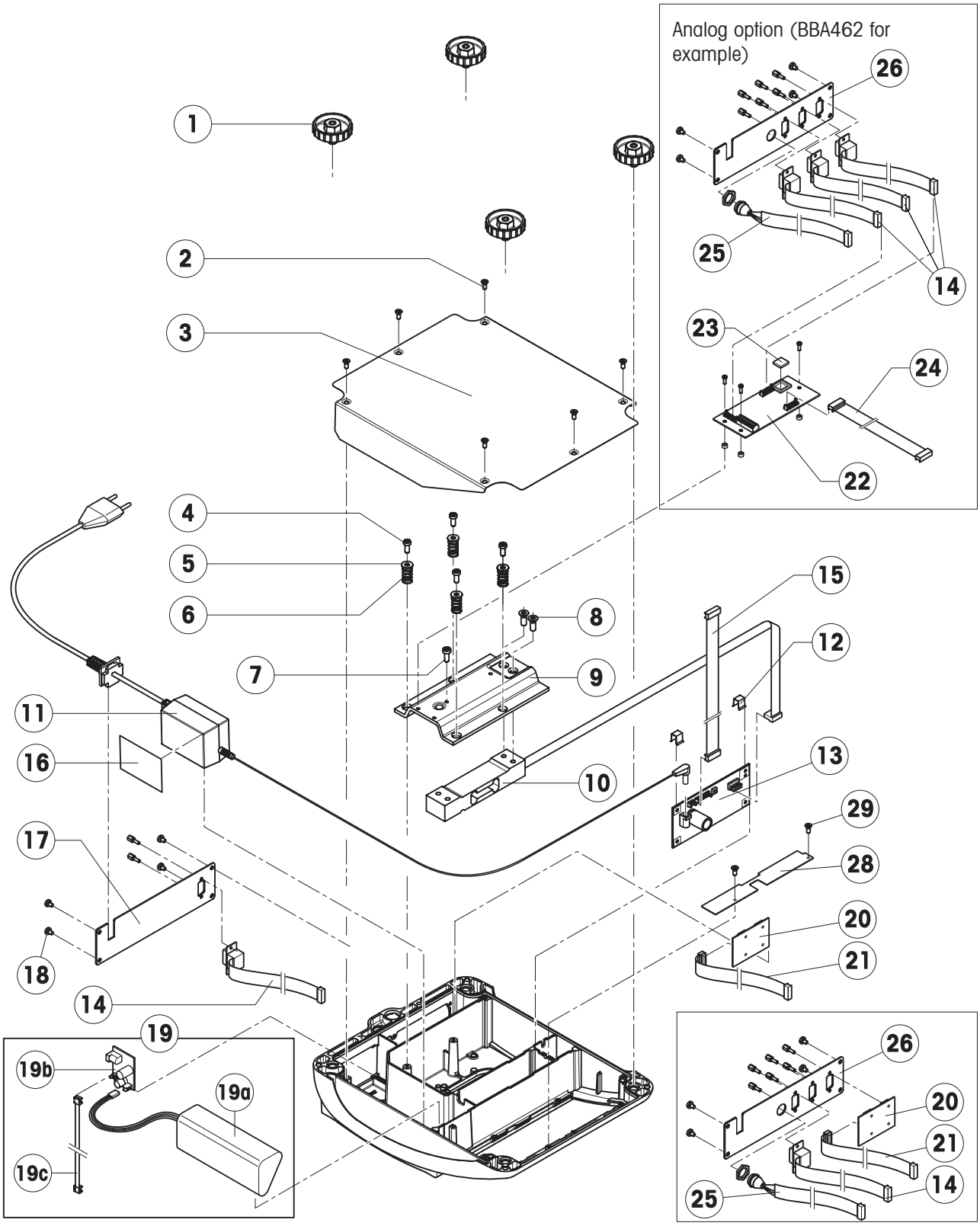
[1)] New rubber cushions have a hole in the surface to assist with assembly. A pin can be used to insert the cushion into the corresponding drilled hole in the load plate support.

Scales with strain gauge weighing cells (continued)



Item	Qty.	Description	Order No.
1	4	adjustable foot Ø 1.7" (44 mm) (M10 x 0.75 mm)	21203434
2	6	countersunk Torx screw M4 x 12	*
3	1	bottom plate for small platform model	–
4	4	button head Torx screw M4 x 12	*
5	4	wide flange washer 4.3 x 20	*
6	4	overload spring	**
7	1	overload stop adjustment screw (with certain production series only)	**
8	2	countersunk Torx screw M6 x 16	*
9	1	overload plate for small platform model	–
10	1	**weighing cell with cable** (certifiable)	
		weighing range 3 kg: LC0765-5-MRV (Standard cell)	21203873
		weighing range 6 kg: LC0765-10-MRV (Standard cell)	21203874
11	1	**bench AC adapter** (always order together with item 16):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
12	2	spring clip	*
13	1	analog PCB BBA AN DMS 7k	21203092
14	1	RS cable 18.1" (460 mm)	21203168
15	1	A/D cable 4.3" (110 mm), for small platform model	21203164
16	1	adhesive patch for AC adapter or battery (for battery version order 2 pcs.)	21203184
17	1	RS connector plate for BBA/BBK422 / BBA/BBK432 / BBA/BBK442 (various types, depending on the equipment)	–
18	4	raised cheese head Torx screw M4 x 8	*
19		**for scales with AccuPac only:**	
19a	1	accu 14.4V NiMH (always order together with item 16)	22011349
19b	1	print charger NiMH	22011351
19c	1	battery cable (charging PCB – analog PCB)	21203233
20	1	PCB RS option (2 x RS232C), standard with BBA462	21203476
		PCB RS option (1 x RS232 + 1 x RS 485)	21255083
		PCB Digital I/O (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option (1 x RS232 + 1 x USB)	21204008
		PCB USB option IP65 (1 x RS232 + 1 x USB Sub D)	21204114
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
21	1	connection cable RS option 15.0" (380 mm)	21203490
		connection cable Ethernet / USB option (use only if the Ethernet or USB option is installed **together** with an analog option)	22010154
22	1	PCB analog option (not for BBA422)	21203383
23	1	EPROM with interface program (for PCB analog option)	22013444
24	1	connection cable analog option 9.9" (250 mm)	21203604

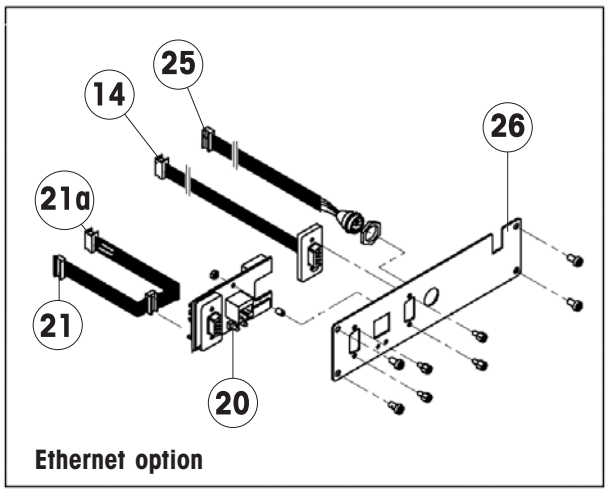
Scales with strain gauge weighing cells (continued)

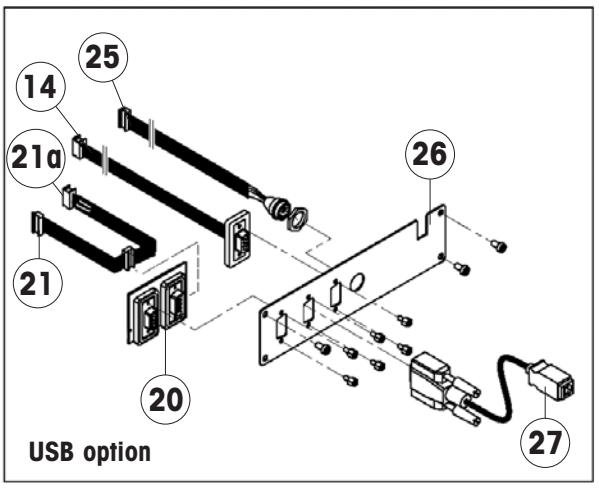


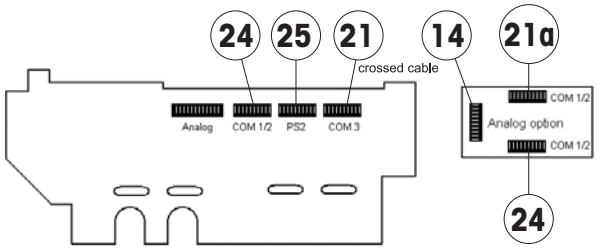
25	1	cable PS2, 18.1" (460 mm) (keyboard connection, BBA462 only)	21204107
26	1	connector plate for 3 RS interfaces and 1 keyboard cable: standard scale: 1 x PCB RS Option, 1 x RS cable 18.1" (460 mm), 1 x PS2 cable scale with optional analog interface: 3 x RS cable 18.1" (460 mm), 1 x PS2 cable	–
27	1	cable USB for IP65 (with Sub D socket and USB socket of type B)	21204031
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500 M3 x 6	–

* included in the small parts set (Chapter 4.6)
** see Chapter 5.8 "Replacing the weighing cell"

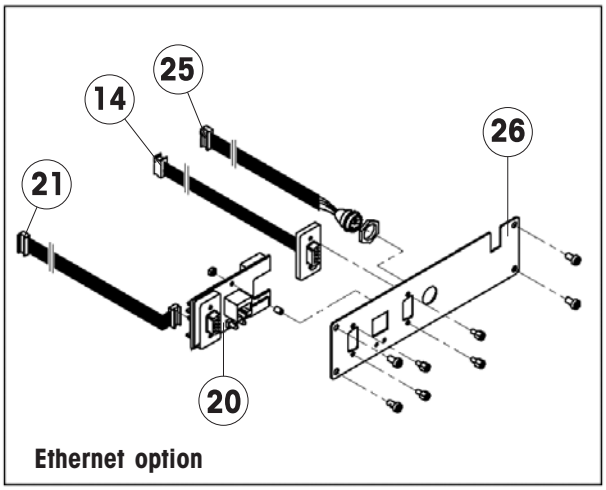
With analog option

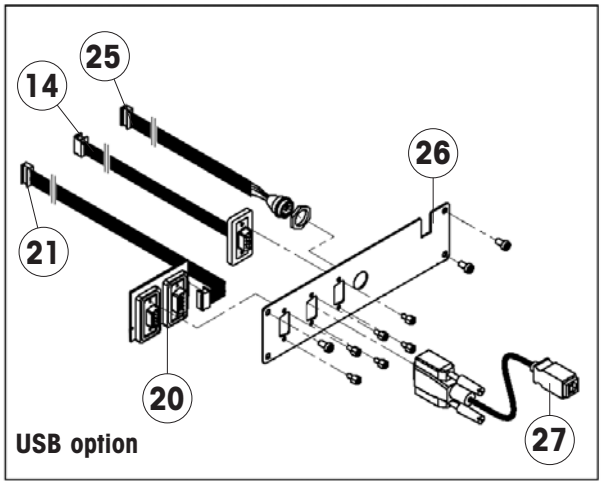


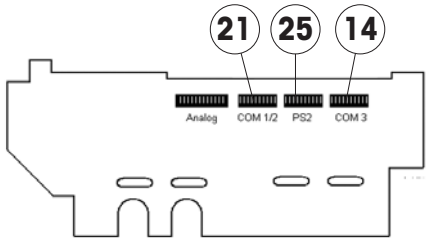




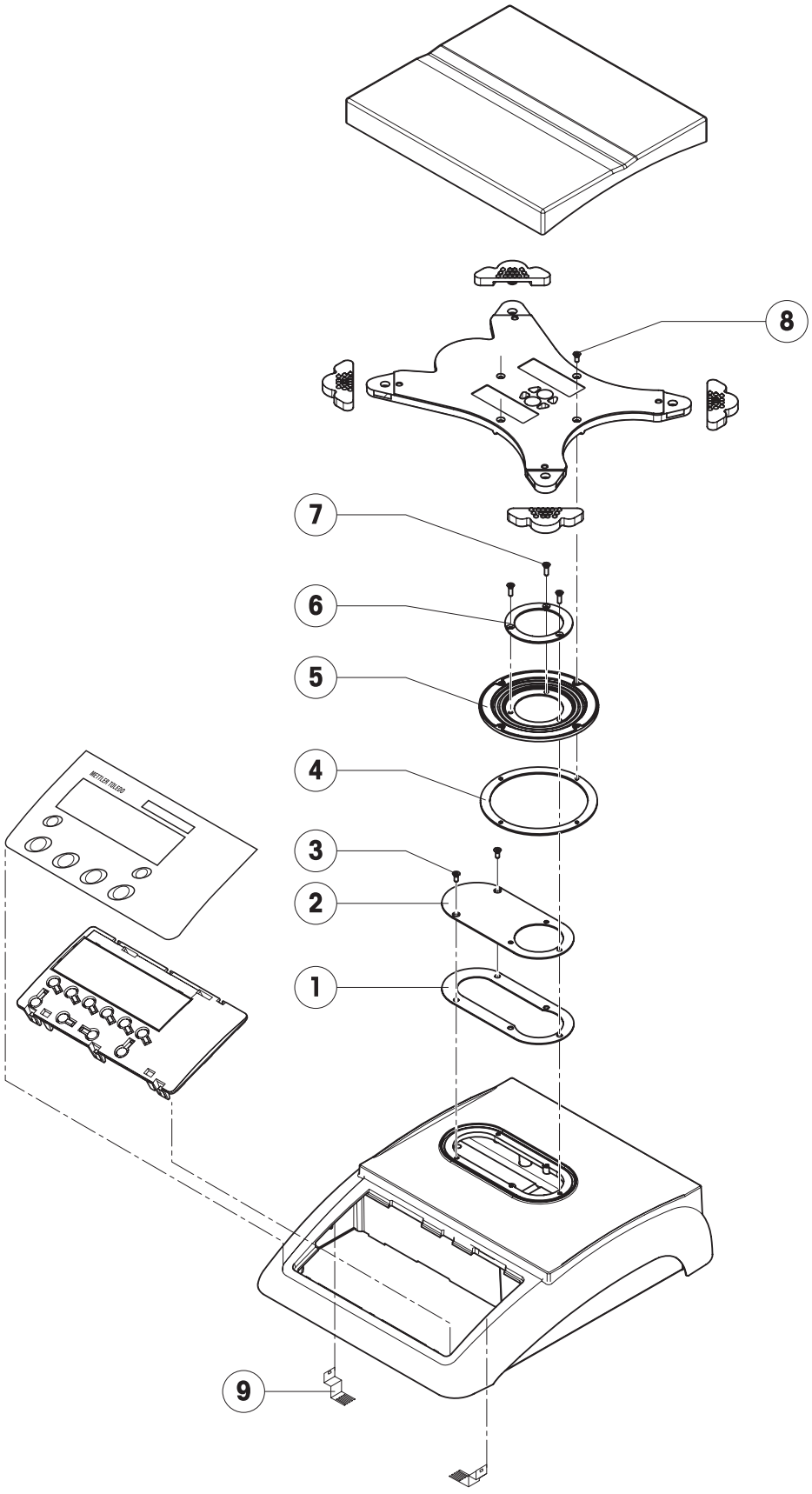
Without analog option







2.2 Scales with strain gauge weighing cell and IP65 protection

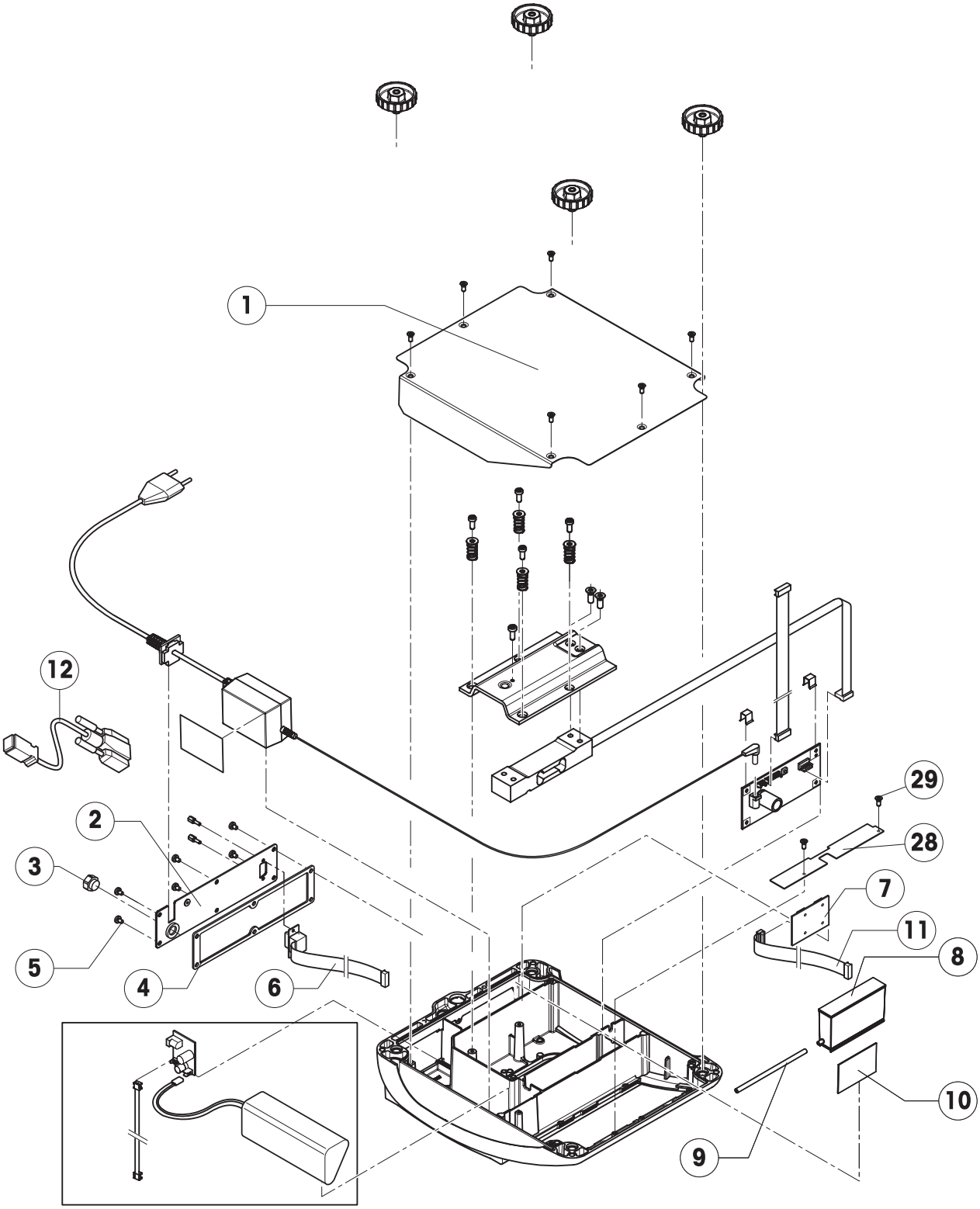


Item	Qty.	Description	Order No.
1	1	packing for cover plate	21203235
2	1	cover plate	–
3	2	countersunk Torx screw M3 x 8	*
4	1	flange D = 100 mm	–
5	1	diaphragm	21203077
6	1	flange D = 58 mm	–
7	3	countersunk Torx screw M3 x 10	*
8	4	countersunk Torx screw M3 x 8	*
9	2	EMC clamp	21203480

* included in the small parts set (Chapter 4.6)

Note: Parts of the scale not numbered in the illustration are included in the normal version (Chapter 2.1).

Scales with strain gauge weighing cell and IP65 protection (continued)

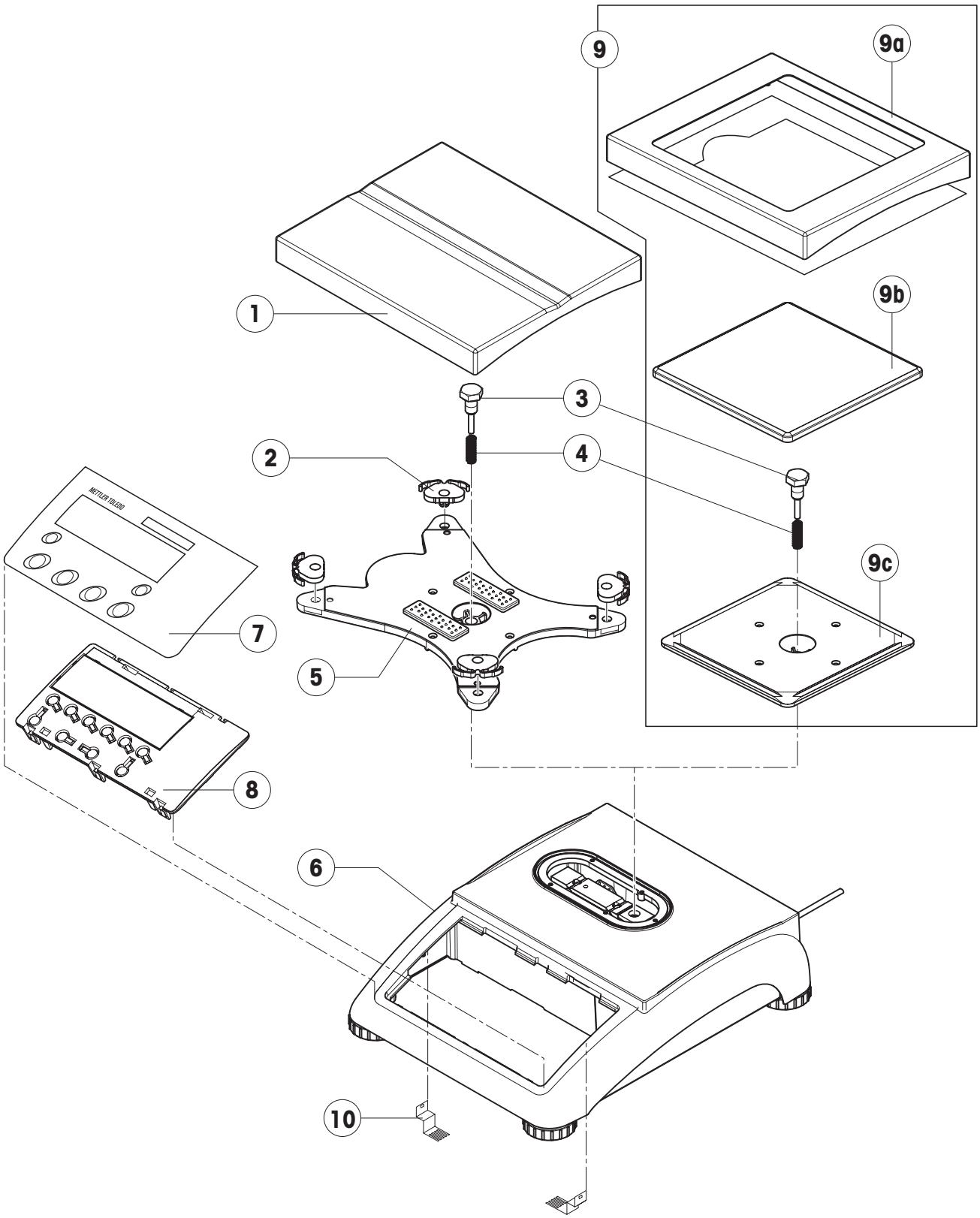


Item	Qty.	Description	Order No.
1	1	bottom plate for small platform model IP65 version	21203511
2	1	RS connector plate IP65 version (various types, depending on the equipment)	–
3	1	air supply/extraction filter	21203860
4	1	packing for RS connector plate	21203236
5	6	raised cheese head Torx screw M4 x 8	*
6	1	RS cable 18.1" (460 mm) IP65	21203717
7	1	PCB RS option (2 x RS232C) IP65	21255081
		PCB RS485 option (1 x RS232 + 1 x RS485) IP65	21255083
		PCB Digital I/O (1 x RS232 + 1 x Digital I/O) IP65	22010184
		PCB USB option (1 x RS232 + 1 x USB Sub D) IP65	21204114
8	1	pressure equalizer	21203611
9	1	pressure equalizer tube LA	21203862
10	1	adhesive patch for pressure equalizer	21203184
11	1	connection cable RS option 15.0" (380 mm)	21203490
12	1	cable USB option IP65 (with Sub D socket and USB socket of type B)	21204031
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500 M3 x 6	–

* included in the small parts set (Chapter 4.6)

Note: Parts of the scale not numbered in the illustration are included in the normal version (Chapter 2.1).

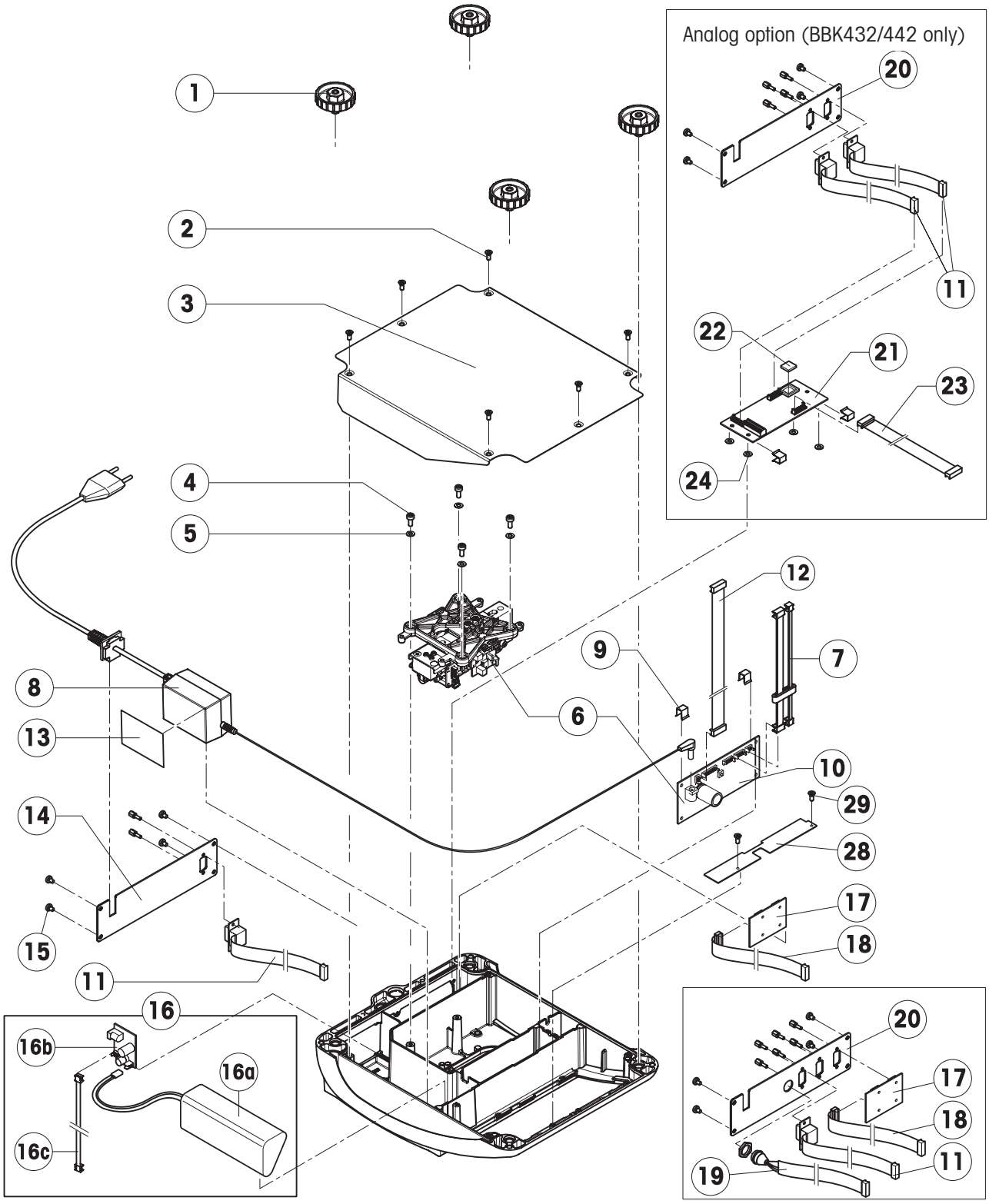
2.3 Scales with MonoBloc weighing cell



Item	Qty.	Description	Order No.
1	1	weighing pan 7.9" x 9.5" (200 x 240 mm) for 12 lb (6 kg) scale	21203071
2	4	pan mount	21203238
3	1	hexagon screw for load plate support	–
4	1	fastener spring	–
5	1	load plate support 7.9" x 9.5" (200 x 240 mm)	–
6	1	case with small platform	–
7	1	keypad overlay	Chap. 2.4 – 2.7
8	1	mounting plate and display unit (digital PCB and display compl.)	Chap. 2.4 – 2.7
9		**for 6 lb (3 kg) models only**	
9a	1	draft shield and screen	21203299
9b	1	weighing pan 6.5" x 6.5" (165 x 165 mm)	00225158
9c	1	load plate support 6.5" x 6.5" (165 x 165 mm)	–
10	2	EMC clamp	21203480

* included in the small parts set (Chapter 4.6)

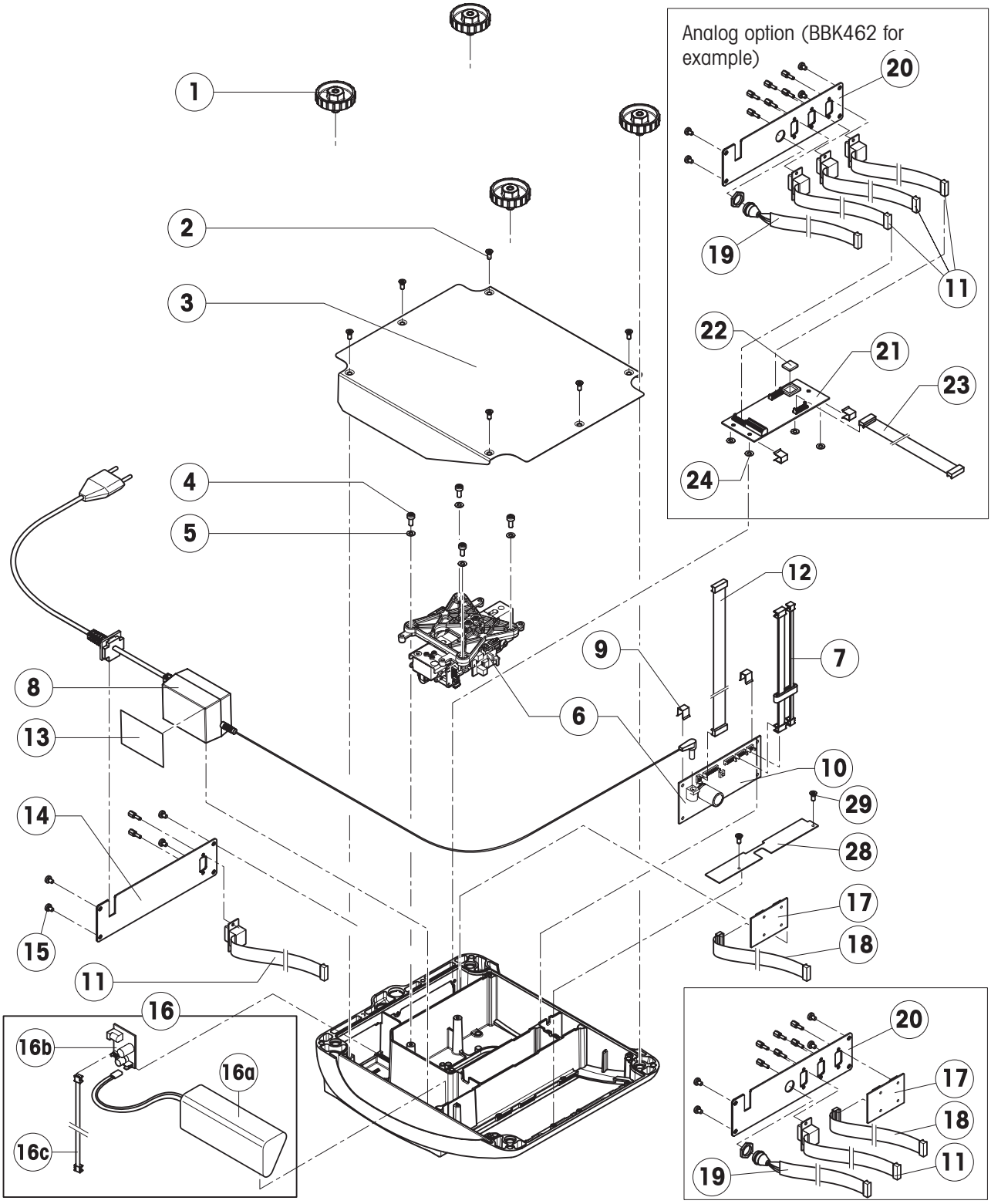
Scales with MonoBloc weighing cell (continued)



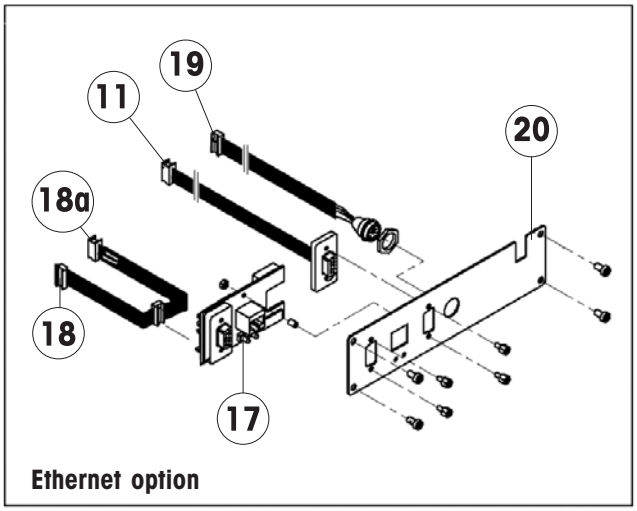
Item	Qty.	Description	Order No.
1	4	adjustable foot Ø 1.7" (44 mm) (M10 x 0.75 mm)	21203434
2	6	countersunk Torx screw M4 x 12	*
3	1	bottom plate for small platform model	–
4	4	cylinder head Torx screw M4 x 12	*
5	4	flange washer 4.3 x 9	–
6	1	**weighing module** (load cell and analog PCB)	
		weighing module 3002 (for weighing range 6 lb (3 kg)	11102685
		weighing module 6001 (for weighing range 12 lb (6 kg)	11102686
7	1	cell cable MB SM with ferrite ring	21203289
8	1	**bench AC adapter 8VA** (always order together with item 13)	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
9	2	spring clip	*
10	1	AN MonoBloc analog PCB	21203100
11	1	RS cable 18.1" (460 mm)	21203168
12	1	AD cable 4.3" (110 mm), for small platform model	21203164
13	1	adhesive strip for AC adapter or battery (for battery version order 2 pcs.)	21203184
14	1	RS connector plate (various types, depending on the equipment)	–
15	4	raised cheese head Torx screw M4 x 8	*
16		**for scales with AccuPac only:**	
16a	1	accu 14.4V NiMH (always order together with item 13)	22011349
16b	1	print charger NiMH	22011351
16c	1	battery cable (charging PCB – analog PCB)	21203233
17	1	PCB RS option (2 x RS232C), standard for BBK462	21203476
		PCB RS485 option (1 x RS232C + 1 x RS485)	21255083
		PCB Digital I/O (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option (1 x RS232 + 1 x USB)	21204008
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
18	1	connection cable RS option 15.0" (380 mm)	21203490
		connection cable Ethernet / USB option (use only if the Ethernet or USB option is installed **together** with an analog option)	22010154
19	1	PS2 cable, 18.1" (460 mm) (keyboard connection, BBK462 only)	21204107
20	1	connector plate for 3 RS interfaces and 1 keyboard cable (1 x PCB RS option, 1 x RS cable 18.1" (460 mm), 1 x PS2 cable)	–
21	1	PCB analog option (not for BBK 422)	21203383
22	1	EPROM with interface program (for PCB analog option)	22013444
23	1	connection cable analog option 9.9" (250 mm)	21203604
24	4	fixation buffers	–
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500 M3 x 6	–

* included in the small parts set (Chapter 4.6)

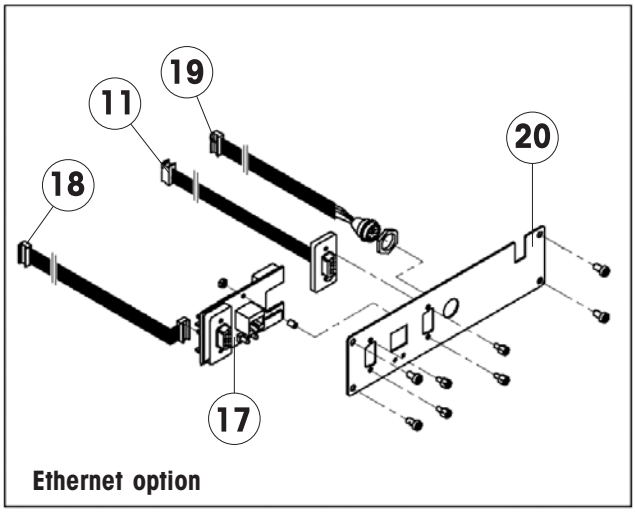
Scales with MonoBloc weighing cell (continued)

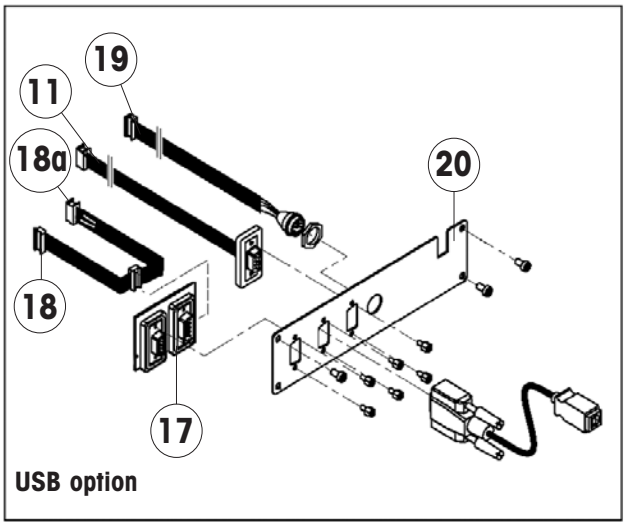


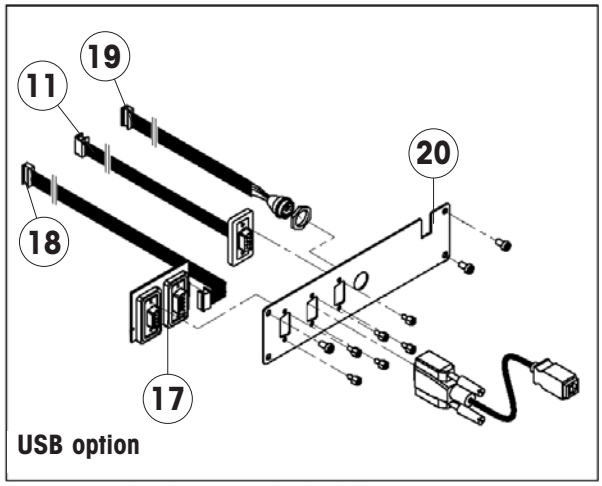
With analog option

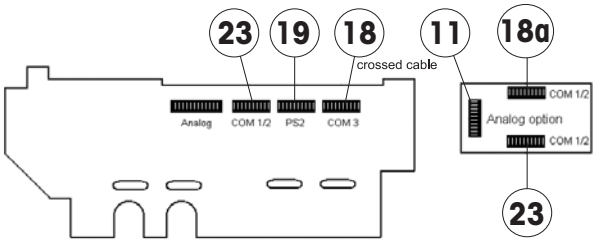


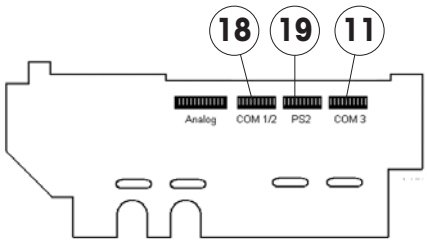
Without analog option



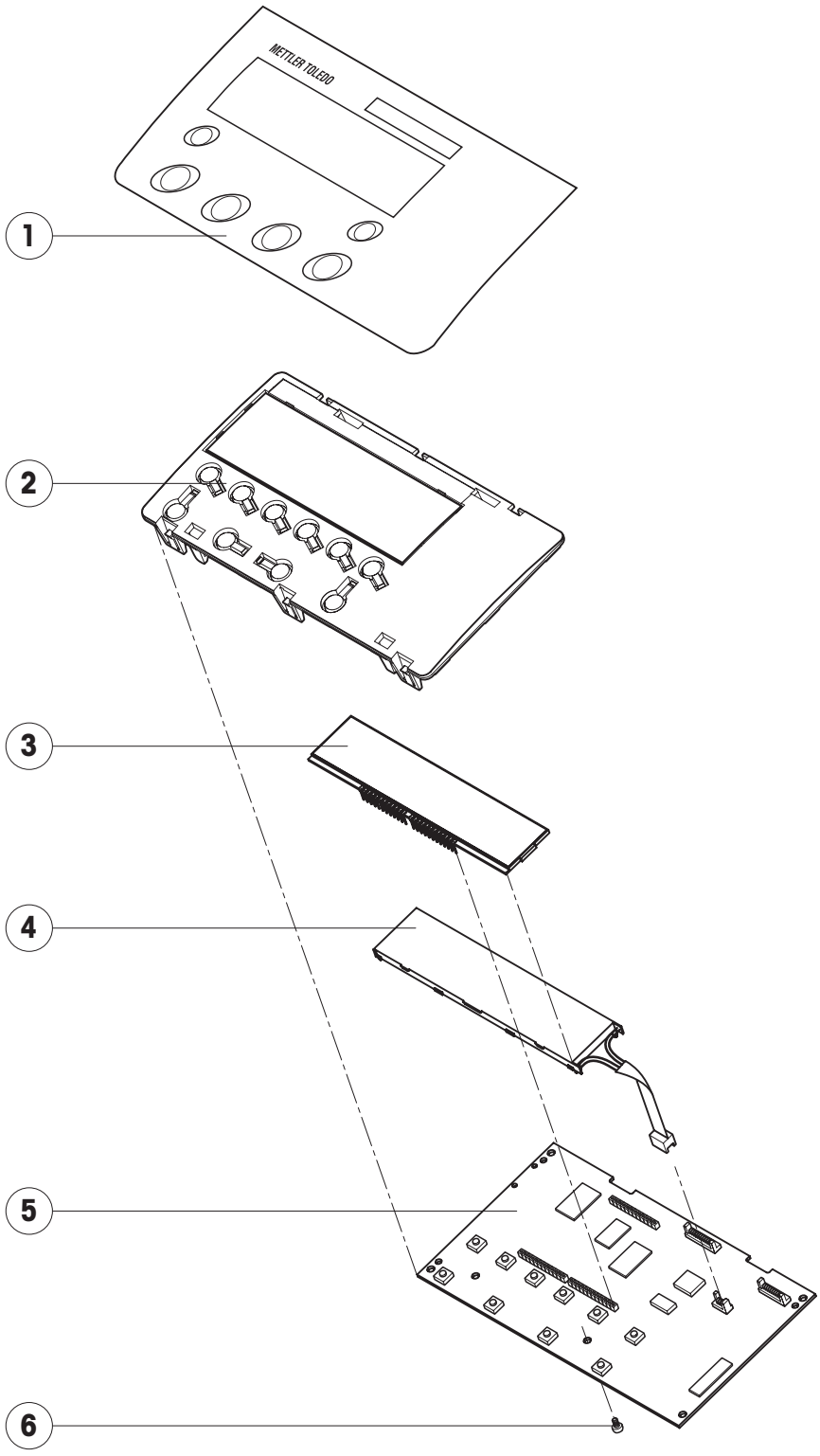








2.4 Display unit BBA422 / BBA425 / BBK422

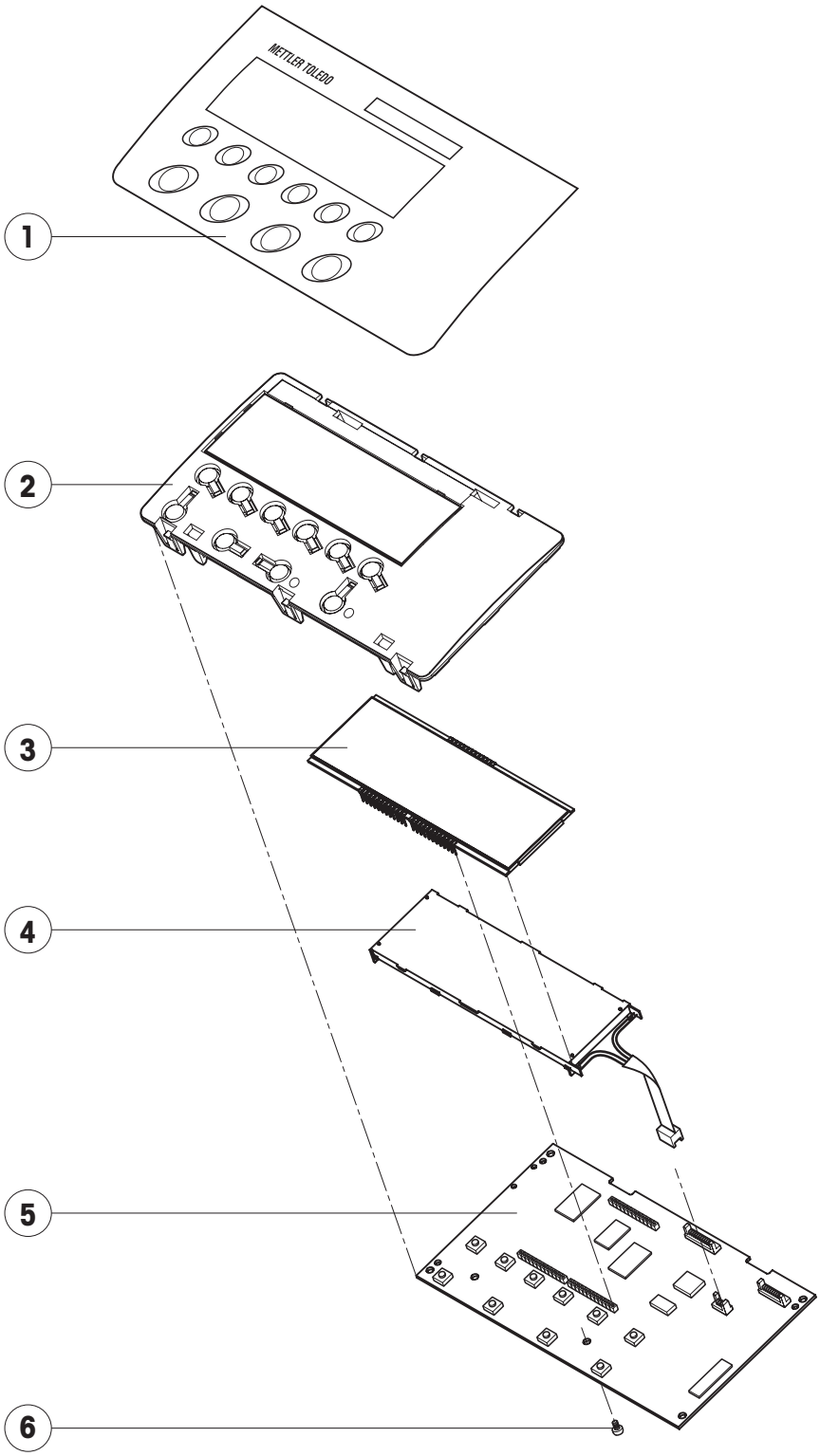


Item	Qty.	Description	Order No.
1	1	keypad overlay for small platform model	22011400
2	1	display mounting plate (always order together with item 1)	21203120
3	1	LCD	21203134
4	1	backlighting unit	21203136
5	1	digital PCB with FLASH Memory Chip (soldered)[1)]	21204025
6	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

[1)] see Chapter 9.5 for information on loading the software

2.5 Display unit BBA432 / BBK432

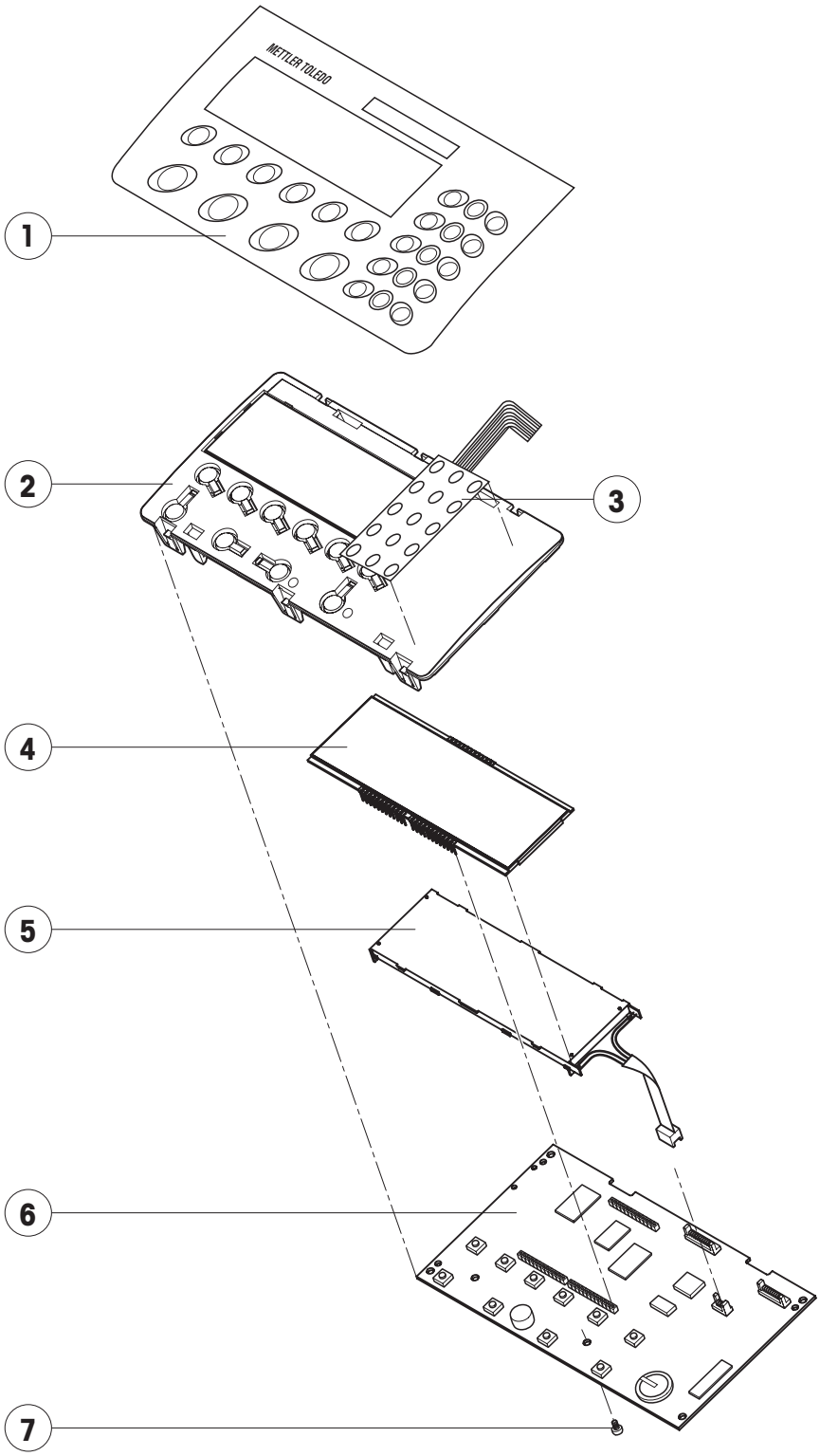


Item	Qty.	Description	Order No.
1	1	keypad overlay for small platform model	22011409
2	1	BC display mounting plate (always order together with item 1)	21203491
3	1	LCD	21203687
4	1	backlighting unit	21203137
5	1	digital PCB with FLASH Memory Chip (soldered)[1)]	21204025
6	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

[1)] see Chapter 9.5 for information on loading the software

2.6 Display unit BBA442 / BBK442



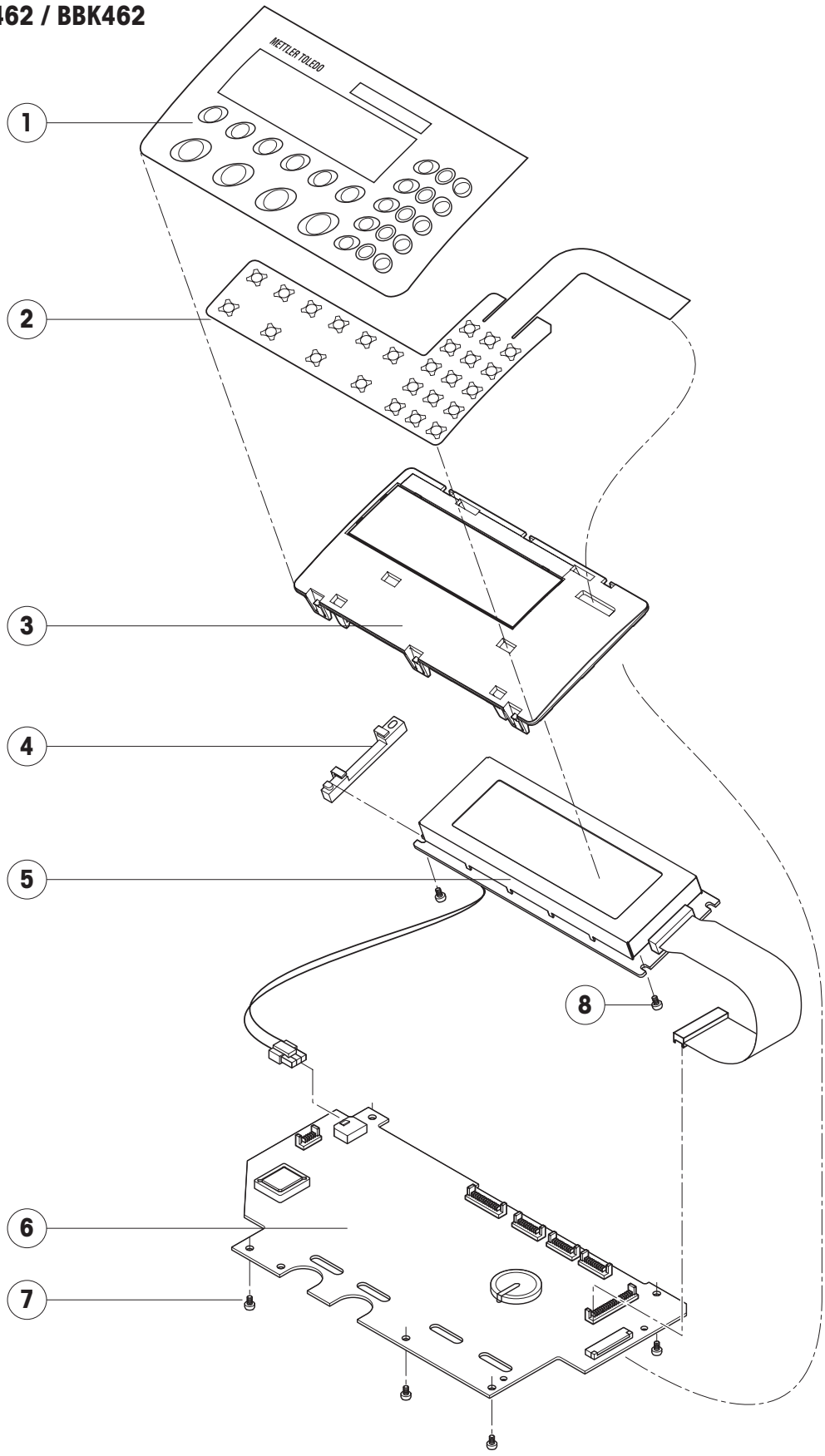
Item	Qty.	Description	Order No.
1	1	keypad overlay for small platform model	22011410
2	1	display mounting plate (always order together with item 1 and 3)	21203448
3	1	pressure sensitive keypad membrane (15 keys) [1)]	21203439
4	1	LCD	21203687
5	1	backlighting unit	21203137
6	1	digital PCB with FLASH Memory Chip (soldered) [2)]	22013719
7	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

1) always order together with item 1

2) see Chapter 9.5 for information on loading the software

2.7 Display unit BBA462 / BBK462



Item	Qty.	Description	Order No.
1	1	keypad overlay BBA/BBK462 small platform	22011403
2	1	pressure sensitive keypad membrane (25 keys)	21203501
3	1	display mounting plate BBA/BBK462 (always order together with items 1 and 2)	21203507
4	1	spacer plate	21255046
5	1	LCD module 240 x 64 dots CCFL	21203515
6	1	**digital PCB** with FLASH Memory Chip (soldered)[1)]	
		digital PCB for BBA/BBK462	21203996
		digital PCB for SQC-16	21203772
		digital PCB for Remote without software [2)]	21203996
7	5	retaining screw	*
8	2	Torx oval head tapping screw 2.9 x 13 (red)	*

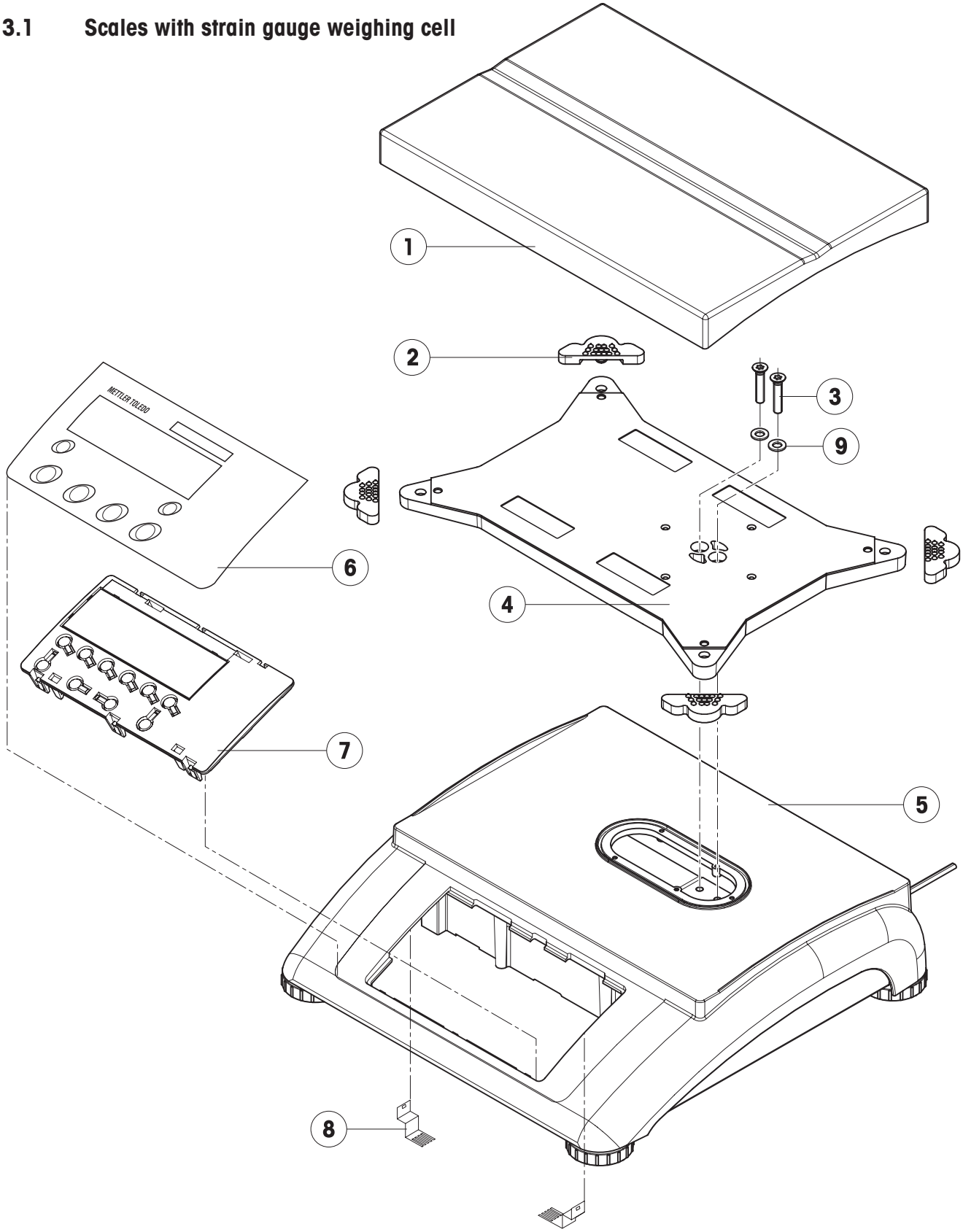
* included in the small parts set (Chapter 4.6)

[1)] see Chapter 9.5 for information on loading the software

[2)] When replacing the digital PCB of a BBA/BBK462 Remote, you can acquire the software from Support.SQC@mt.com.

3 Compact scales, large platform

3.1 Scales with strain gauge weighing cell

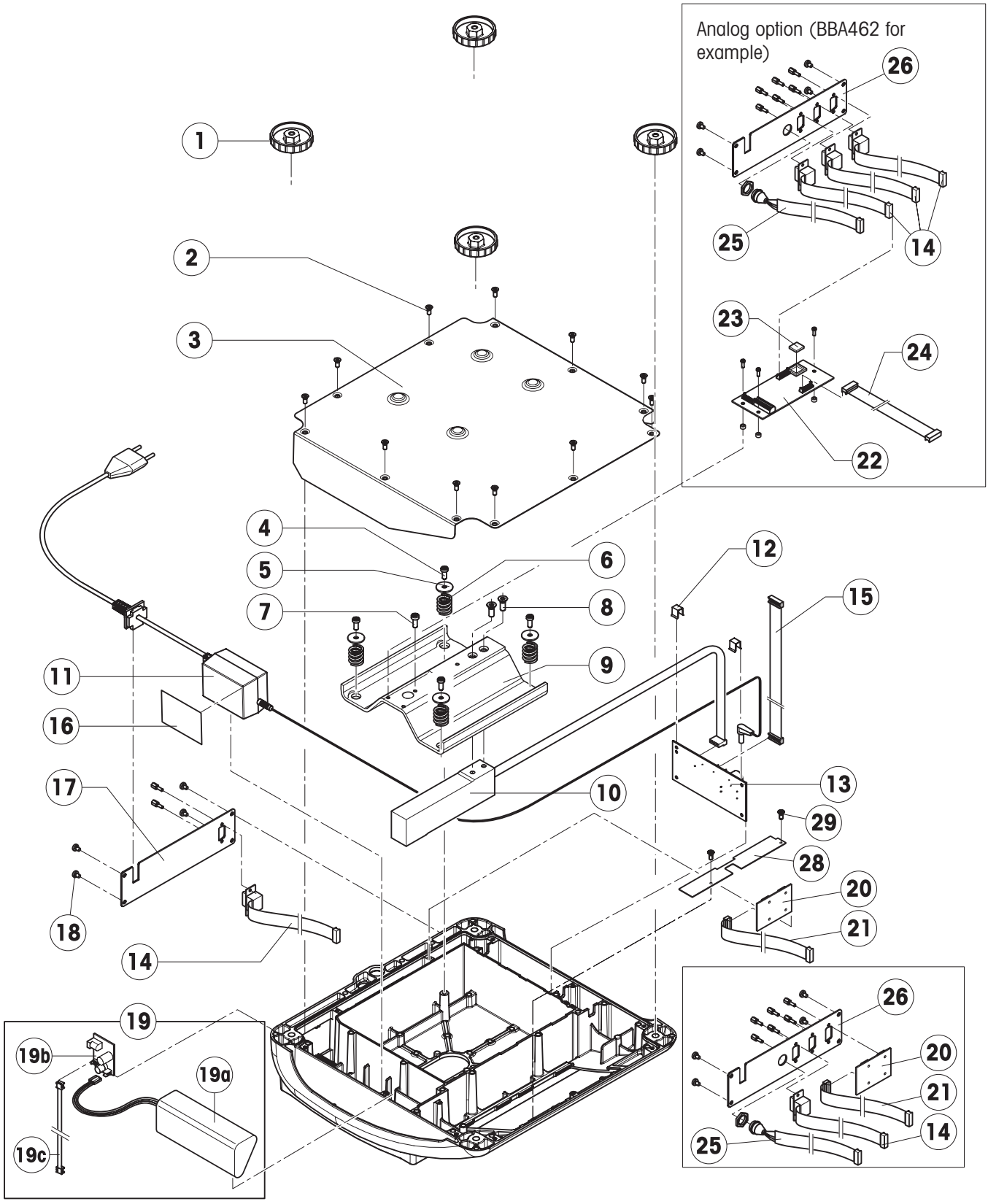


Item	Qty.	Description	Order No.
1	1	weighing pan 9.5" x 9.5" (240 x 350 mm)	21203072
2	4	rubber cushions [1)]	21203073
3	2	countersunk Torx screw M6 x 30	*
4	1	pan support plate 9.5" x 9.5" (240 x 350 mm)	–
5	1	housing, large platform	–
6	1	keypad overlay	Chap. 3.4 – 3.7
7	1	mounting plate and display unit (digital PCB with LCD and backlighting unit)	Chap. 3.4 – 3.7
8	2	EMC clamp	21203480
9	2	ferrite rings	–

* included in the small parts set (Chapter 4.6)

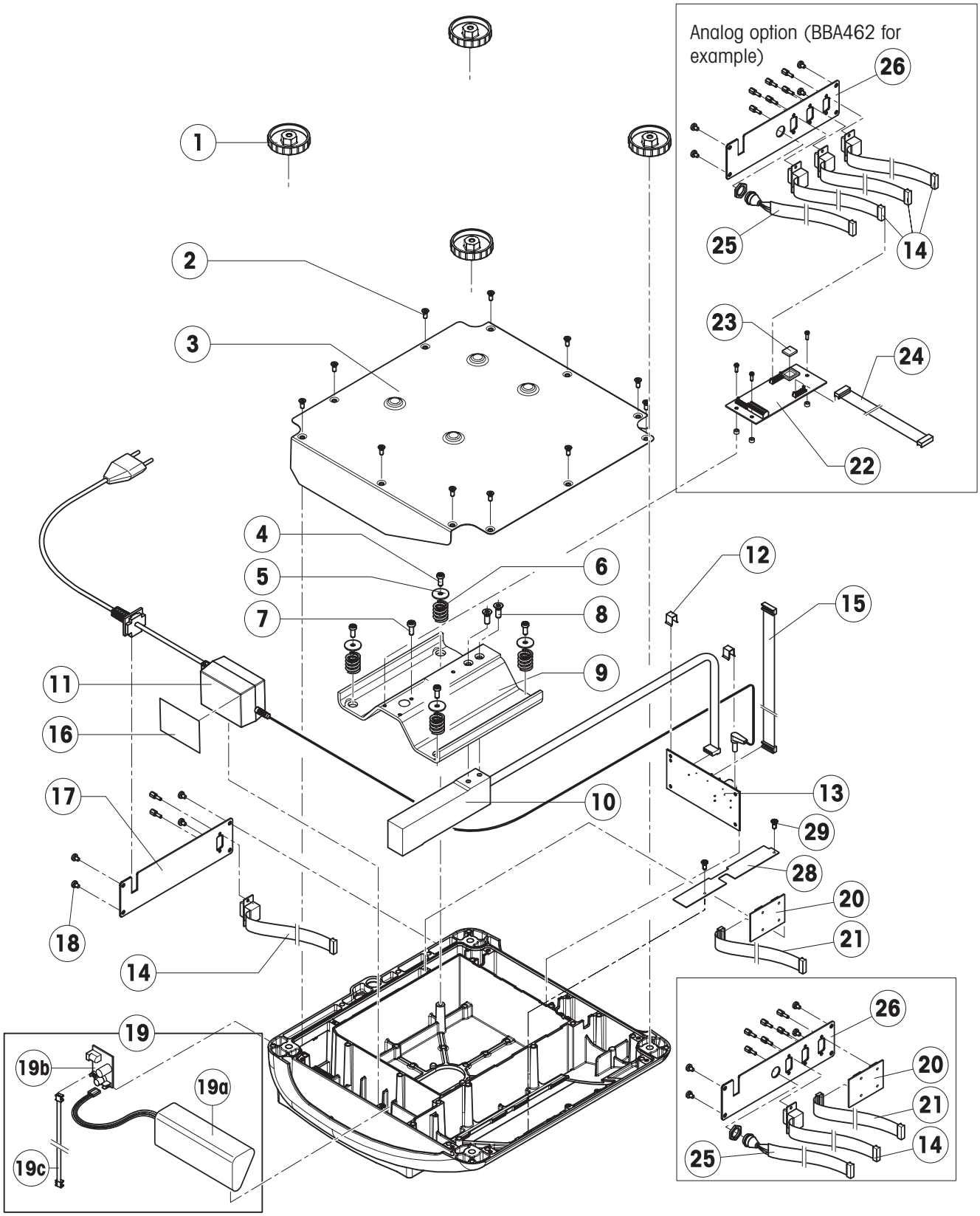
[1)] New rubber cushions have a hole in the surface to assist with assembly. A pin can be used to insert the cushion into the corresponding drilled hole in the load plate support.

Scales with strain gauge weighing cell (continued)



Item	Qty.	Description	Order No.
1	4	adjustable foot Ø 2.2" (55 mm) (M10 x 0.75 mm)	21203433
2	11	countersunk Torx screw M4 x 12	*
3	1	bottom plate for large platform model	–
4	4	button head Torx screw M5 x 12	*
5	4	wide flange washer 5.3 x 20	*
6	4	overload spring	**
7	1	overload stop adjustment screw (with specific production series only)	**
8	2	countersunk Torx screw M6 x 16	*
9	1	overload plate for large platform model	–
10	1	**weighing cell with cable** (certifiable)	
		weighing range 15 kg: LC0785-20-MRV (standard cell)	21203885
		weighing range 35 kg: LC0785-50-MRV (standard cell)	21203886
		weighing range 60 kg: LC0785-100-MRV (standard cell)	21203887
11	1	**bench AC adapter** (always order together with item 16):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply	22011311
12	2	spring clip	*
13	1	analog PCB BBA AN DMS 7k	21203092
14	1	RS cable 18.1" (460 mm)	21203168
15	1	A/D cable 11.8" (300 mm) for large platform model	21203167
16	1	adhesive patch for AC adapter	21203184
	2	adhesive patches for battery, thick	21255260
	2	adhesive patches for battery, thin	21203184
17	1	RS connector plate (various types, depending on the equipment)	–
18	4	raised cheese head Torx screw M4 x 8	*
19		**for scales with with AccuPac only:**	
19a	1	accu 14,4 V NiMH (always order together with item 16)	22011349
19b	1	print charger NiMH	22011351
19c	1	battery cable (charging PCB – analog PCB)	21203233
20	1	PCB RS option (2 x RS232C), standard for BBA462	21203476
		PCB RS option (1 x RS232 + 1 x RS 485)	21255083
		PCB digital I/O (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option (1 x RS232 + 1 x USB)	21204008
		PCB USB option IP65 (1 x RS232 + 1 x USB Sub D)	21204114
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
21	1	connection cable RS option 15.0" (380 mm)	21203490
		connection cable Ethernet / USB option (use only if the Ethernet or USB option is installed together with an analog option)	22010154
22	1	PCB analog option (not for BBA422)	21203383
23	1	EPROM with interface program (for PCB analog option)	22013444

Scales with strain gauge weighing cell (continued)

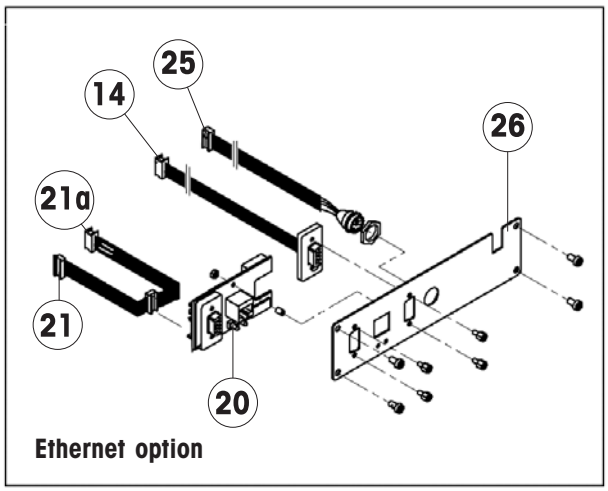


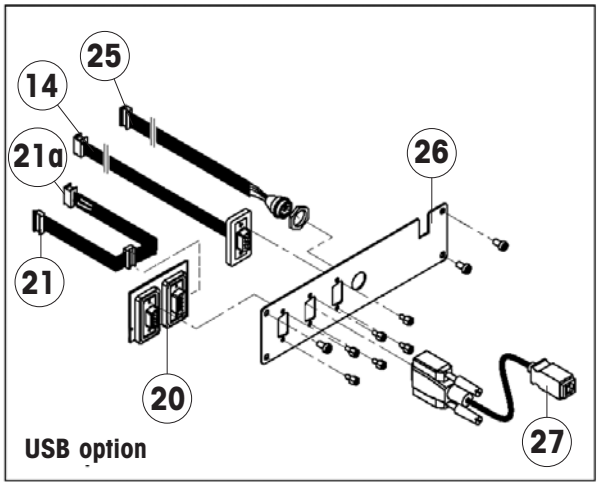
24	1	connection cable analog option 9.9" (250 mm)	21203604
25	1	PS2 cable, 18.1" (460 mm) (keyboard connection, BBA462 only)	21204107
26	1	connector plate BBA462 for 3 RS interfaces and 1 keyboard cable: standard scale: 1x PCB RS option, 1x RS cable 18.1" (460 mm), 1x PS2 cable scale with optional analog interface: 3x RS cable 18.1" (460 mm), 1x PS2 cable	–
27	1	cable USB for IP65 (with Sub D socket and USB socket type B)	21204031
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500C M3 x 6	–

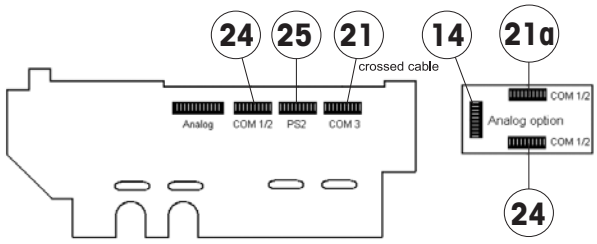
* included in the small parts set (Chapter 4.6)

** see section 5.8 "Replacing the weighing cell"

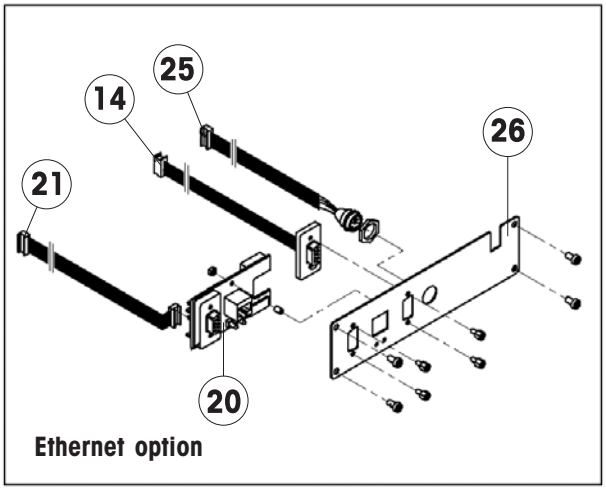
With analog option

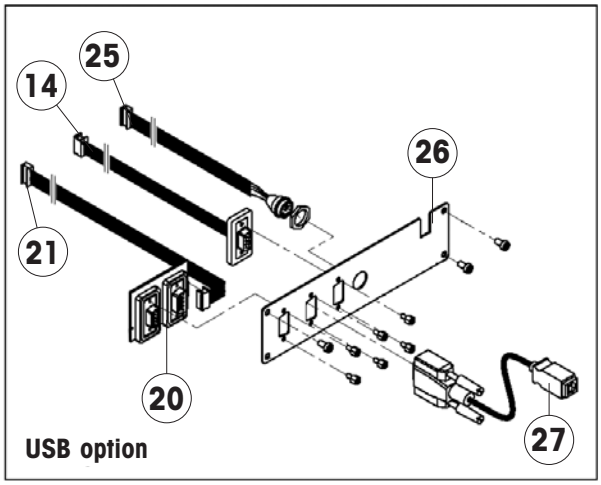


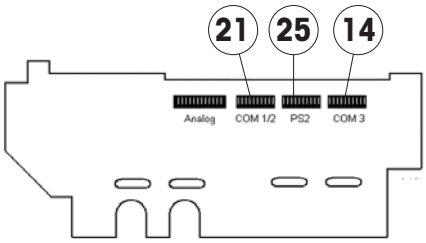




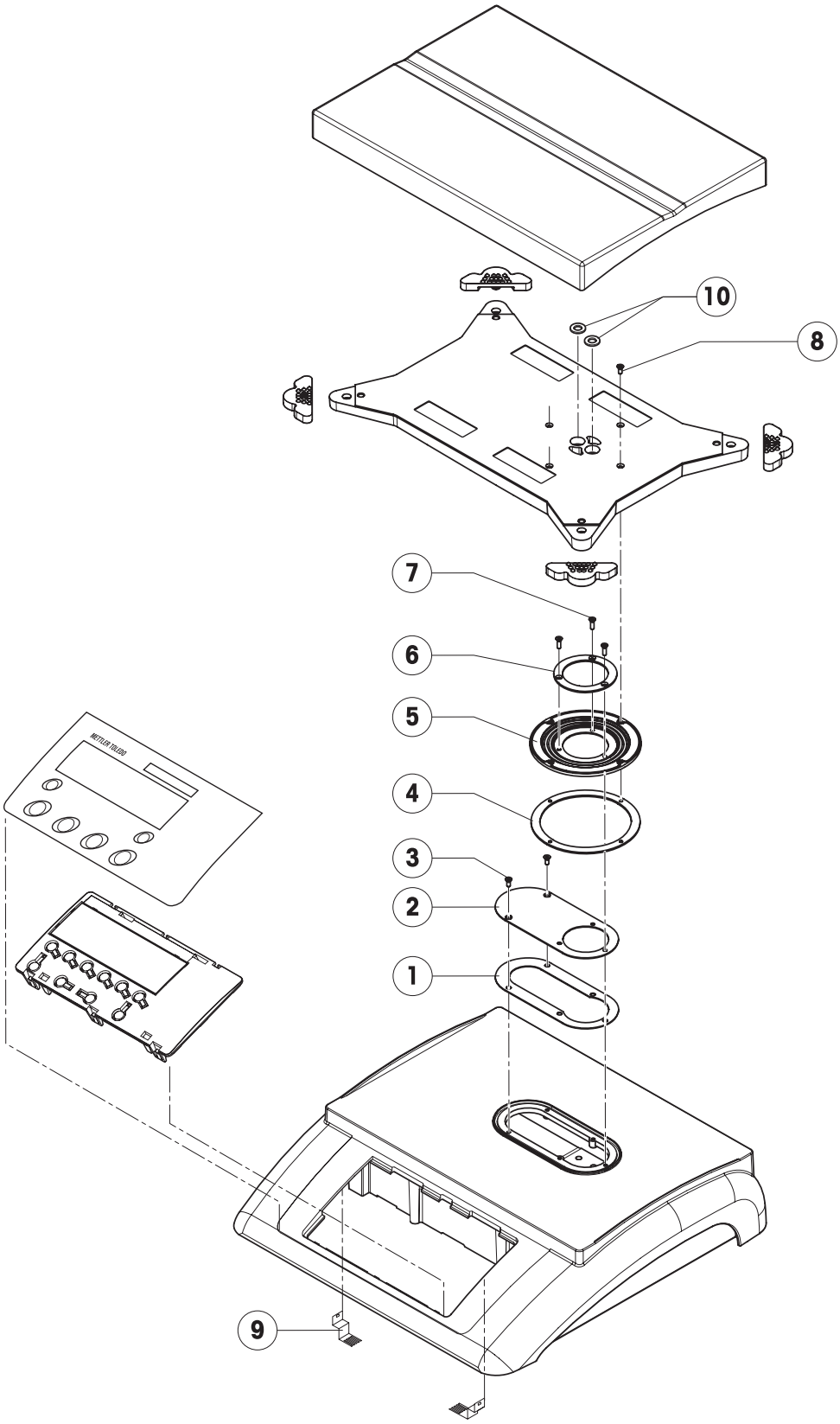
Without analog option







3.2 Scales with strain gauge weighing cell and IP65 protection

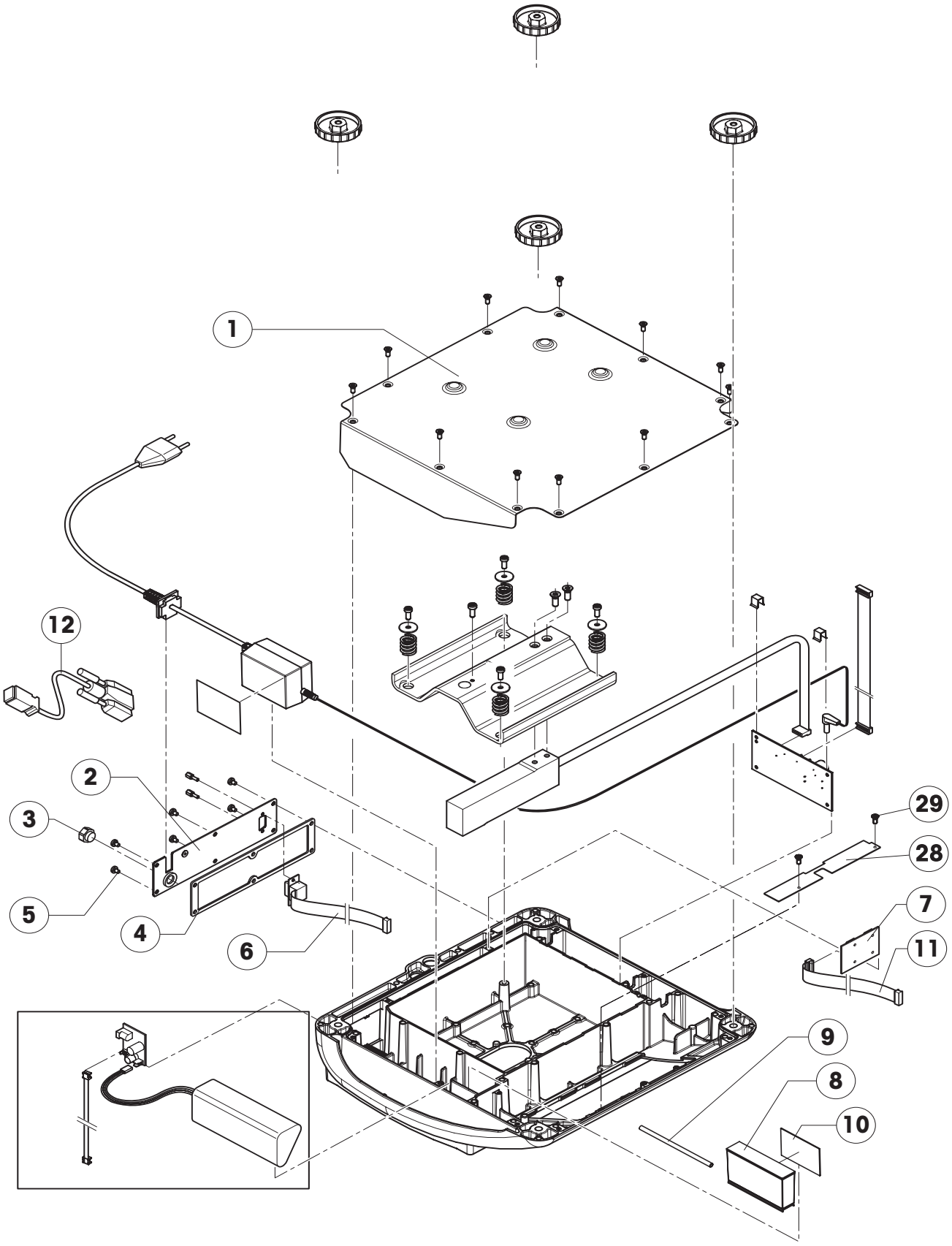


Item	Qty.	Description	Order No.
1	1	packing for cover plate	21203235
2	1	cover plate	–
3	2	countersunk Torx screw M3 x 8	*
4	1	flange D = 100 mm	–
5	1	diaphragm	21203077
6	1	flange D = 58 mm	–
7	3	countersunk Torx screw M3 x 10	*
8	4	countersunk Torx screw M3 x 8	*
9	2	EMC clamp	21203480
10	2	ferrite rings	–

* included in the small parts set (Chapter 4.6)

Note: Parts of the scale not numbered in the illustration are included in the normal version (Chapter 3.1).

Scales with strain gauge weighing cell and IP65 protection (continued)

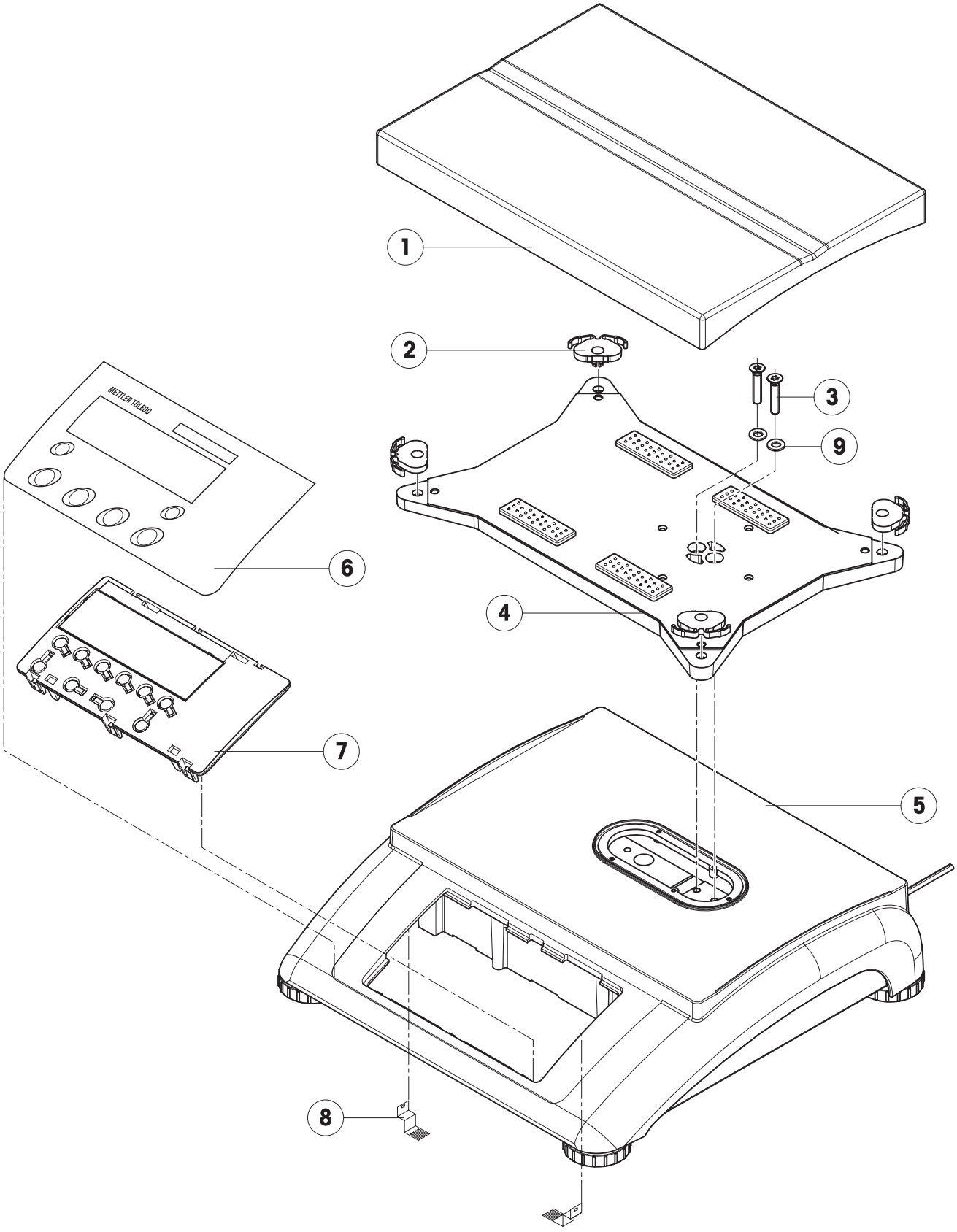


Item	Qty.	Description	Order No.
1	1	bottom plate for large platform model IP65 version	21203512
2	1	RS connector plate IP65 version (various types, depending on the equipment)	–
3	1	air supply/extraction filter	21203860
4	1	packing for RS connector plate	21203236
5	6	raised cheese head Torx screw M4 x 8	*
6	1	RS cable 18.1" (460 mm) IP65	21203717
7	1	PCB RS option (2 x RS232) IP65	21255081
		PCB RS485 option (1 x RS232 + 1 x RS485) IP65	21255083
		PCB Digital I/O (1 x RS232 + 1 x Digital I/O) IP65	22010184
		PCB USB option (1 x RS232 + 1 x USB Sub D) IP65	21204114
8	1	pressure equalizer	21203611
9	1	pressure equalizer tube LA	21203862
10	1	adhesive patch for pressure equalizer	21203184
11	1	connection cable RS option 380 mm	21203490
12	1	cable USB option for IP65 (with Sub D socket and USB socket of type B)	21204031
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500C M3 x 6	–

* included in the small parts set (Chapter 4.6)

Note: Parts of the scale not numbered in the illustration are included in the normal version (Chapter 3.1).

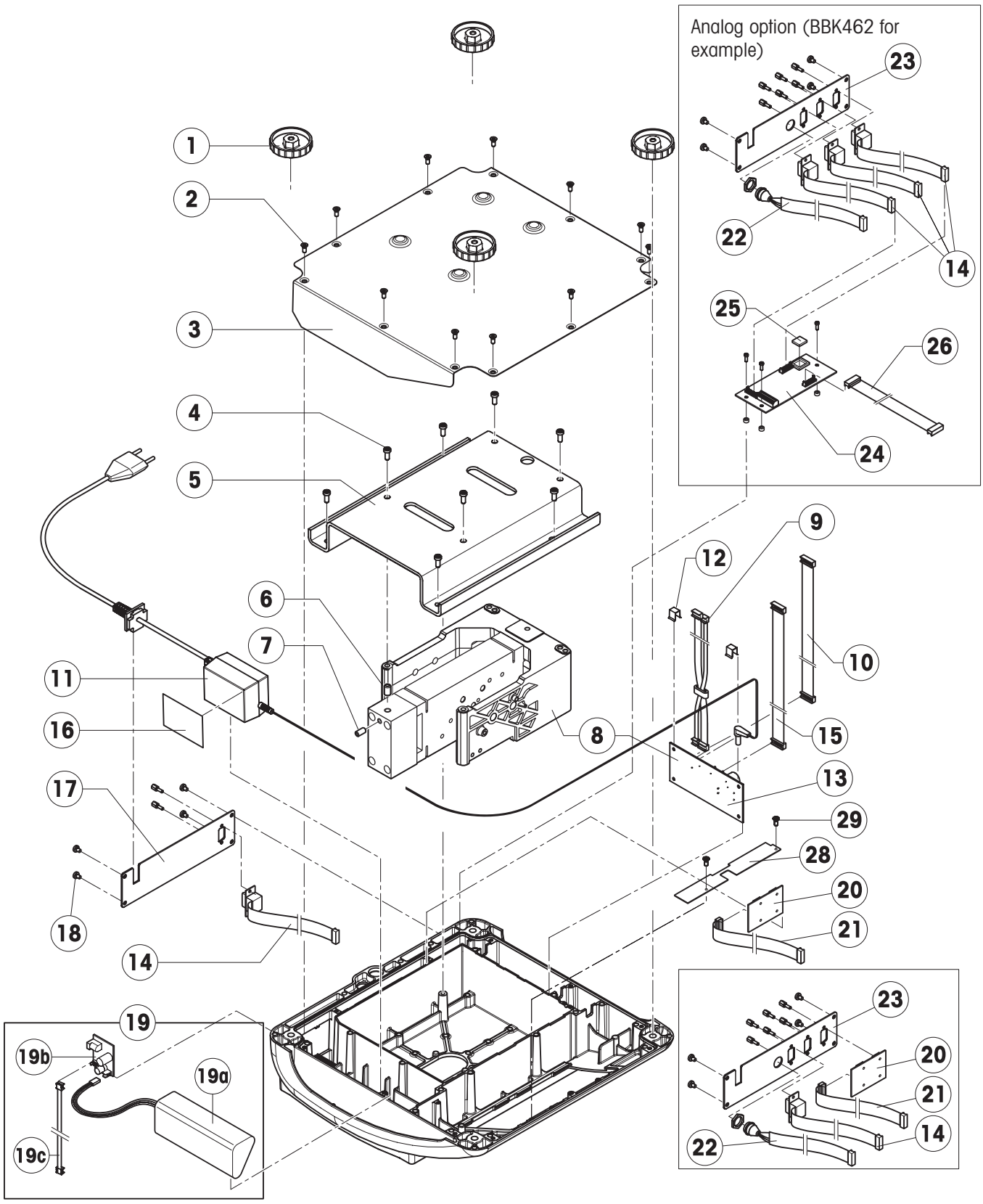
3.3 Scales with MonoBloc weighing cell



Item	Qty.	Description	Order No.
1	1	weighing pan 9.5" x 13.8" (240 x 350 mm)	21203072
2	4	pan depositer	21203238
3	2	countersunk Torx screw M6 x 30	*
4	1	pan support plate 9.5" x 13.8" (240 x 350 mm)	–
5	1	housing, large platform	–
6	1	keypad overlay	Chap. 3.4 – 3.7
7	1	mounting plate and display unit (digital PCB with LCD and backlighting unit)	Chap. 3.4 – 3.7
8	2	EMC clamp	21203480
9	2	ferrite rings	–

* included in the small parts set (Chapter 4.6)

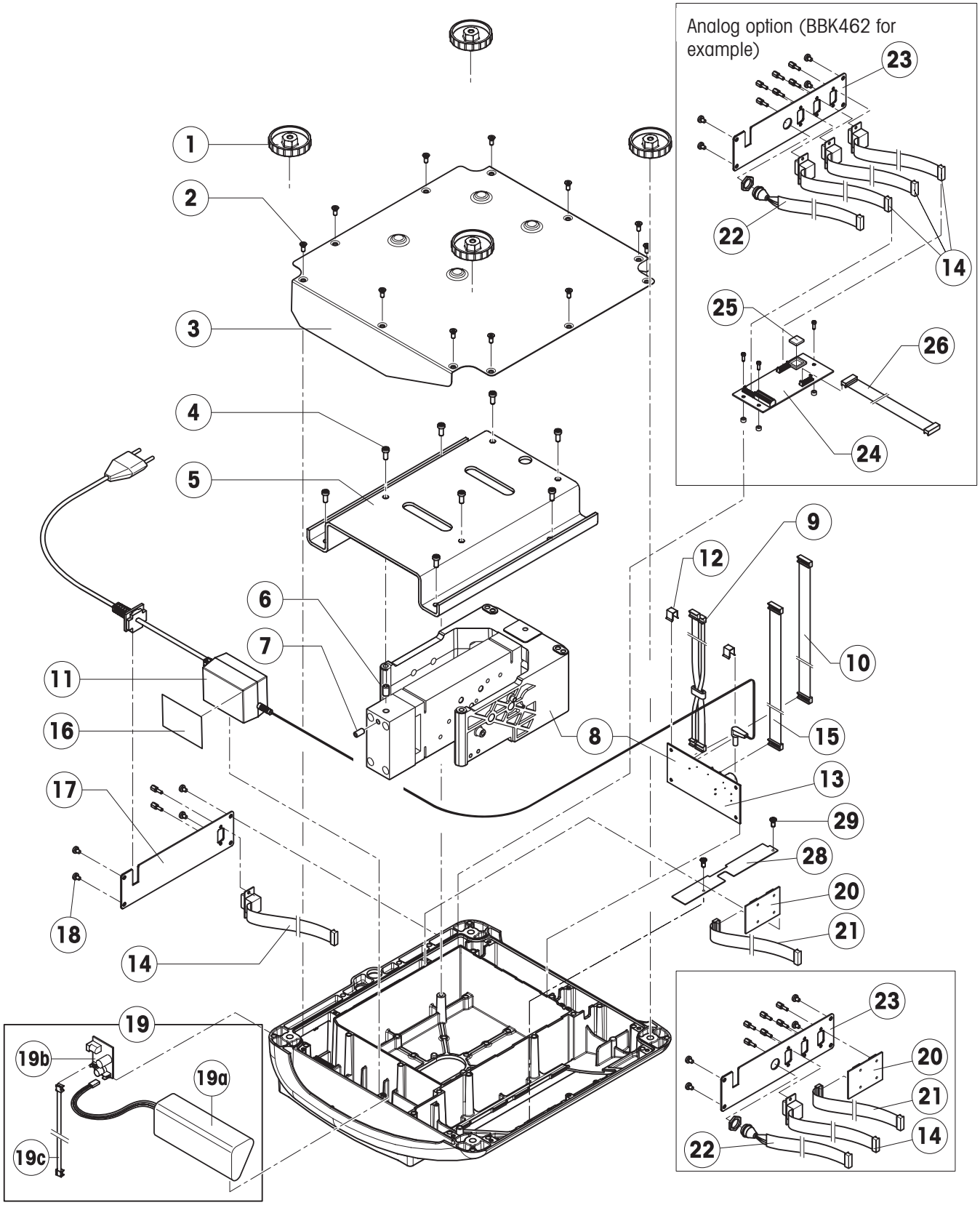
Scales with MonoBloc weighing cell (continued)



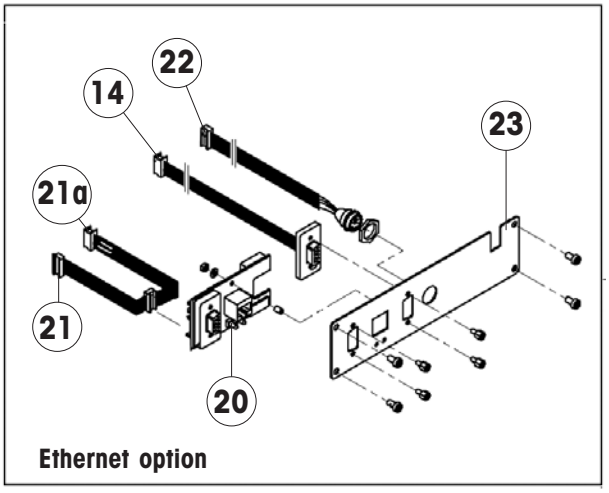
Item	Qty.	Description	Order No.
1	4	adjustable foot Ø 2.2" (55 mm) (M10 x 0.75 mm)	21203433
2	11	countersunk Torx screw M4 x 12	*
3	1	bottom plate for large platform model	–
4	8	button head Torx screw M5 x 12	*
5	1	overload plate	–
6	1	overload stop: adjustment screw	–
7	1	overload stop: arrestment screw	–
8	1	**weighing module** (load cell and analog PCB): weighing module 32001 for ranges 30 lb and 70 lb (15 kg and 35 kg)	11102687
9	1	cell cable MB-LA with ferrite ring	21203290
11	1	**bench AC adapter 8VA** (always order together with item 16):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
12	2	spring clip	*
13	1	analog PCB AN MonoBloc	21203100
14	1	RS cable 18.1" (460 mm)	21203168
15	1	AD cable 11.8" (300 mm), for large platform model	21203167
16	1	adhesive patch for AC adapter	21203184
	2	adhesive patches for battery, thick	21255260
	2	adhesive patches for battery, thin	21203184
17	1	RS connector plate (various types, depending on the equipment)	–
18	4	raised cheese head Torx screw M4 x 8	*
19		**for scales with AccuPac only:**	
19a	1	accu 14.4V NiMH (always order together with item 16)	22011349
19b	1	print charger NiMH	22011351
19c	1	battery cable (store PCB – analog PCB)	21203233
20	1	PCB RS option (2 x RS232C), standard with BBK462	21203476
		PCB RS485 option (1 x RS232C + 1 x RS485)	21255083
		PCB digital I/O (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option (1 x RS232 + 1 x USB)	21204008
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
21	1	connection cable RS option 15.0" (380 mm)	21203490
		connection cable Ethernet / USB ption (use only if the Ethernet or USB option is installed **together** with an analog option)	22010154
22	1	PS2 cable, 18.1" (460 mm) (keyboard connection, BBK462 only)	21204107
23	1	connector plate for 3 RS interfaces and 1 keyboard cable (1x PCB RS Option, 1x RS cable 18.1" (460 mm), 1x PS2 cable)	–
24	1	PCB analog option (not for BBK 42..)	21203383
25	1	EPROM with interface program (for PCB analog option)	22013444
26	1	connection cable analog option 15.0" (380 mm)	21203490
28	1	fastening plate	22015204
29	2	cheese head screw DIN7500 M3 x 6	–

* included in the fasteners set (Chapter 4.6)

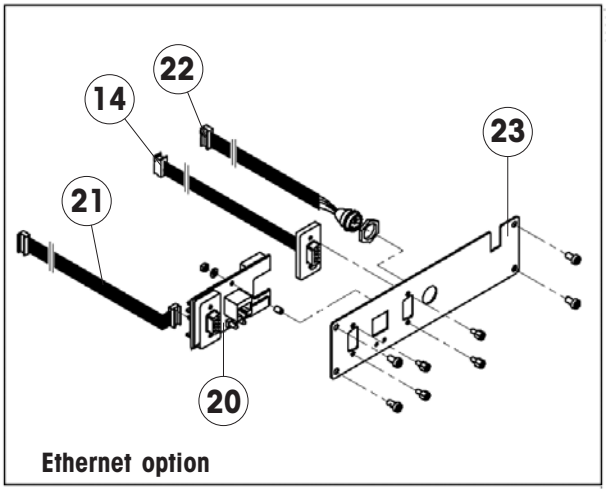
Scales with MonoBloc weighing cell (continued)

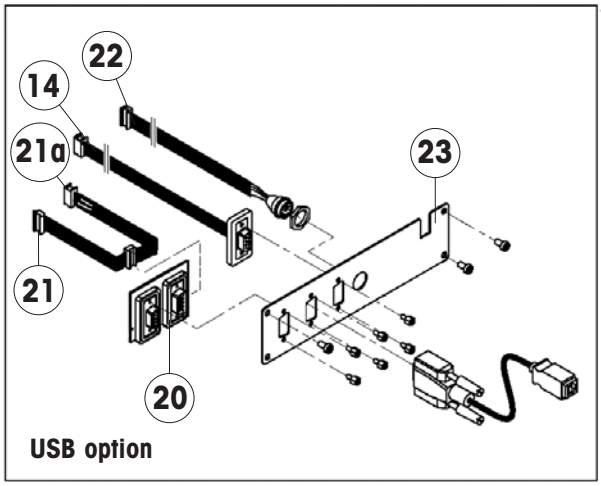


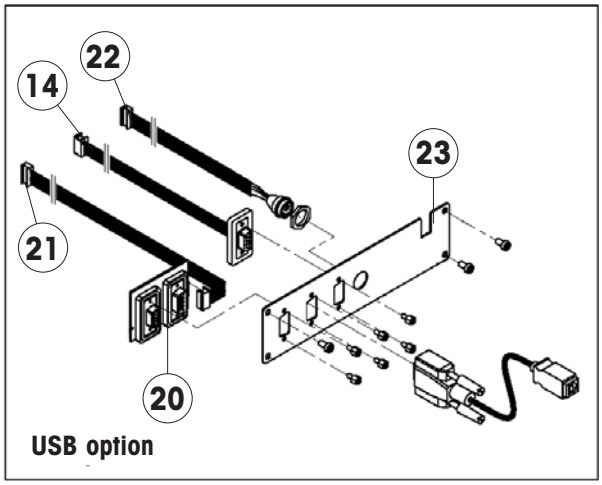
With analog option

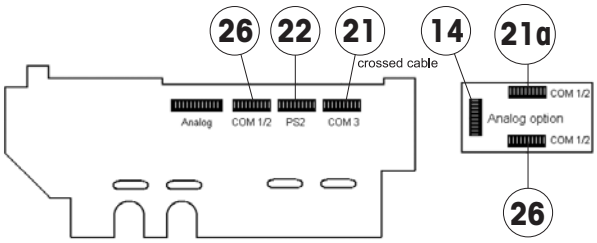


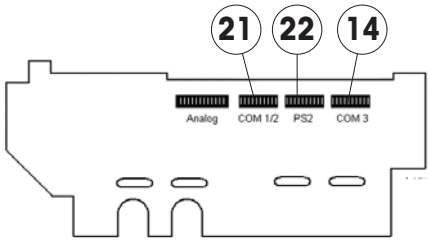
Without analog option



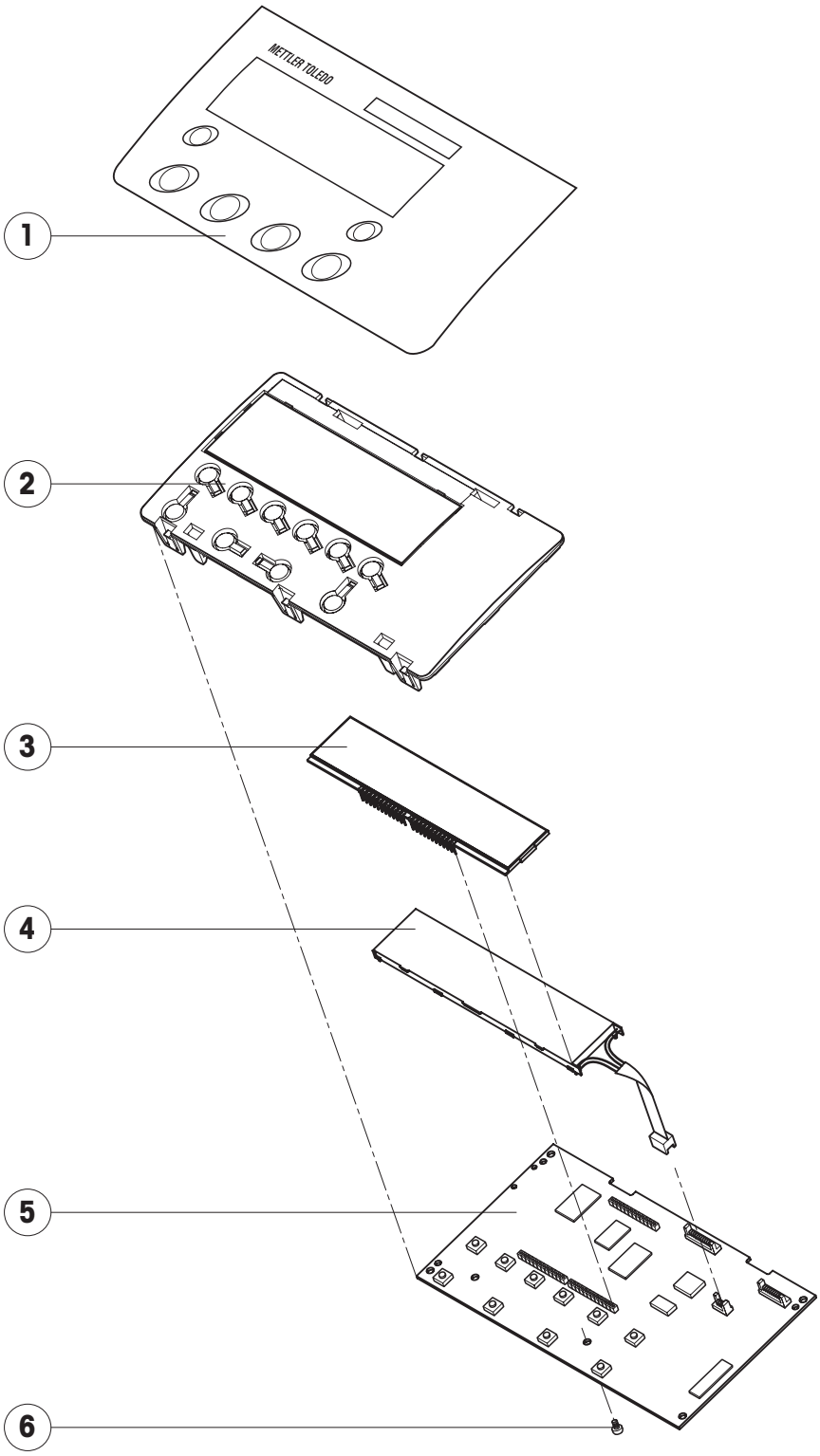








3.4 Display unit BBA422 / BBA425 / BBK422

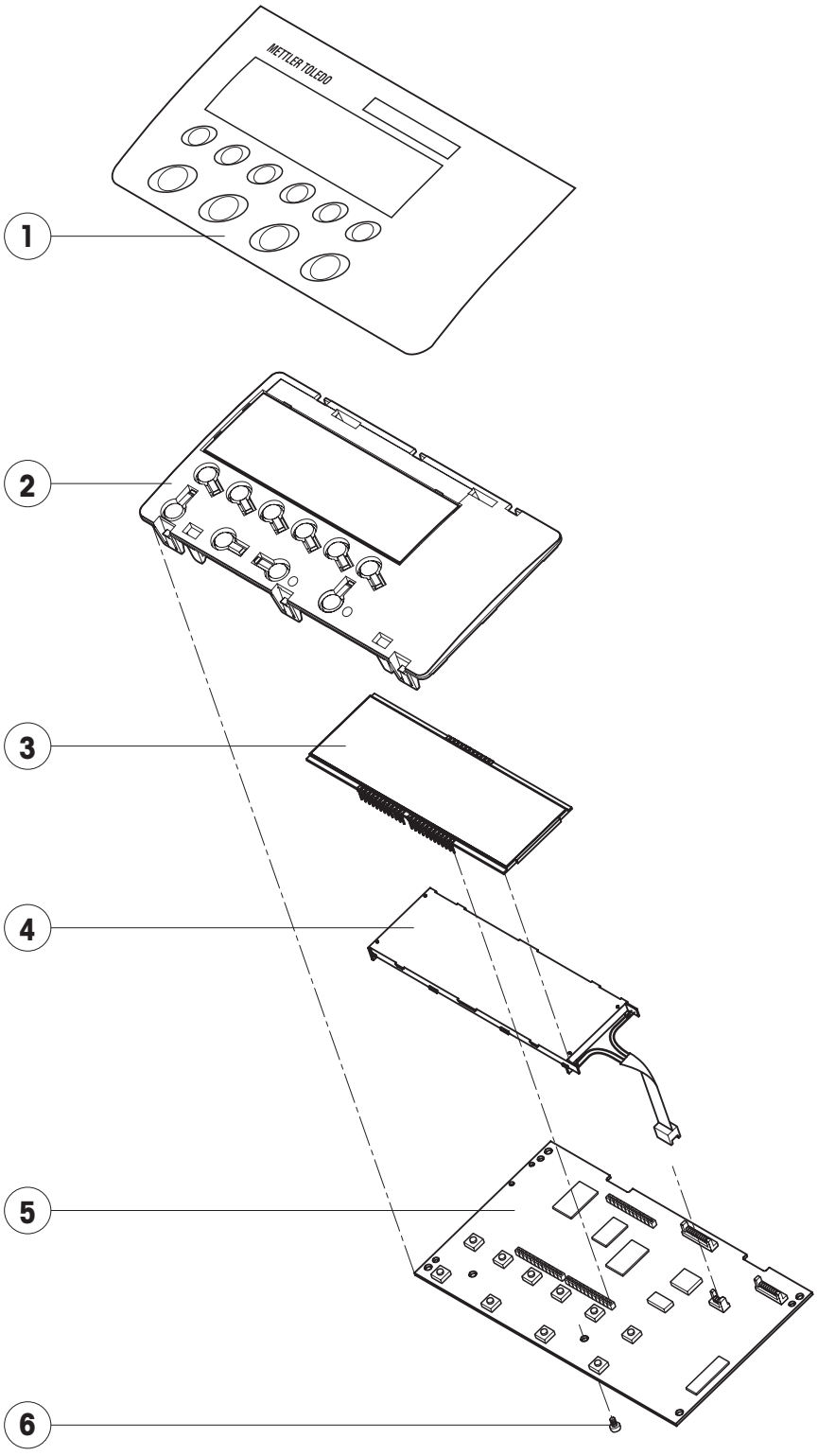


Item	Qty.	Description	Order No.
1	1	keypad overlay for large platform model	22011404
2	1	display mounting plate (always order together with item 1)	21203120
3	1	LCD	21203134
4	1	backlighting unit	21203136
5	1	digital PCB with FLASH Memory Chip (soldered)[1)]	21204025
6	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

[1)] see Chapter 9.5 for information on loading the software

3.5 Display unit BBA432 / BBK432

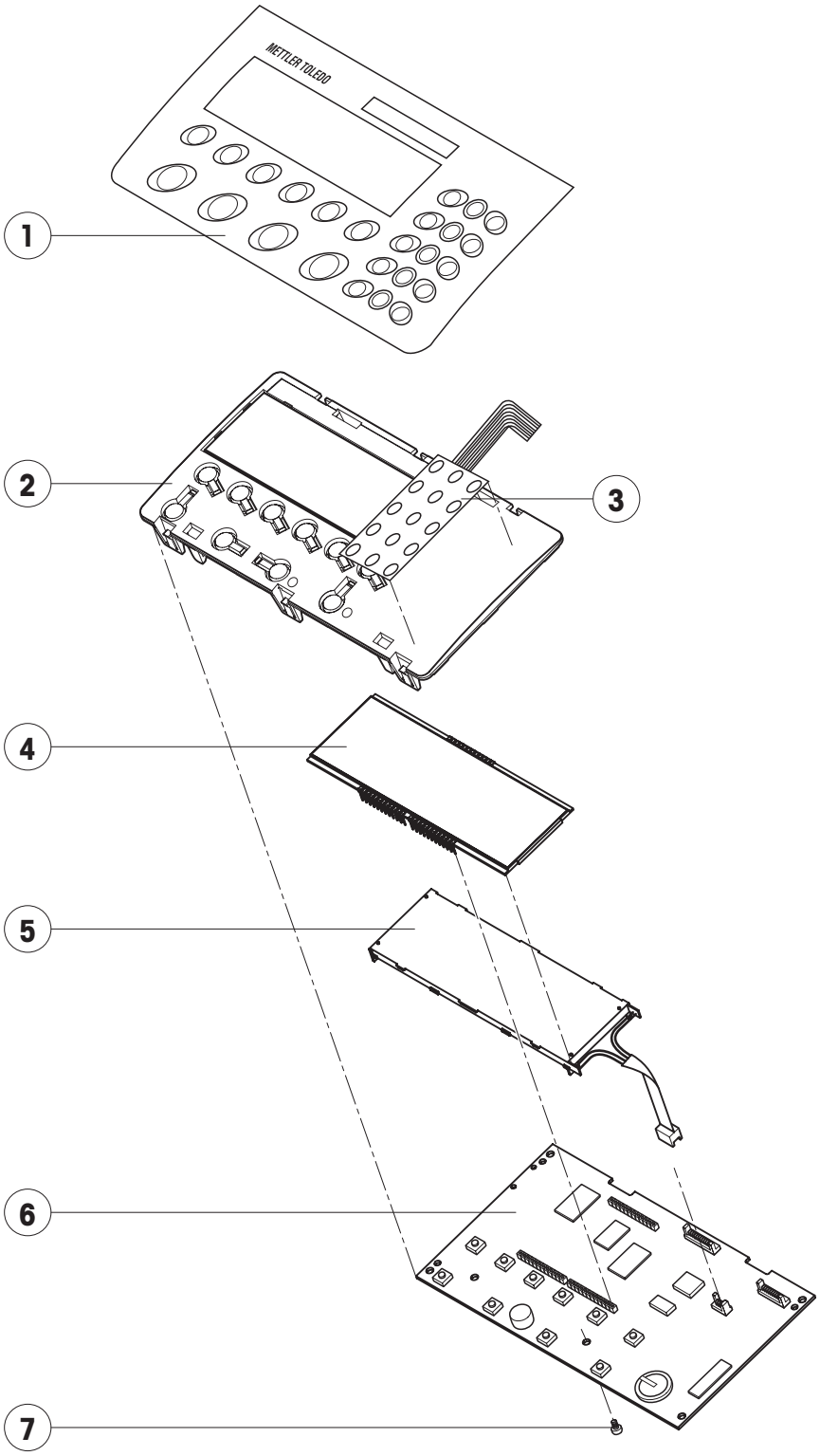


Item	Qty.	Description	Order No.
1	1	keypad overlay for large platform model	22011412
2	1	display mounting plate (always order together with item 1)	21203120
3	1	LCD	21203687
4	1	backlighting unit	21203137
5	1	digital PCB with FLASH Memory Chip (soldered)[1)]	21204025
6	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

[1)] see Chapter 9.5 for information on loading the software

3.6 Display unit BBA442 / BBK442



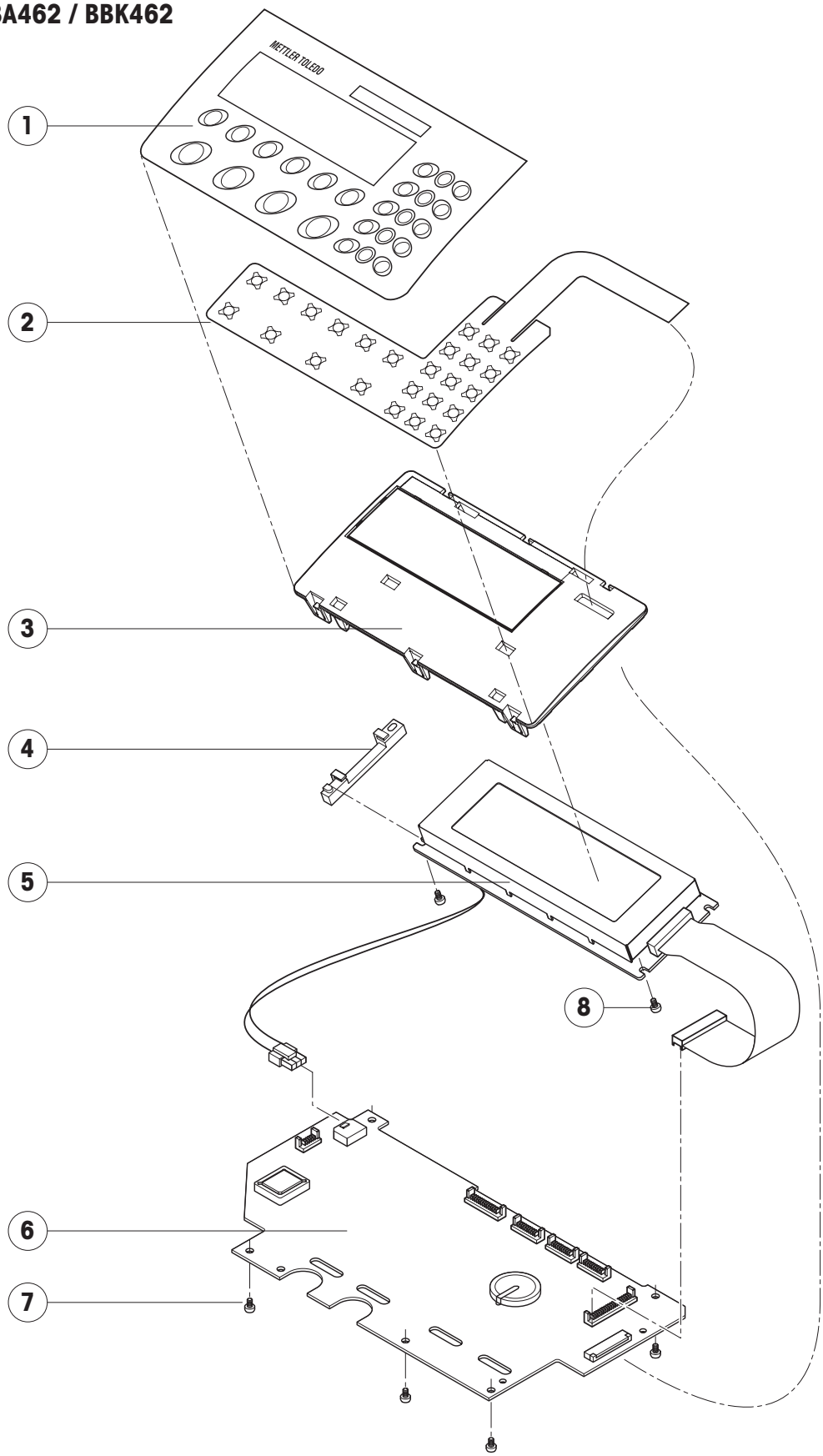
Item	Qty.	Description	Order No.
1	1	keypad overlay for large platform model	22011413
2	1	display mounting plate (always order together with item 1 and 3)	21203448
3	1	pressure sensitive keypad membrane (15 keys)[1)]	21203439
4	1	LCD	21203687
5	1	backlighting unit	21203137
6	1	digital PCB with FLASH Memory Chip (soldered) [2)]	22013719
7	1	Torx oval head tapping screw 2.9 x 13 (red)	*

* included in the small parts set (Chapter 4.6)

1) always order together with item 1

2) see Chapter 9.5 for information on loading the software

3.7 Display unit BBA462 / BBK462



Item	Qty.	Description	Order No.
1	1	BBA/BBK462 keypad overlay for large platform model	22011407
2	1	pressure sensitive keypad membrane (25 keys)	21203501
3	1	display mounting plate (always order together with items 1 and 2)	21203507
4	1	spacer plate	21255046
5	1	LCD module 240 x 64 dots CCFL	21203515
6	1	**digital PCB** with FLASH Memory Chip (soldered)[1)]	
		digital PCB for BBA/BBK462	21203996
		digital PCB for SQC-16	21203772
		digital PCB for Remote without software [2)]	21203996
7	5	retaining screw	*
8	2	Torx oval head tapping screw 2.9 x 13 (red)	*

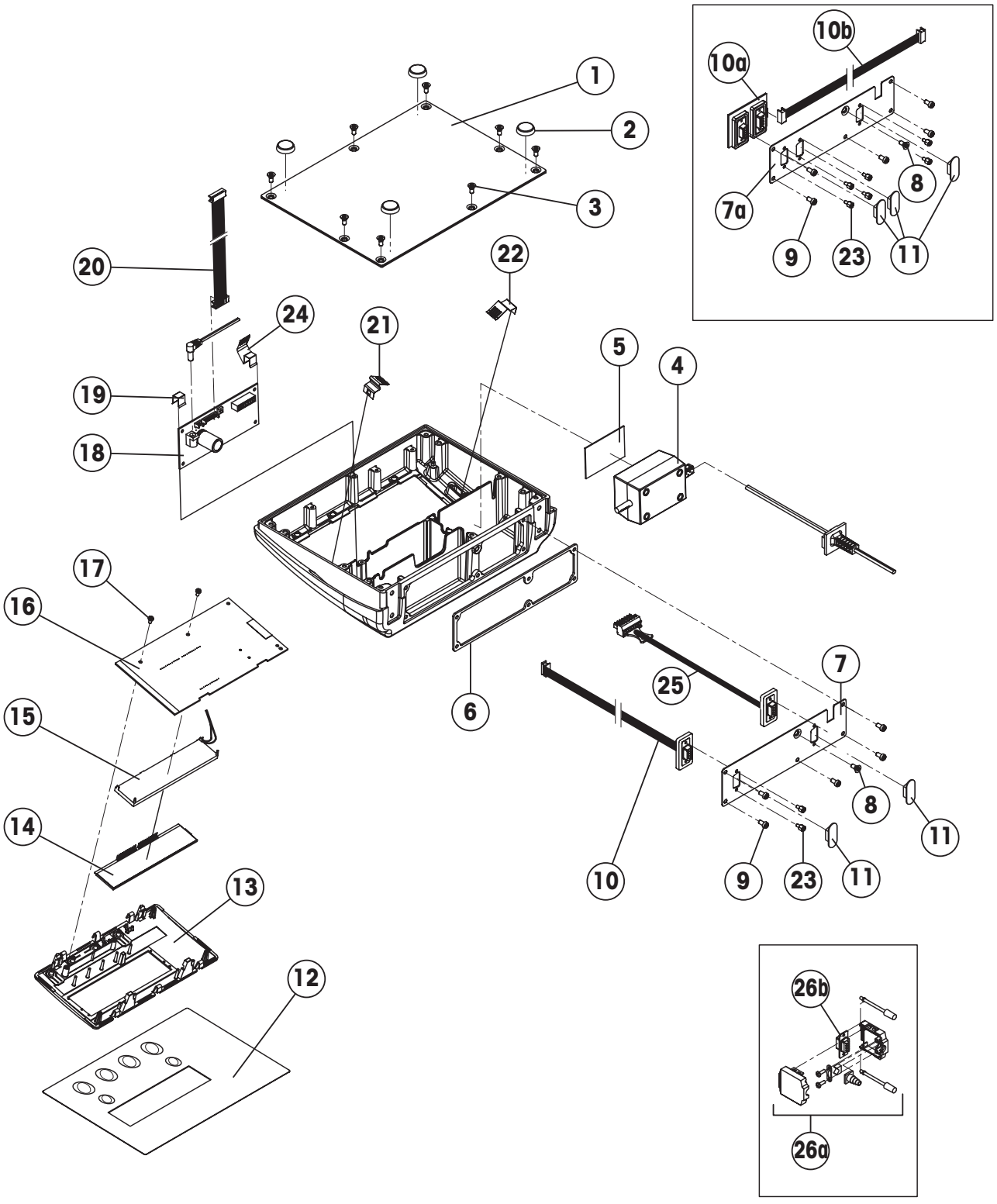
* included in the small parts set (Chapter 4.6)

1) see Chapter 9.5 for information on loading the software

2) When replacing the digital PCB of a BBA/BBK462-Remote, you can acquire the software from Support.SQC@mt.com.

4 Terminals

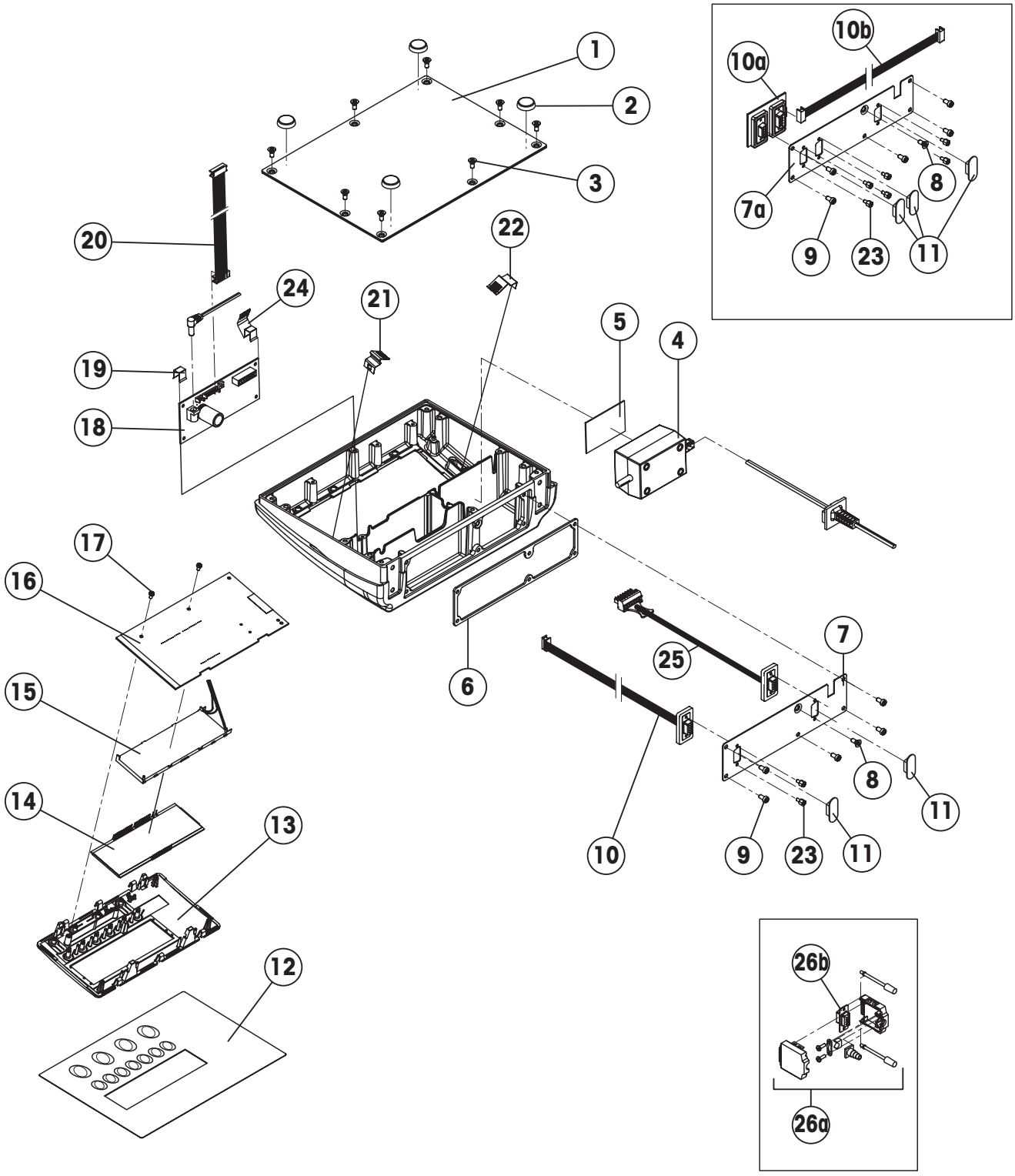
4.1 IND425 terminal



Item	Qty.	Description	Order No.
1	1	base plate with seal attached	21255118
2	4	rubber foot	00200068
3	8	countersunk screw M4 x 12 Torx T20	*
4	1	**bench AC adapter 8VA** (always order together with item 5):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
5	1	adhesive tape for AC adapter	21203184
6	1	seal for terminal rear panel	21255012
7	1	connector plate for 1 interface (RS232C/load cell) standard	–
7a	1	connector plate for 3 interfaces (various types)	–
8	1	countersunk screw M4 x 12 Torx T20	*
9	5	fillister head screw M4 x 8 Torx T20	*
10	1	RS232C interface IP65 with cable (soldered) standard	21203717
10a	1	PCB RS option IP65 (2 x RS232C)	21255081
		PCB RS485 option IP65 (1 x RS422/485 + 1 x RS323C)	21255083
		PCB digital I/O IP65 (1 x RS232 + 1 x digital I/O)	22010184
		PCB USB option IP65 (1 x RS232 + USB Sub-D)	21204114
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
10b	1	connection cable for 2 RS interfaces	21203490
11	2	dust cover for interfaces	11101560
12	1	keypad overlay IND425	22011414
13	1	display mounting plate BC (always order together with item 12)	21255041
14	1	LCD	21203134
15	1	backlighting	21203136
16	1	digital PCB with FLASH Memory Chip (soldered)	21204025
17	2	Torx oval head tapping screw 2.9 x 13 (red)	*
18	1	analog board 7k	21255054
19	1	fastening clamp for analog board	*
20	1	A/D cable 11.8" (300 mm)	21203167
21	1	EMC clamp short	21203480
22	1	EMC clamp long	21255047
23	4	screw lock	*
24	1	EMC clamp for analog board	22007948
25	1	load cell connection cable with Sub-D socket and plug for analog board	22010055
26	–	**9-pin Sub-D connector** (for connecting the load cell to the terminal):	–
26a	1	Sub-D standard housing (dismantled)	22007870
26b	1	pin base	22007869

* included in the small parts set (Chapter 4.6)

4.2 IND435 terminal

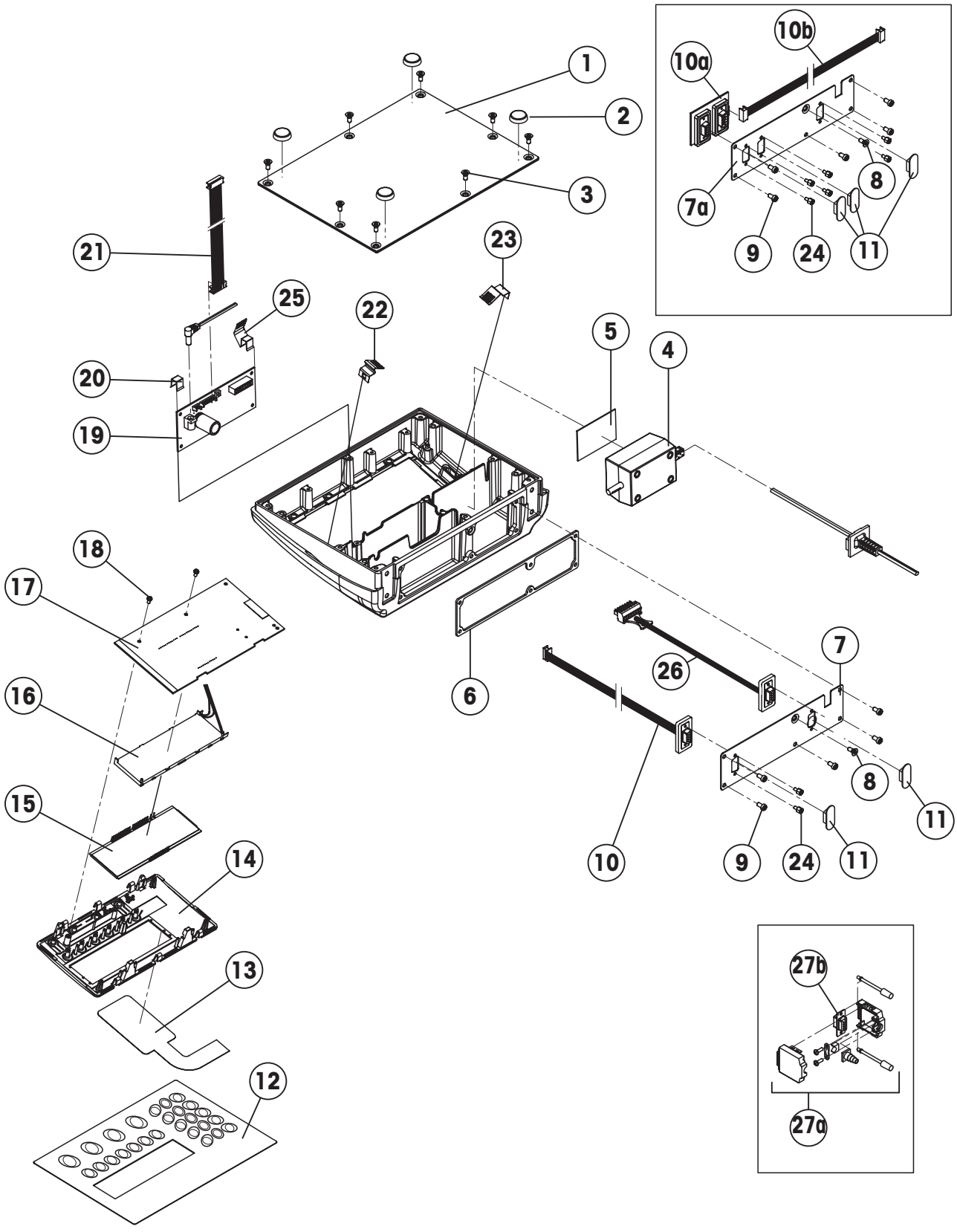


Item	Qty.	Description	Order No.
1	1	base plate with seal attached	21255118
2	4	rubber foot	00200068
3	8	countersunk screw M4 x 12 Torx T20	*
4	1	**bench AC adapter 8VA** (always order together with item 5):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
5	1	adhesive tape for AC adapter	21203184
6	1	seal for terminal rear panel	21255012
7	1	connector plate for 2 interfaces (RS232C/load cell) standard	–
7a	1	connector plate for 3 interfaces (various types)	–
8	1	countersunk screw M4 x 12 Torx T20	*
9	5	fillister head screw M4 x 8 Torx T20	*
10	1	RS232C interface IP65 with cable (soldered) [1)]	21203717
10a	1	PCB RS option IP65 (2 x RS232C)	21255081
		PCB RS485 option IP65 (1 x RS422/485 + 1 x RS323C)	21255083
		PCB Digital I/O IP65 (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option IP65 (1 x RS232 + USB Sub-D)	21204114
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
11	2	dust cover for interfaces	11101560
12	1	keypad overlay IND435	22011423
13	1	display mounting plate (always order together with item 12)	22010038
14	1	LCD	21203687
15	1	backlighting	21203137
16	1	digital board with FLASH Memory Chip (soldered)	21204025
17	2	Torx oval head tapping screw 2.9 x 13 (red)	*
18	1	analog board 7 k	21255054
19	1	fastening clamp for analog board *	*
20	1	A/D cable 11.8" (300 mm)	21203167
21	1	EMC clamp short	21203480
22	1	EMC clamp long	21255047
23	4	screw lock	*
24	1	EMC clamp for analog board	22007948
25	1	load cell connection cable with Sub-D socket and plug for analog board	22010055
26	–	**9-pin Sub-D connector** (for connecting the load cell to the terminal):	–
26a	1	Sub-D standard housing (dismantled)	22007870
26b	1	pin base	22007869

* included in the small parts set (Chapter 4.6)

[1)] If an analog interface option is built in, a second cable of this type is used to connect the optional analog interface board (built into OptionPac, see Chapter 4.5) to the connector plate of the terminal (item 7a above).

4.3 IND445 terminal

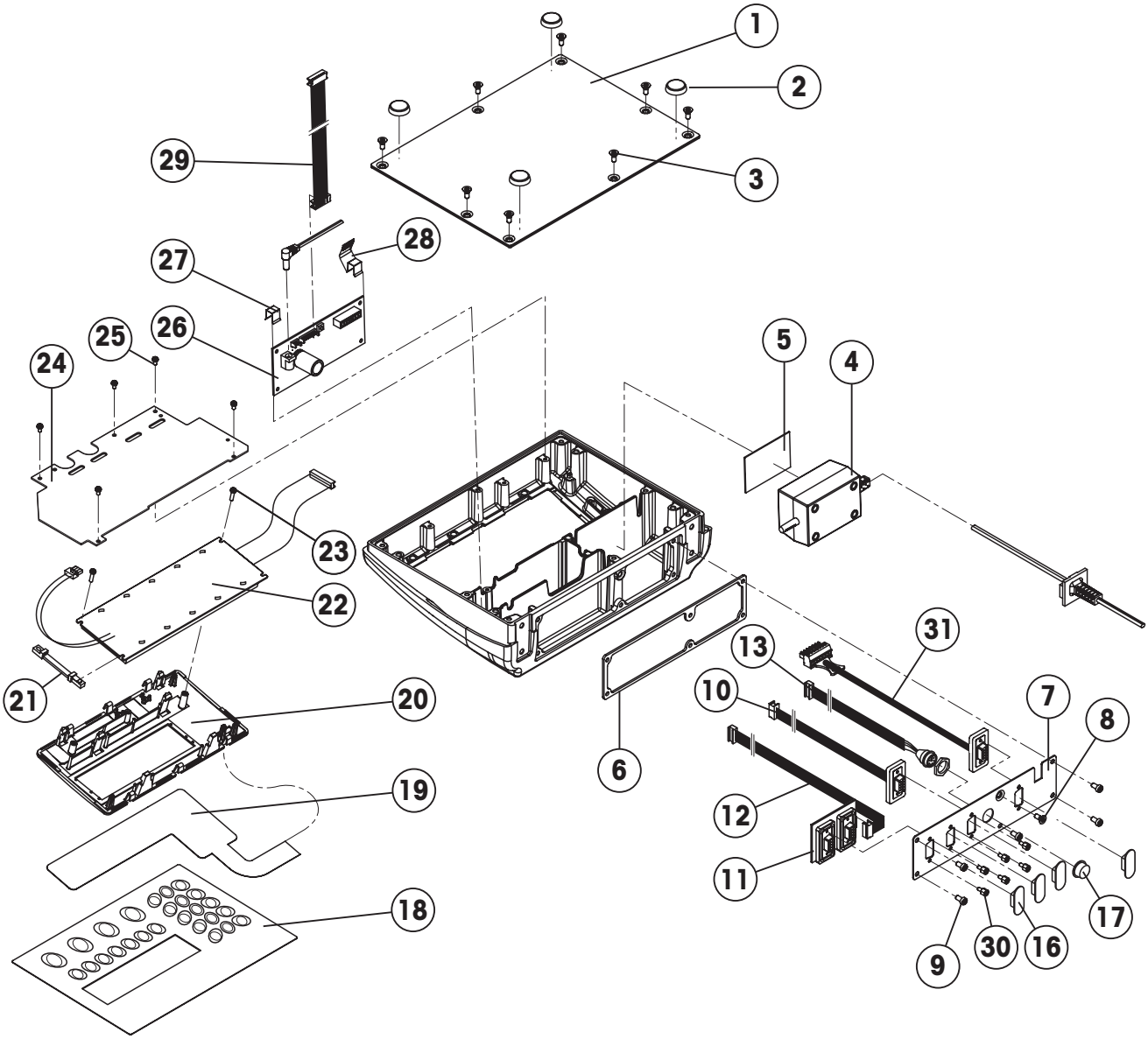


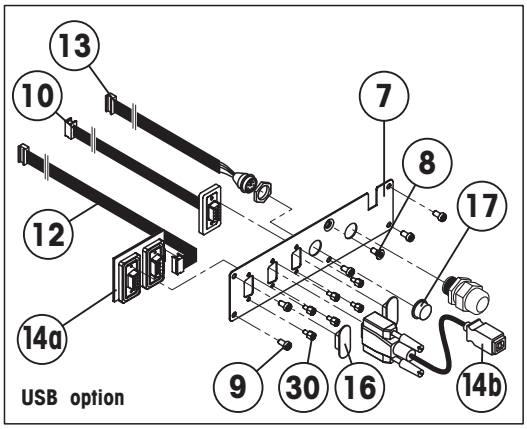
Item	Qty.	Description	Order No.
1	1	base plate with seal attached	21255118
2	4	rubber foot	00200068
3	8	countersunk screw M4 x 12 Torx T20	*
4	1	**bench AC adapter 8VA** (always order together with item 5):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
5	1	adhesive tape for AC adapter	21203184
6	1	seal for terminal rear panel	21255012
7	1	connector plate for 2 interfaces (RS232C/load cell) standard	–
7a	1	connector plate for 3 interfaces (various types)	–
8	1	countersunk screw M4 x 12 Torx T20	*
9	5	fillister head screw M4 x 8 Torx T20	*
10	1	RS232C interface IP65 with cable (soldered) [1)]	21203717
10a	1	PCB RS option IP65 (2 x RS232C)	21255081
		PCB RS485 option IP65 (1 x RS422/485 + 1 x RS323C)	21255083
		PCB Digital I/O IP65 (1 x RS232 + 1 x Digital I/O)	22010184
		PCB USB option IP65 (1 x RS232 + USB Sub-D)	21204114
		PCB Ethernet option (1 x RS232 + 1 x Ethernet RJ45)	21204027
11	2	dust cover for interfaces	11101560
12	1	keypad overlay IND445	22011424
13	1	numeric membrane keypad (always order together with item 12)	21203439
14	1	display mounting plate (always order together with items 12 and 13)	22010039
15	1	LCD	21203687
16	1	backlighting	21203137
17	1	digital board with FLASH Memory Chip (soldered)	22013719
18	2	Torx oval head tapping screw 2.9 x 13 (red)	*
19	1	analog board 7k	21255054
20	1	fastening clamp for analog board	*
21	1	A/D cable 11.8" (300 mm)	21203167
22	1	EMC clamp short	21203480
23	1	EMC clamp long	21255047
24	4	screw lock	*
25	1	EMC clamp for analog board	22007948
26	1	load cell connection cable with Sub-D socket and plug for analog board	22010055
27	–	**9-pin Sub-D connector** (for connecting the load cell to the terminal):	–
27a	1	Sub-D standard housing (dismantled)	22007870
27b	1	pin base	22007869

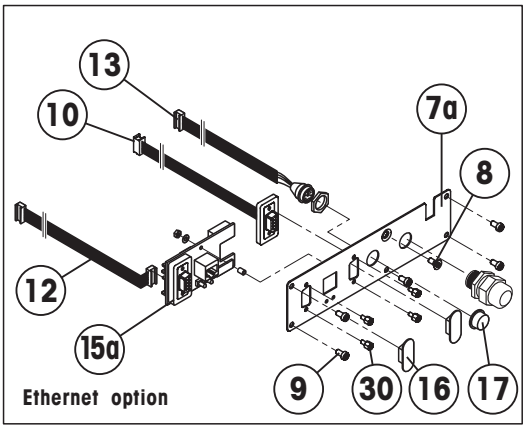
* included in the small parts set (Chapter 4.6)

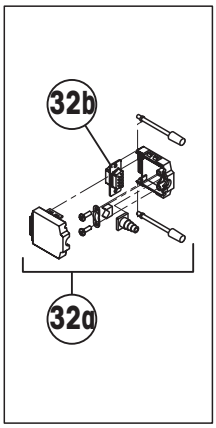
[1)] If an analog interface option is built in, a second cable of this type is used to connect the optional analog interface board (built into OptionPac, see Chapter 4.5) to the connector plate of the terminal (item 7a above).

4.4 IND465 terminal



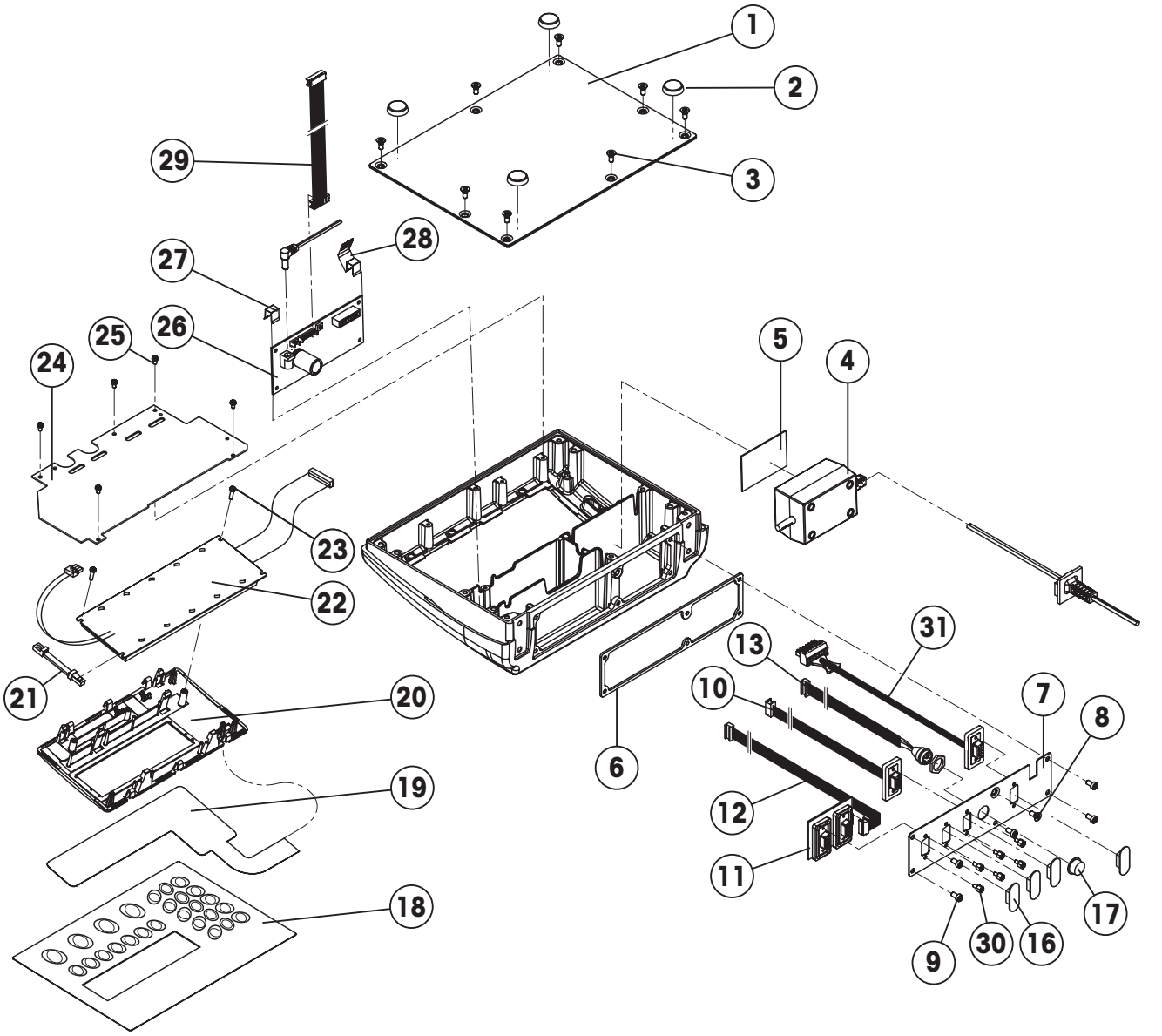


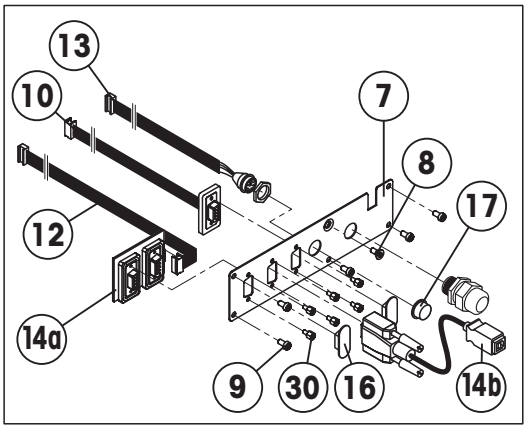


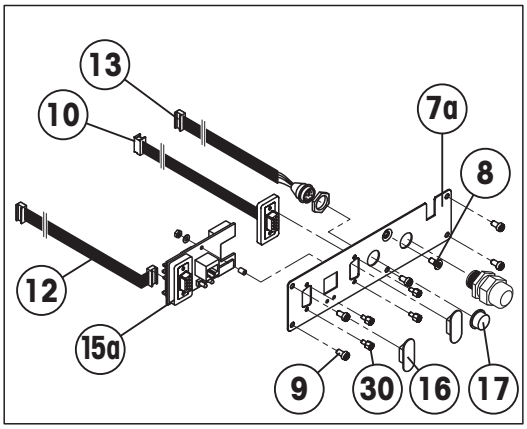


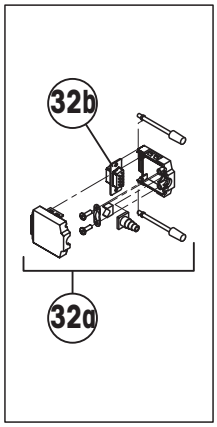
Item	Qty.	Description	Order No.
1	1	base plate with seal attached	21255118
2	4	rubber foot	00200068
3	8	countersunk screw M4 x 12 Torx T20	*
4	1	**bench AC adapter 8VA** (always order together with item 5):	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
5	1	adhesive tape for AC adapter	21203184
6	1	seal for terminal rear panel	21255012
7	1	**standard:** connector plate for 3 x RS232C/PS2/load cell [1)]	–
7a	1	**option:** connector plate for 2 x RS232C/Ethernet/PS2/load cell	–
8	1	countersunk screw M4 x 12 Torx T20	*
9	5	fillister head screw M4 x 8 Torx T20	*
		standard interfaces:	
10	1	RS232C interface IP65 with cable (soldered) [2)]	21203717
11	1	**standard:** board with 2 x RS232C IP65 (requires connecting cable item 12)	21255081
		option: board with RS485 option IP65 (1 x RS422/485 + 1 x RS232C)	21255083
		option: board with digital I/O IP65 (1 x RS232 + 1 x digital I/O)	22010184
12	1	connecting cable for 2 RS interfaces	21203490
13	1	PS2 cable 18.1" (460 mm) (keyboard connection)	21204107
14		**USB option**	
14a	1	board USB option (1 x Sub-D socket for RS232C + 1 x Sub-D connector for USB) [3)]	21204114
14b	1	USB cable (with Sub-D and USB type B sockets)	21204031
15	1	**Ethernet option** (requires connector plate item 7a)	
15a	1	board Ethernet option (1 x RS232C + 1 x Ethernet RJ45) [3)]	21204027
16	4	dust cover for interfaces	11101560
17	1	dust cover for PS2 interface	22010058
18	1	keypad overlay IND465	22011417
19	1	numeric keypad membrane (25 keys) (always order together with item 18)	21203501
20	1	display mounting plate (always order together with items 18 and 19)	21255043
21	1	spacer plate	21255046
22	1	LCD module 240 x 64 dots CCFL	21203515
23	2	Torx oval head tapping screw 2.9 x 13 (red)	*
24	1	**digital board** [4)]	
		IND465 with FLASH Memory Chip (soldered)	21203996
		SQC 16 with FLASH Memory Chip (soldered)	21255772
		Remote with FLASH Memory Chip (soldered) [5)]	21203996
25	5	fillister head screw M3 x 6 Torx T10	*
26	1	analog board 7k	21255054
27	1	fastening clamp for analog board *	*

IND465 terminal (continued)









28	1	EMC clamp for analog board	22007948
29	1	A/D cable 11.8" (300 mm)	21203167
30	8	screw lock	*
31	1	load cell connection cable with Sub-D socket and plug for analog board	22010055
32	–	9-pin Sub-D connector for connecting the load cell with the terminal	–
32a	1	Sub-D standard housing (dismanteled)	22007870
32b	1	pin base	22007869

* included in the small parts set (Chapter 4.6)

1) Is also used with analog interface option and USB option.

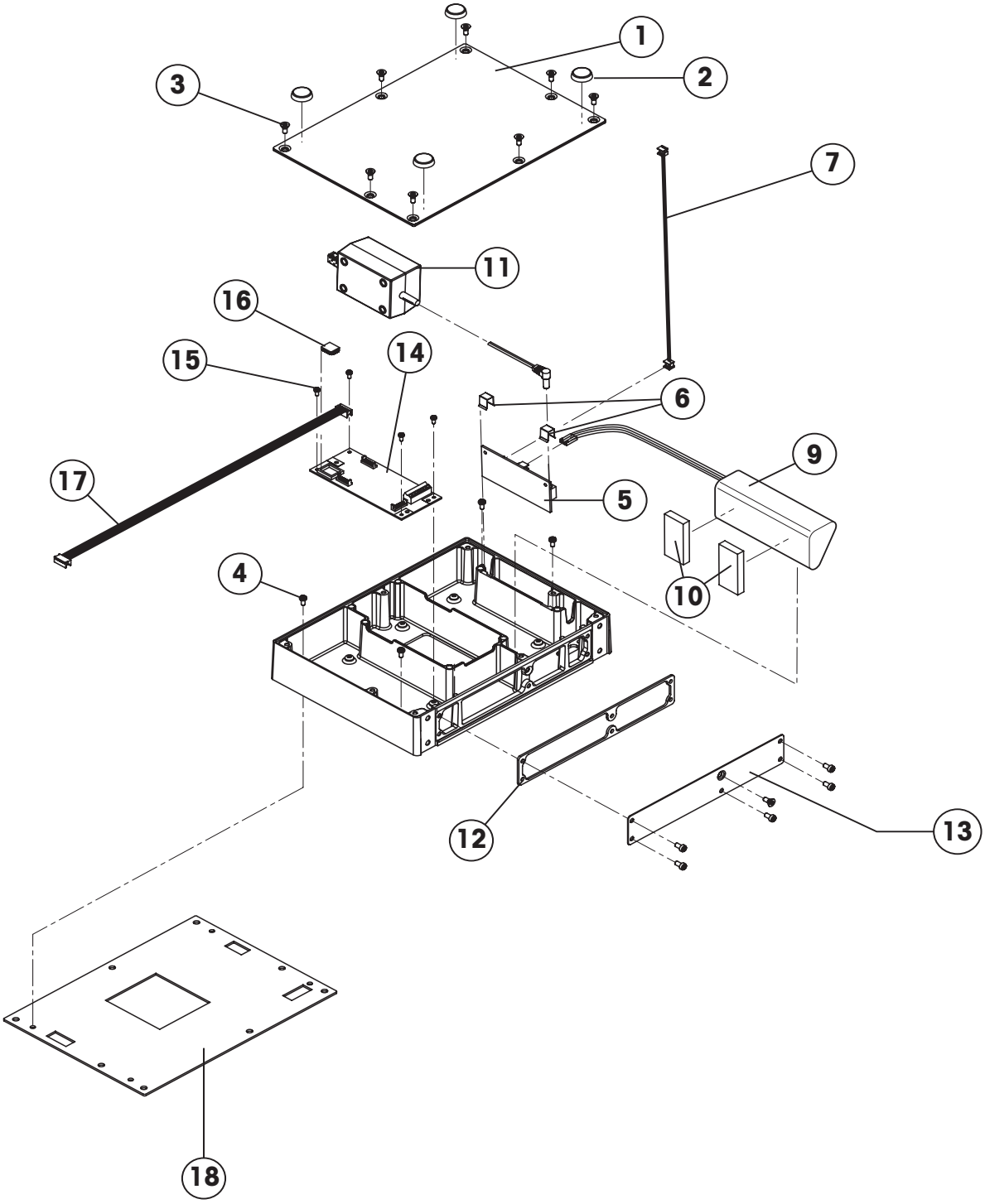
2) If an analog interface option is built in, a second cable of this type is used to connect the analog interface option board (built into the OptionPac, see chapter 4.5) to the connector plate of the terminal (item 7 above).

3) Replaces the standard interface board (2 x RS232C), order no. 21255081. The standard connecting cable (order no. 21203490) can be used with the optional interface board. However, if an analog interface option is present the "ETH/USB option" cable (order no. 22010154) must be used instead of the standard connecting cable (order no. 21203490).

4) See Chapter 9.5 for information on loading the software.

5) When replacing the digital PCB of an IND465 Remote, you can acquire the software from Support.SQC@mt.com.

4.5 OptionPac



Item	Qty.	Description	Order No.
1	1	base plate with seal attached	21255118
2	4	rubber foot	00200068
3	8	countersunk screw M4 x 12 Torx T20	*
4	4	fillister head screw M5 x 12	*
5	1	PCB for NiMH storage battery charger circuit	22011451
6	2	fastening clamp for charging circuit board	*
7	1	connecting cable charging circuit – analog board	21203233
9	1	battery 14.4V NiMH (always order together with item 10)	22011350
10	2	adhesive tape for battery	21255260
11	1	**bench AC adapter 8VA** (always order together with adhesive tape order no. 21203184):	
		USA version	22011364
		external power supply unit (battery charger) for operation with a storage battery (without power cable)	22011300
		socket for external power supply unit	22011311
12	1	seal for back panel OptionPac	21255013
13	1	back panel without openings	21255003
14	1	analog interface option board (IND435/445/465 only)	21203383
15	4	tapping screw M3 x 6	–
16	1	EPROM with interface software for analog option (IND435/445/465 only)	22013444
17	1	cable for analog option (IND435/445/465 only)	21203604
18	1	seal (between OptionPac and terminal)	21255011
	5	fillister head screw M4 x 8 Torx T20	*
	1	countersunk screw M4 x 10 Torx T20	*

* included in the small parts set (Chapter 4.6)

4.6 Small parts set

The small parts set comprises all the standard components (screws, washers, etc.) required for service work on scales and terminals.

Qty.	Description	Order No.
1	**small parts set**	21203404
20	countersunk Torx screw M3 x 8	–
20	countersunk Torx screw M3 x 10	–
20	countersunk Torx screw M6 x 30	–
50	countersunk Torx screw M4 x 10	–
10	countersunk Torx screw M4 x 12	–
20	button head Torx screw M3 x 6	–
30	button head Torx screw M4 x 12	–
30	button head Torx screw M5 x 12	–
20	wide flange washer 4.3 x 20	–
20	wide flange washer 5.3 x 20	–
20	countersunk Torx screw M6 x 16	–
20	spring clip	–
50	raised cheese head Torx screw M4 x 8	–
10	screw lock	–
10	Torx oval head tapping screw 2.9 x 13	–

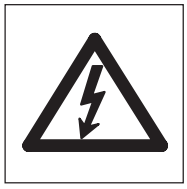
5 Replacing components with compact scales

5.1 Important notes

This section describes how to change individual components of the compact scales. When doing this, please refer to the exploded view drawings and spare parts lists in Chapters 2 and 3. **Important**: After replacing components, a **functional check** of the scale must always be carried out.

5.1.1 Safety and environment

The following **instructions must be observed for all repairs**:



– **Disconnect the scale from the power supply before starting repair work!**

– The scale contains electronic components which can be damaged by electrostatic discharges. **You must therefore always wear a grounded wriststrap when performing repair work!** Grounded wriststraps can be purchased from specialist electronics dealers.

– Defective components must be disposed of according to the instructions in Chapter 1!

- **Servicing work in explosion hazard zones is strictly prohibited.** Ignition power could inadvertently be generated, causing an explosion. **Servicing work should therefore only be undertaken in secure areas.** The location in which the scale is installed must be declared by the system operator to be safe for the duration of the repair work. If no such declaration is available, the scale must be switched off and disconnected from the power supply and moved to a safe area.
- The scales can also be disconnected and reconnected to the power supply in potentially explosive environments provided that the power supply has first been switched off.

5.1.2 Tools and working aids

– Screwdrivers: Torx T10, T20, T25, and T30; Phillips 5 mm; flat type size 4
– Torque wrench up to 10 Nm
– Wrench heads Torx T25, T30, and hex 17 mm
– Open-end wrench, size 20
– Feeler gauge
– Carpet knife ("cutter")
– Grounded wriststrap (as protection against electrostatic discharges)
– Weights of class M1 or F1

5.1.3 Work instructions

Take great care when inserting and tightening screws into holes tapped **directly into the aluminum casting**: After inserting the screw, always turn it first about 1 turn counterclockwise until it engages in the existing thread, and only then screw it tight! Do not tighten the screw too much, since this may damage the thread in the aluminum casting!

5.2 Replacing the keypad overlay

- Lift up the defective keypad overlay (if necessary carefully prying it up with a knife) and gently peel it off the scale. **Note**: take care that the specification label is not damaged when the membrane is removed!
- Carefully clean display mounting plate, keypad membrane (BBA/BBK462, BBA/BBK442) and window (removing all traces of adhesive).
- Make sure that the specification label is in its correct position (must be visible through the window in the keypad overlay), then peel off the protective film from the new overlay and carefully affix the latter to the display mounting plate.
- Press the keypad overlay down uniformly.

5.3 Replacing the AC adapter

Note: The AC adapter has a fuse as overcurrent protection. For safety reasons this fuse cannot be replaced, and the AC adapter must therefore be replaced completely if the fuse blows. This applies only to scales that are connected directly to the AC power line (without rechargeable battery and external AC adapter).

- Unscrew the adjustable feet and remove them.
- Undo the bottom plate retaining screws, removing them and the plate itself.
- Disconnect the AC adapter cable from the analog PCB.
- Remove the AC adapter (held on by an adhesive patch) from the wall of the housing. If necessary, carefully insert a flat blade (knife or screwdriver) between adapter and housing and pry them apart. Remove all traces of adhesive from the housing.
- Undo the screws holding the RS connector plate in place (rear panel of scale) and remove the plate.
- Slide the AC adapter power cord grommet out of the RS connector plate. Remove the AC adapter from the scale.
- Place the new AC adapter in the scale and fix it in place with the adhesive patch.
- Slide the power cord grommet into the slot of the RS connector plate and screw the plate in place.

  Note for scales with IP65 protection: Check that the seal of the connector plate is still correctly fastened to the housing. If it is not, the seal must be replaced as follows: Remove the existing seal from the housing so as to leave no trace. Clean and degrease the surface to which it was fastened. Carefully affix the new seal to the housing in exactly the right position.
- Plug the AC adapter output cable onto the analog PCB.
- Replace the bottom plate and the adjustable feet.

5.4 Replacing the battery

Note: This procedure is only required for scales that have a built-in battery and an external AC adapter ("AccuPac" version).

- Unscrew the adjustable feet screws and remove them.
- Undo the bottom plate retaining screws, removing them and the plate itself.
- Undo the screws holding the RS connector plate in place (rear panel of scale) and remove the plate.
- Slide the charging PCB out from the guide and remove both plugs on the PCB (connection cable to battery or analog PCB).
- Remove the battery from the wall of the housing (held in place by the adhesive strip). If necessary, carefully insert a flat blade (knife or screwdriver) between the battery and housing and pry them apart. Remove all traces of adhesive from the housing.
- Remove the battery from the scale and disconnect the cable to the charging PCB.

- Attach the adhesive patch to the wall of the housing, remove its protective foil, place the battery in the scale and press it against the wall of the housing.
- Attach both plugs with connectors to the charging PCB and slide the PCB back it into the guide.
- Replace the RS connector plate and secure with the screws.

  Note for scales with IP65 protection: Check that the seal of the connector plate is still correctly fastened to the housing. If it is not, the seal must be replaced as follows: Remove the existing seal from the housing so as to leave no trace. Clean and degrease the surface to which it was fastened. Carefully affix the new seal to the housing in exactly the right position.
- Check the connections of all cables: The cables must lie in the correct slots of the housing, to ensure they are not pinched by the bottom plate.
- Replace the bottom plate and the adjustable feet.

5.5 Replacing the charging PCB

Note: This procedure is only required for scales with a built-in battery ("AccuPac" version). **Before fitting the new charging PCB, check that the correct AC adapter for "AccuPac" operation is used** (see spare parts lists in Chapters 2 and 3). If not, the AC adapter must also be replaced.

- Undo the screws holding the RS connector plate in place (rear panel of scale) and remove the plate.
- Slide the PCB out from the guide and remove both plugs on the PCB (connection cable to battery or analog PCB).
- Attach both plugs with connectors to the (new) charging PCB and slide it into the guide.
- Replace the RS connector plate and secure with the screws.

  Note for scales with IP65 protection: Check that the seal of the connector plate is still correctly fastened to the housing. If it is not, the seal must be replaced as follows: Remove the existing seal from the housing so as to leave no trace. Clean and degrease the surface to which it was fastened. Carefully affix the new seal to the housing in exactly the right position.

5.6 Replacing the analog PCB

Note: For scales with MonoBloc weighing cells the entire weighing module is usually replaced as its components (load cell and analog PCB) are a matching set: The analog PCB contains all temperature compensation data of the weighing cell (TK data). If only the analog PCB is to be replaced, then please note the following: A printout with the TK data of the weighing cell should be included in every scale. If this is not the case then this data must be printed out before the analog PCB is replaced. The TK data cannot otherwise be loaded into the new analog PCB (see Chapter 9)!

- Unscrew the adjustable feet and remove them. Undo the bottom plate retaining screws, removing them and the plate itself.
- Disconnect weighing cell cable, connecting cable to the digital PCB and the AC adapter output cable from the analog PCB.
- Pull off the two spring clips from the analog PCB and remove it.
- Fit the new analog PCB and fix it in place with the spring clips.
- Connect the weighing cell cable, the A/D cable from the digital PCB and the AC adapter output cable to the analog PCB.
- Replace the bottom plate and the adjustable feet.

Note: After replacing the analog PCB all scale data must be entered again in technician mode (Chapter 7), plus all supervisor mode settings must be re-entered! The scale must first be calibrated and a linearization and recalibration carried out as required. For scales with MonoBloc weighing cells the TK data of the weighing cell must first be loaded into the new analog PCB via computer (see Chapter 9).

5.7 Replacing the display mounting plate, display unit and digital PCB

The display mounting plate is located underneath the keypad membrane and is attached to the scale housing by 6 snaps. The display unit comprises the digital PCB, the liquid crystal display (LCD) and the backlighting unit (on the BBA/BBK462 the lighting is integrated into the LCD module). It is held in place on the mounting plate by snaps. The digital PCB is connected to the analog PCB and the RS232C interface by two ribbon cables (on BBA/BBK422 and 462 there is an additional cable for the keypad).

5.7.1 Preliminary word

- Unscrew the adjustable feet and remove them.
- Undo the bottom plate retaining screws, removing them and the plate itself.
- **BBA/BBK422, 425, 432, 442:** Remove both EMC clamps. Remove the fastening plate (since January 2008) that supports the locking tappets of the display insert by loosening the two screws. Undo the red retaining screw (since September 2005) which fastens the display unit to the mounting plate. Pull back the front cantilever snaps holding the display unit to release it, raise the front edge of the display unit and withdraw it from the rear snaps. Disconnect the RS232 cable and the connecting cable to the analog PCB from the digital PCB. Remove the display unit.
- **BBA/BBK462:** Remove the fastening plate (since January 2008) that supports the locking tappets of the display insert by loosening the two screws. Unscrew the 5 screws holding the digital PCB to the scale housing. Detach all cable connections from the digital PCB and remove PCB. Unscrew the 2 red mounting screws (since September 2005) fixing the LCD module to the display insert. Push the front retaining clips on the LCD module forward slightly, swivel the module up and pull it out from the rear brackets.

5.7.2 Replacing the display mounting plate

Note: In order to replace the display mounting plate, the keypad overlay must be removed. This cannot then be reused and must also be replaced. On BBA/BBK442 and462 the keypad membrane affixed to the display insert must also be replaced.

- Remove keypad overlay (Chapter 5.2).
- Push the 3 cantilever snaps at the front edge of the display mounting plate backwards to release the plate and remove it to the outside.
- Insert the new display mounting plate into the aperture so that it clicks into place.
- **BBA/BBK442 and 462 only:** Remove the protective films from the new keypad membrane and carefully stick the membrane onto the display insert.
- Apply the new self-adhesive keypad overlay (Chapter 5.2).

5.7.3 Replacing the liquid crystal display (LCD) or the backlighting unit

Important: The following steps apply only to BBA/BBK422, 425, 432, 442. On BBA/BBK462 the entire LCD module must be replaced where applicable (see Chapter 5.7.1 for dismantling instructions).

- Place the display unit with the digital PCB downwards on a conductive CMOS film.
- Disconnect the backlighting ribbon cable from the digital PCB.
- Carefully insert a flat blade screwdriver (size 4) between the digital PCB and the backlighting unit immediately adjacent to the connectors.
- With the screwdriver pry the liquid crystal display and the backlighting unit out of the socket strips. When doing this, lever the shaft of the screwdriver against the edge of the digital PCB. Never lever the tip of the screwdriver against the surface of the PCB, as this could damage the latter!

- Remove the upper protective film of the backlighting unit.
- Place the new backlighting unit onto the digital PCB (it snaps into place on the board).
- Remove the upper and lower protective cover of the LCD.
- Carefully place the LCD onto the backlighting unit and ensure that the connector pins are correctly aligned with the socket strips. When correctly positioned, the ends of the LCD and backlighting unit are flush. Use a flat object such as a ruler to exert a uniform pressure on the LCD and gently push it home.
- Push the backlighting unit ribbon cable connector onto the digital PCB pins.

5.7.4 Replacing the digital PCB

The following steps apply only to BBA/BBK422, 425, 432, 442. On BBA/BBK462 the digital PCB and the LCD are separate units that can be replaced individually (see Chapter 5.7.1 for dismantling instructions).

- Remove the LCD and backlighting unit as described in the previous chapter.
- Fit LCD and backlighting unit onto the new digital PCB (Chapter 5.7.3).

After the digital PCB has been replaced, the application software of the scale has to be downloaded into the flash memory of the digital PCB (refer to Chapter 9 of this service manual). If the software was not loaded successfully via the PC, the complete digital PCB with the soldered-on flash memory chip has to be replaced.

5.7.5 Final reassembly

- Connect the RS232 cable and the cable from the analog PCB to the digital PCB.
- Engage the display unit or the LCD module under the rear snaps of the display mounting plate and then lower its front edge until it snaps into place. Fit the red retaining screw(s) (since September 2005).

  Caution: At BBA/BBK42x, BBA/BBK432 and BBA/BBK442: The red screw is used for adjusting. It must first be tightened completely and then loosened by half a rotation. If this is not done, the pushbuttons on the digital PCB are too close to the display insert and can no longer be pressed. The distance between the pushbuttons of the digital PCB and the display insert can be modified by means of this red adjusting screw. An additional manual keyboard test must always be carried out. In this context fine adjustment also has to be carried out with the adjusting screw.
  At the BBA/BBK462 the two red screws (since September 2005) do not serve as adjusting screws and can be tightened without any problems.
  Caution: Reattach the fastening plate (since January 2008) that supports the locking tappets of the display insert. On BBA/BBK42x the LC display is only held in the connector strip on one side. Because of this, for assembly of the PCB, the display, and the backlighting must be held together by hand, otherwise the backlighting may come out of the drilled holes in the PCB and be displaced!
- Install both EMC clamps (does not apply to BBA/BBK462).
- **BBA/BBK462 only**: Attach all cables to the digital PCB and secure the board to the scale housing with the 5 screws.
- Replace the bottom plate and adjustable feet.

5.8 Replacing the weighing cell

5.8.1 Replacing a strain gauge weighing cell

Disassembly

- Remove the weighing pan.
- **Scales without IP65 protection**: Undo the pan support plate retaining screws and remove the pan support plate.
- **Scales with IP65 protection** (see exploded view drawings in Chapters 2 and 3):
  - Undo the 4 M3 x 8 screws fastening the membrane to the load plate support.
  - Undo the two M6 x 30 retaining screws of the load plate support and carefully lift the load plate support off. **Note**: If the load plate support remains attached to the membrane, the membrane must be released with a thin pin. (Insert the pin through the drilled holes in the load plate and carefully press the membrane down.)
  - Undo the 3 M3 x 10 screws fastening the small flange to the membrane. Remove the small flange, the membrane, and the large flange.
  - Undo the 2 M3 x 8 fastening screws of the cover plate. Carefully lift off the cover plate together with the rubber seal.
- Turn the scale upside down, unscrew the adjustable feet and remove them.
- Undo the bottom plate retaining screws, removing them and the plate itself.

Replacing the load cell

- Remove the weighing cell cable connector from the analog PCB.
- Undo the 4 retaining screws for the overload plate. Remove the screws, washers and springs.
- Remove the overload plate with the weighing cell screwed to it.
- Remove the weighing cell retaining screws.
- Screw the new weighing cell to the overload plate. **Important**: Before tightening the screws, verify that the weighing cell is aligned exactly parallel with the edges of the overload plate! Screw torque: **10 Nm!**
- There is an adjustment screw for the overload stop with scales from specific production series. The overload stop must then first be readjusted after replacing the load cell. If the adjustment screw has been removed, a drop of superglue should be applied to the thread to keep the screw firmly in place after adjustment. A feeler gauge should be used to adjust the overload stop. The adjustment screw is to be tightened until there is a gap between the screw and weighing cell according to the table below. **Caution**: Turning the screw too tightly can damage the weighing cell!

Scale	Color of overload spring	Gap between adjustment screw and weighing cell
P.. 6 lb (3 kg)	red	0.45 mm
P.. 12 lb (6 kg)	red	0.45 mm
S.. 30 lb (15 kg)	white	0.25 mm
S.. 70 lb (35 kg)	brown	0.25 mm
S.. 120 lb (60 kg)	black	0.40 mm

- Place the overload plate with the weighing cell screwed to it in the scale. Fit the springs and washers, then tighten the screws.
- Fit the weighing cell cable connector onto the analog PCB pins.

Assembly

- Replace the bottom plate and the adjustable feet.

- **Scales without IP65 protection**: Turn the scale the right way up, replace the pan support plate and secure it with the screws. Before finally tightening the screws, make sure that the pan support plate is aligned squarely with the scale housing. **Important**: screw torque **10 Nm**!
- **Scales with IP65 protection** (see exploded view drawings in Chapters 2 and 3):
  - Mount the rubber seal and the cover plate and insert the 2 M3 x 8 fastening screws (but do not tighten them yet).
  - Lay the large flange on the cover plate, then lay the membrane in position and align the 3 fastening holes. Next, lay the small flange in position and align it exactly. Insert the 3 M3 x 10 screws and tighten them evenly together with the two M3 x 8 screws of the cover plate.
  - Align the large flange exactly on the 4 fastening holes of the membrane.
  - Lay the load plate support in position, and then insert the two M6 x 30 fastening screws and slightly tighten them. Before finally tightening the screws, make sure that the pan support plate is aligned squarely with the scale housing. **Important**: screw torque **10 Nm**!
  - To be able to screw the large flange and the membrane to the load plate support, the flange and the membrane must be lifted slightly, because the fastening screws are too short to reach to the threaded holes in the flange. To do this, proceed as follows:

    Carefully insert a fine screwdriver under the side of the large flange and lift the flange slightly together with the membrane. Insert one of the 4 M3 x 8 fastening screws in the corresponding drilled hole in the load plate support and screw it in only slightly. Insert the remaining 3 M3 x 8 fastening screws into the membrane and then tighten all 4 screws evenly.

    Note: Instead of using a screwdriver to lift the flange and membrane, this can also be done by temporarily inserting two M3 screws at least 15 mm long into two opposite holes in the load plate support and slightly tightening them. (These temporary screws are long enough to reach the threaded holes in the flange and to lift the flange together with the membrane). Insert two of the 4 M3 x 8 fastening screws into the free drilled holes in the load plate support and screw them in slightly. Undo the two temporary screws and insert the two remaining M3 x 8 screws in their place. Tighten all 4 screws evenly.

- Replace the weighing pan.
- Calibrate the scale in technician mode and linearize it (Chapter 7). If a weighing cell with another capacity has been installed, the new weighing range must also be selected.

Note: Scales with strain gauge weighing cells have fixed cornerload stops that do not need to be readjusted.

5.8.2 Replacing the MonoBloc weighing cell

Note: If a MonoBloc weighing cell is to be replaced, then the analog PCB must also be replaced at the same time as these components are a matching set (the analog PCB contains all TK data of the weighing cell). Both components are supplied together (temperature compensation data). After installing the new weighing cell, this printout must be stored in the scale (it is required if only the analog PCB is to be replaced, see Chapter 5.6)!

Replacing the weighing cell of scales with small platforms (P... types)

- Remove the weighing pan (with 6 lb (3 kg) models also remove the draft shield).
- Carefully undo the retaining screw of the load plate support. **Note**: When loosening the screw, under no circumstance is the load plate support to be under any tension!
- Remove the load plate support and the screw. Seal the threaded hole on the weighing cell with an adhesive strip so that the spring cannot fall out.

- Turn the scale upside down, unscrew the adjustable feet and remove.
- Undo the retaining screws of the bottom plate and remove this.
- Remove the load cell cable coming from the analog PCB. **Note:** The plugs are only attached to the analog PCB by soldered joints, the cable must therefore be handled with care!
- Undo the 4 retaining screws for the overload cell. Remove the screws and washers.
- Carefully lift out the cell from the scale. **Note**: The cell may only be held by the baseplate or by the back part of the block!
- Carefully disconnect the cables at the cell that connect the weighing cell with the analog PCB. **Note**: Care should be taken as there is a small connection PCB with fine wires on the weighing cell that must not be jolted! The PCBs are also sensitive to mechanical tension and pressure!
- Connect the cables to the new weighing cell.
- Carefully insert the new weighing cell in the scale and secure with the 4 screws (with washers).
  Note: torque: **2.8 Nm**.
- Connect both plugs of the load cell cable to the analog PCB. Slide the ferrite core on the load cell cable as near as possible to the separating wall of the housing.
- Replace the bottom plate and adjustable feet.
- Turn the scale the right way up, remove the adhesive patch from the threaded hole on the load cell and check to ensure that the spring is in the hole. Replace the load plate support and secure it with the old hexagon screw. Before finally tightening the screw, make sure that the load plate support is aligned squarely with the scale housing. **Caution**: Under no circumstances is the load plate support to be under any tension when turning the screw! Screw torque: **5 Nm**.
- Replace the weighing pan (with XS models, also replace the draft shield).
- Adjust the scale in technician mode and linearize. It should again be recalibrated (Chapter 7). If a weighing cell of another capacity has been installed, then the new weighing range ("Range") and the resolution ("Resol.") must also be selected.

Note: For scales with MonoBloc weighing cells, the corner and overload stops are permanently set and do not need to be adjusted.

Replacing the weighing cell of scales with large platforms (S... types)

- Remove the weighing pan.
- Carefully undo the retaining screws of the load plate support. **Note**: When loosening the screw, under no circumstance is the load plate support to be under any tension! Remove the load plate support and screws.
- Turn the scale upside down, unscrew the adjustable feed and remove them.
- Undo the retaining screws of the bottom plate and remove.
- Remove the plugs of the load cell cables coming from the analog PCB. **Note:** The plugs are only attached to the analog PCB by soldered joints, the cable must therefore be handled with care!
- Undo the retaining screws of the overload plate and remove them.
- Carefully lift out the overload plate together with the attached cell from the scale.
- Undo the 4 retaining screws of the weighing cell and carefully remove the overload plate.
- Carefully disconnect the cables at the cell that connect the load cell with the analog PCB. **Note**: Care should be taken as there is a small connection PCB with fine wires on the weighing cell that must not be jolted! The PCBs are also sensitive to mechanical tension and pressure!
- Connect the cables to the new weighing cell.
- Screw the new weighing cell to the overload plate. **Important**: Before tighening the screws, verify that the load cell is aligned exactly parallel with the edges of the overload plate. Screw torque: **4 Nm**!
- **Undo the locking screw of the overload protection and set the adjustment screw to a gap of 0.012" (0.3 mm) (use**

feeler gauge). **Retighten the locking screw**.

- Carefully attach the connection cables of the analog PCB to the cell.
- Carefully insert the overload plate with the attached load cell into the scale and secure with the 4 screws. **Note**: torque: **4 Nm**.
- Connect both plugs of the load cell cable to the analog PCB. Slide the ferrite core on the loa cell cable as near as possible to the separating wall of the housing.
- Replace the bottom plate and the adjustable feet.
- Turn the scale the right way up, replace the load plate support and secure it with the screws. Before finally tightening the screw, make sure that the load plate support is aligned squarely with the scale housing. **Caution**: Under no circumstance is the load plate support to be under any tension when turning the screw! Screw torque: **10 Nm**!
- Replace the weighing pan.
- Adjust the scale in technician mode and linearize. It should again be recalibrated (Chapter 7) If a weighing cell with another capacity has been installed, then the new weighing range ("Range") and the resolution ("Resol.") must also be selected.

Note: For scales with MonoBloc weighing cells, the corner overload stops are permanently set and do not need to be adjusted.

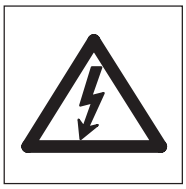
6 Repair of terminals

6.1 Important information

When performing repairs please refer to the exploded view drawings and lists of spare parts in Chapter 4 of this manual. **Important**: After replacing components, a **functional check** of the terminal must always be carried out.

6.1.1 Safety and environment

Whenever repairs are carried out, the following **safety precautions** must always be taken:



- **The terminal must be disconnected from the power supply before repair work is started!**
- The terminal and the OptionPac contain electronic components which can be damaged by electrostatic discharges. **You must therefore always wear a grounded wriststrap when performing repair work.** Grounded wriststraps can be purchased from specialist electronics dealers.
- Defective components must be disposed of according to the instructions in Chapter 1!

6.1.2 Tools and working aids

- Torx screwdrivers T10, T20, and T30
- Phillips screwdrivers size 2
- Insulated slotted-head screwdriver (with plastic-covered shaft), size 4
- Grounded wriststrap (to protect against electrostatic discharges)

6.1.3 Work instructions

Take great care when inserting and tightening screws into holes tapped **directly into the aluminum casting**: After inserting the screw, always turn it first about 1 turn counterclockwise until it engages in the existing thread, and only then screw it tight! Do not tighten the screw too much, since this may damage the thread in the aluminum casting!

6.2 Disassembling/reassembling the terminal

- Remove base plate from terminal or OptionPac (8 screws, Torx T20).
- **If OptionPac is installed**: Disconnect all cable connections between OptionPac and terminal in OptionPac.
  Tip: Note where cables are connected. Unfasten OptionPac from terminal (4 Phillips screws) and lift off.
- Reassemble in reverse order.

6.3 Replacing the keypad overlay

- Lift the defective keypad overlay by a corner and gently peel it off.
- Carefully remove all traces of adhesive with, for example, a wooden or plastic scraper. **Caution**: Make sure not to damage the keypad membrane of IND445 and IND465 terminals!
- Carefully clean the windows of the keypad overlay and the display mounting plate.
- Peel off protective film from new overlay.
- Center the keypad overlay on the display mounting plate and press down uniformly.

6.4 Replacing the AC adapter

Note: The AC adapter has a fuse as overcurrent protection. For safety reasons this fuse cannot be replaced, and the AC adapter must therefore be completely replaced if the fuse blows or the AC adapter is defective.

- Open terminal, remove OptionPac (if present) (Chapter 6.2).
- Peel output cable of AC adapter off analog board. **Battery-operated scales only:** The output cable of the AC adapter is plugged into the charging circuit board of the OptionPac and is usually already removed when the OptionPac is disassembled (Chapter 6.2).
- Remove **AC adapter** from wall of housing (attached by adhesive patch). If necessary, carefully insert a flat blade (knife or screwdriver) between AC adapter and housing and detach AC adapter. Remove all traces of adhesive from housing.
- Undo the 6 screws holding the RS connector plate in place (rear panel of terminal) and remove the plate. (**Take care:** cable connections!).
- Remove power cord grommet of AC adapter from RS connector plate. Remove AC adapter from terminal.
- Attach new adhesive patch to housing wall and peel off protective film.
- Place new AC adapter in terminal and press onto adhesive patch.
- Locate the power cord grommet (with its closed side facing up!) in the center of the blanking plate slot, then press the grommet down thoroughly. This requires a fair amount of force which is intended as it ensures proper IP protection. **Caution: Never use a hammer or similar tool for pushing the grommet into place because this may damage the wires!** Once the grommet is properly located in the slot you may fasten the blanking plate.
- Plug AC adapter output cable onto analog board. **Battery-operated terminals**: The output cable of the AC adapter must be plugged onto the charging circuit board in the OptionPac.
- Install terminal/OptionPac (Chapter 6.2).

6.5 Replacing the analog board

- Open terminal, remove OptionPac (if present) (Chapter 6.2).
- Disconnect the load cell connection cable and all other cable connectors from analog board. **Tip**: Make a note of the cable connections!
- Pull off the spring clip and the EMC clamp from the analog board and remove it.
- Fit new analog board and fasten in place with the spring clip and the EMC clamp.
- Plug the load cell connection cable and all other cable connectors onto the analog board.
- Close terminal, mount OptionPac (if present) (Chapter 6.2).

Caution: **After replacing the analog board all scale data and user settings must be reentered, because they are saved in the EAROM on the analog board! When they have been reentered, the weighing system must be adjusted/ linearized**. These operations are described in Chapter 7 of the this service manual.

6.6 Replacing the display mounting plate, display unit, and digital board

The display mounting plate is located underneath the keypad overlay and is attached to the scale housing by 6 snaps. The display unit comprises the digital PCB, the liquid crystal display (LCD) and the backlighting unit (on the IND465 terminal the lighting is integrated into the LCD module). It is held in place on the mounting plate and the housing by snaps and screws. The digital PCB is connected to the analog PCB and the RS232C interface by two ribbon cables (on IND445 and IND465 terminals there is an additional cable for the keypad and IND465 has another flat ribbon cable for the additional interfaces).

6.6.1 Preliminary work

- Open terminal, remove OptionPac (if present) (Chapter 6.2).
- **IND425, IND435, IND445:** Undo the two screws (Torx T10) fastening the digital board to the display mounting plate.

  IND465: Undo the five screws (Torx T10) fastening the digital board to the terminal housing.
- **IND425, IND435, IND445 only:** Push back the two (small) black snaps at the front of the display mounting plate and slowly raise the digital board until it is vertical. Carefully pull the digital board vertically upward and out of the rear snaps.
- Disconnect all cables from the digital board, then remove the board. **Tip**: Make a note of the cable connections.
  IND445 and IND465 only: The membrane cable for the keypad of the IND445 (numeric keypad) and IND465 (entire keypad) must also be disconnected from the digital board. Use a soft felt pen to mark first the membrane cable and then the plug, so you know afterwards how the cable has to be plugged in. Then slightly pull out the two small black snaps on the left and right of the plug. This releases the spring mechanism of the plug, and the cable can be pulled off.
- **IND465 only:** Unfasten the two mounting screws fixing the LCD module to the display insert and to the terminal housing. Push the front retaining clips on the LCD module forward slightly, swivel the module up and pull it out from the rear brackets.

6.6.2 Replacing the display mounting plate

Note: In order to replace the display mounting plate, the keypad overlay must be removed. This cannot be reused, and must therefore also be replaced. On IND445 and IND465 terminals the membrane keypad, which is fastened to the display mounting plate, must also be replaced.

- Remove keypad overlay (Chapter 6.3).
- Push the 3 cantilever snaps at the front edge of the display mounting plate backwards to release the plate and remove it to the outside.
- Insert the new display mounting plate into the aperture so that it clicks into place.
- **IND445 und IND465 only:** Peel the protective film off the new membrane keypad and carefully apply the membrane keypad to the display mounting plate. Pass the membrane cable through the aperture and into the inside of the terminal.
- Apply the new self-adhesive keypad overlay (Chapter 6.3).

6.6.3 Replacing the liquid crystal display (LCD) and/or the backlighting unit

The following steps apply only to IND425, IND435, IND445 terminals. On IND465 terminals the entire LCD module must be replaced where applicable (see Chapter 6.6.1 for dismantling instructions).

- Place the display unit with the digital board downwards on a conductive CMOS film.
- Unplug the backlighting ribbon cable from the digital board.
- Carefully insert a flat-bladed screwdriver (size 4) between the digital board and the backlight unit immediately adjacent to the connectors. **Tip**: Use an electrician's screwdriver with an insulated shaft as this reduces the risk of causing damage.

- Use the screwdriver to pry the liquid crystal display and the backlighting unit out of the socket strip(s). **When doing this, lever the shaft of the screwdriver against the edge of the digital board. Never lever the tip of the screwdriver against the surface of the digital board, as this could damage the board!**
- Peel off the upper protective film of the new backlighting unit.
- Place the new backlighting unit onto the digital board. Two of the four feet of the backlighting unit are in the form of pins. These pins must be inserted into the corresponding holes in the digital board.
- Peel the upper and lower protective films off the new LCD.
- Carefully place the LCD onto the backlighting unit and ensure that the contact pins are correctly aligned with the socket strip(s). When correctly positioned, the ends of the LCD and the backlighting unit are flush. Use a flat object such as a ruler to exert a uniform pressure on the LCD and gently push it home.
- Push the backlighting unit ribbon connector onto the digital board pins.

6.6.4 Replacing the digital board

The following steps apply only to IND425, IND435, IND445 terminals. On IND465 terminals the digital PCB and the LCD are separate units that can be replaced individually (see Chapter 6.6.1 for dismantling instructions).

- Remove the LCD and backlighting unit as described in the previous Chapter (6.6.3).
- After the digital board has been replaced, the application software for the terminal must be loaded into the flash memory of the digital board from the PC (see Chapter 9 of this service manual). If downloading the terminal software via a computer fails for any reason, the entire digital PCB inlcuding the soldered Flash Memory chip must be replaced.
- Mount the LCD and backlighting unit on the new digital board (Chapter 6.6.3).

Caution with IND425, IND435 and IND445
The red screw (since September 2005) serves for adjusting! First, they have to be tightened firmly, after this, however, they have to be untightened by a half rotation. If this is not done, the push-buttons on the digital print are too close to the display insert and can no longer be pressed. The distance between the push-buttons on the digital print and the display insert can be changed by this red adjusting screw. In any case, a manual keypad test has to be carried out additionally. In this context, also the fine adjusting has to be made using the adjusting screw.

iND465
The two red screws (since September 2005) do not serve as adjusting screws – unlike IND425, IND435, IND445 – and can be tightened without any problems.

6.6.5 Final reassembly

- Connect all cables to the digital board (incluning the membrane keypad cable on IND445 and IND465 terminals).

  IND445 and IND465 only: The membrane cable for the keypad must also be plugged into the digital board. To do so, pull out the two small black snaps on the left and right of the plug. Then push the membrane cable into the plug as far as the stop, hold it in this position and push the two snaps against the plug. The cable is then held fast.
- Engage the display unit or the LCD module (IND465) under the rear snaps of the display mounting plate and then lower its front edge until it snaps into place. Fit the retaining screws.
- Install both EMC clamps (does not apply to IND465).
- **IND465 only:** Secure the digital board to the scale housing with the 5 screws.
- Install the terminal/OptionPac, if present (Chapter 6.2).
- Replace the bottom plate and secure with 8 screws.

6.7 Repairing the OptionPac

6.7.1 Replacing the battery

Note: This section relates only to terminals which have an OptionPac with built-in battery.

- Remove the base plate of the OptionPac (8 screws, Torx T20).
- Remove battery from wall of housing (attached by adhesive patch). If necessary, carefully insert a flat blade (knife or screwdriver) between battery and housing, then release AC adapter. Remove all traces of adhesive from housing.
- Lift battery out of OptionPac and pull off cable connecting to charging circuit board.
- Fasten adhesive patch to wall of housing, peel off protective film, place battery in OptionPac and press latter against wall of housing.
- Check all cables are correctly laid. The cables must lie in the correct recesses in the housing so they are not trapped by the base plate.
- Screw the base plate of the OptionPac on again.

6.7.2 Replacing the charging circuit board

Note: This section relates only to terminals which have an OptionPac with built-in battery. The charging circuit board has an electronic overload protector which automatically resets after being activated.

- Remove base plate of OptionPac (8 screws, Torx T20).
- Pull off cable from battery (blue plug), then remove the two snap fasteners of the charging circuit board and carefully lift the board out of the housing.
- Undo all cable connections on charging circuit board.
- Plug cable onto new charging circuit board and place board in housing.
- Fasten board with the two snap fasteners and plug cable into battery (blue plug).
- Screw base plate of OptionPac on again.

6.7.3 Replacing the analog option board

Note: This section relates only to terminals fitted with an OptionPac containing the analog option for connecting a second weighing platform.

- Remove base plate of OptionPac (8 screws, Torx T20).
- Undo all cable connections on the analog option board. **Tip**: Make a note of the cable connections.
- Undo the 4 screws fastening the board (Torx T10) and remove the board.
- Using a suitable tool, remove the EPROM from its socket and fit on the new board. **Caution**: The chamfered corner of the EPROM must be aligned with the chamfered corner of the socket (see marking)!
- Place new board in housing and fasten with screws.
- Plug in all cables on the analog option board.
- Screw the base plate of the OptionPac on again.

Caution: **After the analog option board has been replaced, all the data and user settings for the second weighing platform must be reentered, because these are stored in the EAROM on the board! The second weighing platform must then be calibrated and linearized.** These steps are described in Chapter 7 of this service manual.

7 Scale definition, settings and diagnostics

The menu of the BBA/BBK 4… scales and IND 4… terminals includes a special section dedicated to the service technician. The technician setup offers settings and procedures for maintenance and diagnostics. Accessing this part of the menu requires a special password while navigation within the technician menu is the same as with the user and supervsior menu (see User Manual). **Caution**: Settings in the technician menu may only be made by qualified personnel. The wrong settings could result in the scale or terminal not functioning correctly!

7.1 Accessing and using the technician menu

7.1.1 Accessing the technician menu of scales or terminals that are not certified

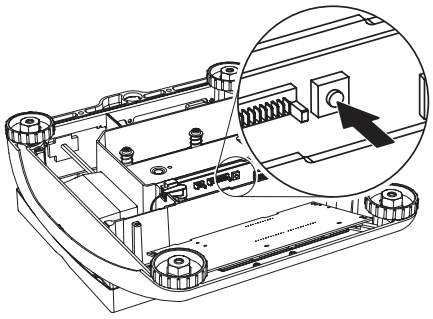
- Press (⇨) and hold it down until the prompt to enter the password appears.
- Press (→0←)(→T←)(→0←)(→T←)(⇨). Once you have confirmed the password, the first menu block ("SCALE") appears. Basically, the technician menu is the same as the one for the supervisor (see User Manual) except that there are some additional blocks for setup and diagnostics.

7.1 2 Accessing the technician menu of certified scales or terminals

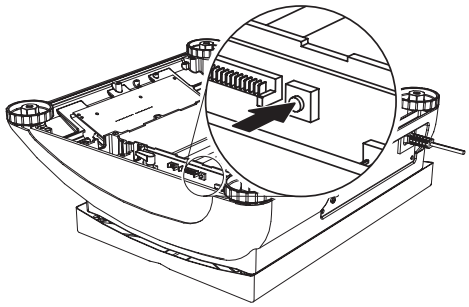
With certified scales and terminals, direct access to the technician setup (with the (→0←), (→T←) and (⇨) key) is blocked. This is for technical reasons, and also to comply with regulations. To access the technician setup, proceed as follows:

- Switch off the scale or terminal.
- Remove the bottom plate of the scale by undoing the retaining screws (Torx T20) (see Chapters 4 and 5 for a detailed description). **Important**: In order to remove the bottom plate it is necessary to break the **certification seal** affixed to them! **Once this seal has been destroyed, the scale must be recertified by an accredited organization, and a new certification seal must be affixed before the instrument may be used as a certified scale again!**
- Hold down the service switch (pushbutton) on the analog PCB (indicated by an arrow in the drawings below), while at the same time switching on the scale or terminal. Keep the service switch pressed in until "SCALE" appears in the display.

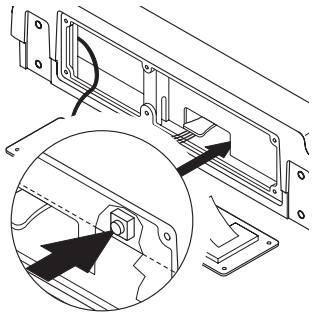
small platform model



large platform model



terminals



7.2 Activating options

The built-in options have to be re-activated after work has been carried out at the analog or digital PCB.
The character „_" is used for a blank in the following command description.

7.2.1 Requesting the status

Command	SOP_EO	Request the status of the Ethernet option
	SOP_UO	Request the status of the USB option
	SOP_IO	Request the status of the digital I/O option
	SOP_BO	Request the status of the battery option
Response	SOP_A_0	Option deactivated
	SOP_A_1	Option activated

7.2.2 Changing the status

Command	SOP_EO_1	Activate the Ethernet option
	SOP_EO_0	Deactivate the Ethernet option
	SOP_UO_1	Activate the USB option
	SOP_UO_0	Deactivate the USB option
	SOP_IO_1	Activate the digital I/O option
	SOP_IO_0	Deactivate the digital I/O option
	SOP_BO_1	Activate the battery option
	SOP_BO_2	Activate the battery option for RAVAS IND4xx
	SOP_BO_0	Deactivate the battery option
Response	SOP_A	Status changed

7.3 Technician menu – Overview

The overview below shows the menu blocks holding additional settings dedicated to the technician ("SCALE", "TERMINAL"). The settings available to the technician only are printed in boldface. The further menu blocks ("APPLICATION", "COMMUNICATION" and "DIAGNOSTICS") are similar to the ones in the supervisor setup (see User Manual) and are not shown below. The factory settings are marked with an asterisk (*). Not all menu items are available with all models.

Level 1	Level 2	Level 3	Level 4
SCALE	**Metrolo**	**no Appr**	
		OIML	
		NTEP	
	Scale 1/Scale 2	**[choose]**	
	Ramp		
	Serial Number		
	Scale Build	**Scale Type**	**Single Range**
			2Multi Interval
			2Multi Range
			3Multi Interval
			3Multi Range
		Base Unit	**g, kg, oz, lb, t**
		Ver. Interval	**e = d, e = 10d**
		Scale Cap. 1	**[entry]**
		Resolution 1	**1200d ...**
		Scale Cap. 2	**[entry]**
		Resolution 2	**1200d ...**
		Scale Cap. 3	**[entry]**
		Resolution 3	**1200d ...**
	Geo Value	**0 ... 31**	
	LIN-CAL	**3 Point**	**[Start]**
		5 Point	**[Start]**
	Calibration	[Start]	
	Control Mode		
	Display	Unit 1	g, kg, oz, lb*, t
		Unit 2	g, kg*, t, lb, oz
		Resolution	1200d ...
		Unt.roll	Off*, On
	Tare	Auto tare	Off*, On
		Chain tare	Off, On*
		Auto clear tare	Off*, On, 9d
		Pushbutton	**Off, On***
	Zero	**Zero-Capt.**	**–2%+18%*, –2+2%**
		Set Zero	**[Start]**
		Auto zero	Off, 0.5d, 1d*, 2d, 5d, 10d
	Restart	Off*, On	
	Filter	Vibration	Low, Medium*, High
		Process	Universal*, Dosing
		Stability	Fast, Standard*, Precise
	Fact	Temp	Off, 1K, 2K, 5K
	MinWeigh	**Set Value**	**[entry]**
		On/Off	Off*, On
	Reset	[Start]	
TERMINAL	Device	Language	English, US English, German, French, Italian, Spanish
		Sleep	Off, 1 min., 3 min., 5 min., 15 min., 30 min.
		Power off (battery version)	Off, 1 min., 3 min., 5 min., 15 min., 30 min.
		Contrast (462/465)	0 ... 5* ... 10
		Backlighting	Off, 5 sec., 10 sec., 30 sec., 1 min., On
		Weight display	small*, large
		Date/Time	Date format EU, US
		Date	[entry]
			Time [entry]
			AM*, PM
		Beeper	Off*, On
	Password	Supervisor Password	[Enter Code], [Retype Code]
	Timeout	**Mode**	**Not active*, Leasing, Text only**
		Days	**1 ... 999**
		Text1	[entry]
		Text2	[entry]
	Reset	[Start]	

Only the settings and procedures for the "SCALE" and "TERMINAL" menus that are available exclusively to service technicians are described here. The other menu options are described in the User Manual.

7.4 Admissibility for certification (*SCALE –> Metrology*)

The following settings are available:

"no Appr" **do not certify scale / no certifiable state**

"OIML" **do certify to OIML / certified**

"NTEP" **do certify to NTEP / certified**

Caution: If a scale is **certified**, a number of scale settings are no longer available.

7.5 Selecting the scale to be configured (*SCALE –> Scale 1/Scale 2*)

Here you specify which scale you want to configure. This option is only available for two-scale systems, i.e. when the scale or terminal has an analog option for connecting a second weighing platform.

The same menu blocks that are described in the sections below are available for both scales in the technician menu.

7.6 Querying the value of the analog/digital converter (*SCALE –> Ramp*)

The percentage deflection of the analog/digital converter ("Ramp") can be displayed in this menu. This value can be used to determine whether the load cell is operating correctly. Scales with identical and correctly operating load cells have roughly the same ramp values. The value is dynamic and changes with the load.

7.7 Serial number of the scale or terminal (*SCALE –> Serial Number*)

In this menu, you can display and change the serial number of the scale or terminal, which consists of seven digits. Note: The number should only be changed or reentered if necessary (e.g. after a new scale PCB is installed). The serial number is found on the rating plate of the scale or terminal.

The serial number can be entered with the numerical keypad for scales and terminals with the Count+ and Smart+ applications. Press →T← for scales and terminals with the Count and Basic appllications. The first digit starts flashing and can now be changed with the →T← and →0← keys.

Confirm new digit with ⊡→. The second digit starts flashing and can be changed in the same way. This also applies for all following digits (seven total). To exit the block, press ⊡→ again after entering the last digit.

7.8 Entering configuration data (*SCALE –> Scale Build*)

This menu includes a number of different submenus for entering configuration data for the weighing system. These submenus are described in the following sections:

Defining the scale type ("Scale Type") —> Chapter 7.8.1

Specifying the base unit ("Base Unit") —> Chapter 7.8.2

Choosing the verification interval ("Verification Interval") —> Chapter 7.8.3

Specifying the capacity of the weighing system ("Scale Capacity") —> Chapter 7.8.4

Choosing the resolution ("Resolution") —> Chapter 7.8.5

7.8.1 Defining the scale type (*SCALE –> Scale Build –> Scale Type*)

The following scale types are available

"Single Range"	Single-range scale.
"2 Multi Interval"	Scale with coarse range and 1 movable fine range. Automatic switching between the ranges in both directions.
"2 Multi Range"	Scale with coarse range and 1 fixed fine range. Automatic switching to the coarse range. Return to fine range after reaching a stable zero position (Gross = 0).
"3 Multi Interval"	Scale with coarse range and 2 movable fine ranges.
"3 Multi Range"	Scale with coarse range and 2 fixed fine ranges.

7.8.2 Specifying the base unit (*SCALE –> Scale Build –> Base Unit*)

The base unit can be specified in this menu. The base unit is used for determining the capacity of the weighing system and the resolution and has nothing to do with the weighing unit used for day-to-day operation (this is specified separately, see User Manual). The following units are available: gram (g), kilogram (kg), metric ton (t), pound (lb) and ounce (oz).

Note: Only "g", "kg" and "t" are available on weighing systems that are suitable for certification to OIML. Only "kg" and "lb" are available on weighing systems that are suitable for certification to NTEP.

7.8.3 Choosing the verification interval (*SCALE –> Scale Build –> Verification Interval*)

This setting is only relevant for certifiable weighing systems (Chapter 7.4). The following verification intervals are available: "e = d" and "e = 10d".

Note: If the verification interval is set to "e = 10d", the last digit of the weighing result is displayed in brackets (known as calibration brackets). These indicate that the last digit is not taken into account for calibration tolerance. If the verification interval is set to "e = d", the weighing result is displayed without brackets.

7.8.4 Specifying the capacity of the weighing system (*SCALE –> Scale Build –> Scale Capacity*)

The capacity of the weighing system must be specified when building a new scale using a IND 4... terminal. Furthermore, if the analog PCB is replaced, it is necessary to specify the capacity, because the EEPROM on the PCB is set to a default value at the factory. On BBA 4.../BBK 4... scales the capacity is shown on the plate above the display and must be set to this value. It is also necessary to set the capacity if a load cell of a different capacity is installed. In this case the capacity must be set in accordance with the load cell used (see specifications in Chapter 8).

Entering the scale capacity (in the previously selected basic unit)

The capacity can be entered with the numerical keypad for scales and terminals with the Count+ and Smart+ applications. Press the →T← key for scales and terminals with the Basic and Count applications. The first digit starts flashing and can now be changed with the →T← and →0← keys. Confirm new digit with the ⊡→ key. The second digit starts flashing and can be changed in the same way. This also applies for all following digits (seven total).

If it is a **multi-interval** or **multi-range** scale (see Chapter 7.8.1), this menu block can be accessed separately for each weighing range ("Scale CAP. 1" to "Scale CAP. 3", depending on the number of weighing ranges). The additional blocks for capacity are displayed after the "Resolution" block. The upper capacity limit must be entered for each weighing range.

Example for a 30 kg dual-range scale: "SCL.CAP 1" = 15 kg, "SCL.CAP 2" = 30 kg. In this example switching from the fine range to the coarse range occurs at 15 kg.

7.8.5 **Choosing the resolution** (*SCALE –> Scale Build –> Resolution*)

The resolution must be specified when building a new scale using a IND4.. terminal

Furthermore, the resolution has to be specified if the analog PCB is replaced, as its EEPROM is factory-set to a basic value. With BBA 4.../BBK 4... scales the resolution is indicated on the plate above the display and must be set to this value. The resolution also needs to be set if a load cell of a different capacity or a different type (e.g. MonoBloc instead of strain gauge) is fitted. In this case the resolution must be entered according to the load cell used (see technical data in Chapter 8 of this Service Manual). The available resolutions depend on the capacity of the weighing system.

If it is a **multi-interval** or **multi-range** scale (see Chapter 7.8.1), this menu block can be accessed separately for each weighing range ("RESOL. 1" to "RESOL. 3", depending on the number of weighing ranges). The additional blocks for resolution are displayed after the corresponding block for entering the capacity ("SCL.CAP 1" bis "SCL.CAP 3").

7.9 Setting the GEO adjustment value (*SCALE –> Geo Value*)

The geo adjustment value is used to adjust the weighing system to local gravity conditions (setting range 0 – 31). The table of geo adjustment values can be found in Chapter 8. **Please note**: If the scale is calibrated at the installation site, the geo value must not be changed afterwards!

The value can be changed with the →T← and →0← keys.

7.10 Linearization with simultaneous calibration (*SCALE –> LIN-CAL*)

In this menu block the weighing system can be linearized and calibrated simultaneously. The calibration is purely computational to compensate for shifts in the maximum load due to linearization. The loads placed on the pan are checked (±5%), so a basic calibration must already have been performed (see chapter 7.11).

Procedure

- First place a preload on the pan, then select the type of linearization/calibration required and confirm with ⊏→:
  - 3-point linearization (default = 0%, 50% and 100% of the maximum load).
  - 5-point linearization (default = 0%, 25%, 50%, 75% and 100% of the maximum load).
- Start the linearization/calibration. The display begins to flash as the scale automatically determines the zero point.

Determination of the zero point can be interrupted manually with ⓘ.

- Once the zero point has been determined, the display prompts you to load a weight (half load for 3-point linearization, quarter load for 5-point linearization). Change the weight if required (available values depend on the capacity of the weighing system).
- Once the weight has been placed on the scale and its value confirmed with ⊏→, linearization is performed at the first point. The display then prompts for additional weights (the number depends on the type of linearization chosen), which again can be changed with the →T← key if necessary. At the last linearization point the scale is also calibrated at the same time.

Linearization/calibration can be cancelled at any time with the ⓘ key.

- Once linearization has been performed at all points, the display confirms that linearization/calibration has been successfully completed.

7.11 Basic calibration (*SCALE –> Calibration*)

The basic calibration uses the display unit 1 (*SCALE –> Display –> Unit 1*).

Procedure

- Before calibration the geo adjustment value should be checked and corrected if necessary (chapter 7.9). It cannot be changed again subsequently.
- Start the calibration. You will be prompted to confirm the preload. Place the desired preload on the pan and confirm it. If there is already a test load on the scale, measurement of the preload can be interrupted manually with ⓘ.
- Once the preload has been measured, the display prompts you to place the calibration weight corresponding to the maximum load on the pan. If you do **not** want to calibrate with this value (e.g. because not enough weights are available), you can choose a different value (available values depend on the capacity of the weighing system). **Note**: You are generally recommended to calibrate the scale **at maximum load**, especially in the case of **certifiable scales**.
- Place the desired weight on the pan and confirm its value. Calibration is now performed, after which its successful completion is briefly confirmed. (Calibration can be cancelled at any time with the ⓘ key).

7.12 Activating control mode (*SCALE –> Control Mode*)

In this menu the current weighing result is displayed at high resolution (without the weighing unit). This enables the weighing system to be checked after calibration and/or linearization, for example.

7.13 Settings for the zero point (*SCALE –> Zero*)

This menu includes a number of submenus with settings for the zero point. These submenus are described in the following sections:

Specifying the zero capturing range ("Zero-Capture") —> Chapter 7.13.1

Shifting the calibration zero point ("Set Zero") —> Chapter 7.13.2

This menu block also includes the auto zero block. This menu block is also available to the supervisor so it is not described here (see User Manual).

7.13.1 Specifying the zero capturing range (*SCALE –> Zero –> Zero-Capt.*)

This menu can be used to specify the range in which the scale is set to zero when it is switched on or when →0← is pressed.

The following settings are available:

"–2%/2%" The zero capturing range is –2% to +2% of the nominal load (certifiable / certified)

"–2%/+18%" The zero capturing range is –2% to +18% of the nominal load (not certifiable / not certified)

Note: The zero capturing range affects the nominal capacity of the weighing system. If the capacity of a load cell is fully utilized, the zero capturing range can be reduced to –2% to +2%.

The new zero point is not active until the scale is restarted.

No changes to Zero-Capt. and Set Zero should be carried out when the restart function is activated.

7.13.2 Shifting the calibration zero point (*SCALE –> Zero –> Set Zero*)

The calibration zero point can be moved in this menu. This is necessary if an auxiliary preload is used or if calibration cannot be performed with the existing preload and it is outside the zero capturing range (in which case the scale would not be able to start up). The corresponding preload must be in position in order for "Set Zero" to be executed. The zero point for calibration by the supervisor is moved to this value, as is the reference point for the zero capturing range.

Procedure

- Ensure that the preload for which the calibration zero point is to be moved is in place.
- Start the function. You will see a prompt asking you if you really want to move the calibration zero point. The calibration zero point is moved when you confirm the prompt.

If the display signals an underload or overload when you quit this menu, switch the scale off and then on again.

7.14 Defining MinWeigh value *(SCALE–> Minweigh)*

The MinWeigh function is to ensure that the weighing results lie within the defined tolerances corresponding to the specifications of the quality-assurance system used.

If the value for MinWeigh = 0, the menu for the supervisor is fully hidden.

The value can be entered with the numerical keypad for scales and terminals with the Count+ and Smart+ applications. Press the →T← key for scales and terminals with the Basic and Count applications. The first digit starts flashing and can now be changed with the →T← and →0← keys. Confirm new digit with the ⊏→ key.

7.15 Settings in the "TERMINAL" menu block

Most of the TERMINAL menu block is also available to the supervisor and is therefore not described here (see User Manual). However, this menu block includes a submenu that is restricted to the service technician and is described below.

7.15.1 Defining a timeout (*TERMINAL –> Timeout*)

In this menu you can limit the period of time for which the scale is used. This is particularly useful for leased scales, since it prevents the scale for being used for longer than the agreed period. This menu item is only available for applications Count+ and Smart+. The following settings are available:

"Not active"	There is no restriction on the period of use of the scale (factory setting).
"Leasing"	The duration of use is limited to the number of days entered. Enter the number of days (1 - 999) during which the scale can be used in the "Days" menu item. The duration of use is valid as of the next day. If the set duration of use has passed, the scale still starts up, but no longer performs measurements and instead displays the message that the duration of use has passed.
"Text"	If the "Text" menu item is activated, user-defined texts which can be entered by the service technician under "Text1" (top line) and "Text2" (bottom line) are displayed. The texts appear approx. 30 seconds after the scale stops moving. This menu item is only available for application Smart+.

7.16 Setting of country version

After replacing the analog or digital board of the scale it is absolutely necessary to check the country specific settings and to adjust them if needed. The country specific settings affect the Technician Password, keyboard map, etc. Technician Password EU = →0← ⊏→ →0← ⊏→, US = →0← →T← →0← →T← ⊏→ .

For this procedure please connect the scale to an PC with an appropriated cable (PC – Scale, RS232, 9-pin straight cable Sub D m/f, 00410024) and open a terminal program on your PC (e.g. HyperTerminal). Verify that the scale is in "Dialog" Mode and the settings of both interface of the scale and PC correspond.

Depending on your location you may need to send the SICS command "DSK_US" (for USA and Canada) or "DSK_EU" (for all other countries) to the scale. The scale will send back "DSK_A". This means that the command had been executed successfully. If this is not the case, please re-check the connection between scale and PC as well as the interface settings and repeat this procedure again. To inquire the current status of the "DSK", send the SICS command "DSK". Note that each SICS command must be terminated with CRLF (carriage return, linefeed).

7.17 Preparing weighing systems for certification

Preparing weighing systems for certification requires the following steps:

1. Make sure the **capacity** (weighing range) and **resolution** of the weighing system (entered in the technician setup) comply with with the certificate of conformance that applies to your country.

   The respective settings are described in the following chapters:

   Capacity: Chapter 7.8.4
   Resolution: Chapter 7.8.5

2. Make sure the **GEO value** (geographical adjustment value, entered in the technician setup) corresponds to your region.

   The respective setting is described in the following chapters:

   – Chapter 7.9

3. In the technician setup declare the weighing system to be "certifiable". **Admissibility for certification** to "NTEP" or "OIML" is available, depending on national legislation.

   The respective setting is described in the following chapters:

   – Chapter 7.4

4. Install the "**certification set**" available as an optional upgrade kit (part no. 21203903).

8 Additional information

8.1 Technical data and tolerances

8.1.1 Certifiable and certified compact scales with strain gauge load cells

The following data apply to all certifiable or certified compact scales with strain gauge load cells.

Scale capacity	3 kg / 6 lb	6 kg / 12 lb	15 kg / 30 lb	35 kg / 70 lb	60 kg / 120 lb
Weighing range	3.000 kg / 6.000 lb	6.000 kg / 12.000 lb	15.000 kg / 30.000 lb	35.000 kg / 70.000 lb	60.000 kg / 120.000 lb
Resolution (acc. NTEP)	6000d	6000d	7500d / 6000d	7000d	6000d
Certification class	III	III	III	III	III
Readability (certifiable)	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb	0.002 kg / 0.005 lb	0.005 kg / 0.01 lb	0.01 kg / 0.02 lb
Linearity	+/–0.00005 kg +/–0.0001 lb +/–0.00015 kg** +/–0.0003 lb**	+/–0.000 1kg +/–0.0002 lb +/–0.0002 kg** +/–0.0005 lb**	+/–0.0002 kg +/–0.0005 lb +/–0.0002 kg** +/–0.0005 lb**	+/–0.0005 kg +/–0.001 lb +/–0.0005 kg** +/–0.001 lb**	+/–0.001 kg +/–0.002 lb +/–0.001 kg** +/–0.002 lb**
Repeatability s	0.00005 kg / 0.0001 lb 0.00015 kg / 0.0003 lb**	0.0001 kg / 0.0002 lb 0.0002 kg / 0.0005 lb**	0.0002 kg / 0.0005 lb 0.0002 kg / 0.0005 lb**	0.0005 kg / 0.001 lb 0.0005 kg / 0.001 lb**	0.001 kg / 0.002 lb 0.001 kg / 0.002 lb**
Calibration weight (full load)	3 kg	6 kg	15 kg	35 kg	60 kg
Min. calibration weight 1)	0.1 kg / 0.1 lb	0.1 kg / 0.2 lb	0.2 kg / 0.3 lb	0.4 kg / 0.7 lb	0.6 kg / 1.2 lb
Overload stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Corner load stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Corner load test weight	1 kg / 2 lb	2 kg / 4 lb	5 kg / 10 lb	11.7 kg /23.3 lb	20 kg / 40 lb
Corner load tolerance	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb	0.002 kg / 0.005 lb	0.005 kg / 0.01 lb	0.01 kg / 0.02 lb

* With approved scales the overload display may only appear when the load is more then 9d above the maximum load

** For scales with protection degree IP65 (BBA425)

1) Certified/certifiable scales should be calibrated under full load.

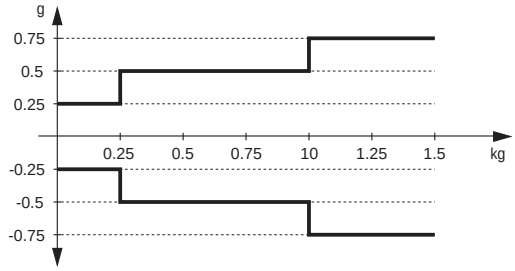
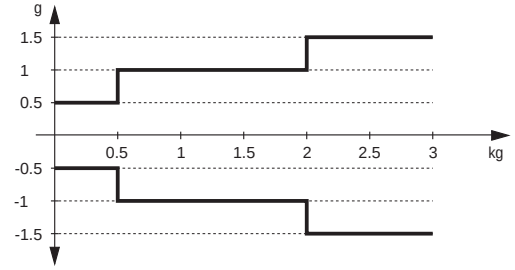
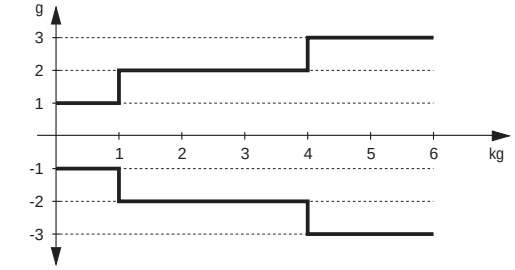
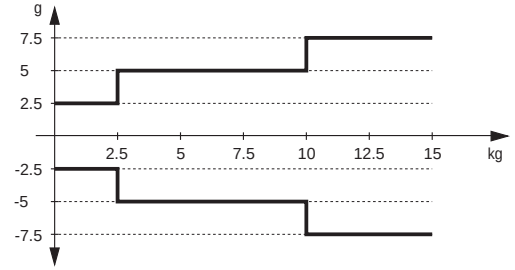
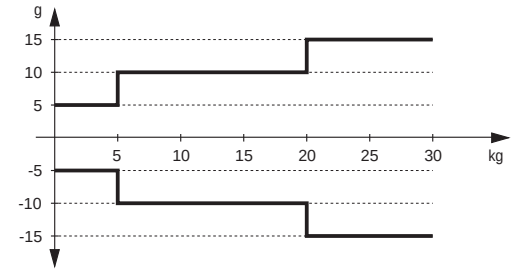
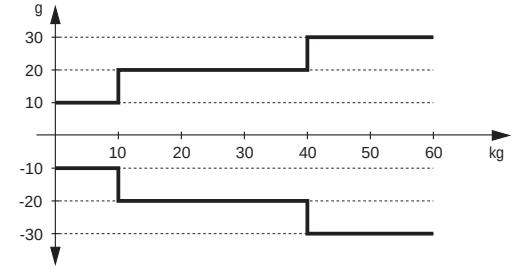
Note on linearity

The linearity of certified or certifiable scales must be verified at 0%, 50% and 100% of the full load. Tolerances are given in the following calibration diagrams.

If there are not enough test weights available to verify the linearity at 0%, 50% and 100% of the full load, then the preset values can be changed.

Note on calibration

Certified/certifiable scales should be calibrated under full load. For the limits of permissible calibration errors for each weighing range, refer to the diagrams on the next page.

Weighing range	Readability	e value	Certification diagram
1.5 kg	0.0005 kg	0.0005 kg	
3 kg	0.001 kg	0.001 kg	
6 kg	0.002 kg	0.002 kg	
15 kg	0.005 kg	0.005 kg	
35 kg	0.01 kg	0.01 kg	
60 kg	0.02 kg	0.02 kg	

8.1.2 Non-certifiable compact scales with strain gauge load cells

The following data apply to all non-certifiable compact scales with standard strain gauge load cells

Scale capacity	3 kg / 6 lb	6 kg / 12 lb	15 kg / 30 lb	35 kg / 70 lb	60 kg / 120 lb
Weighing range	3.000 kg / 6.000 lb	6.000 kg / 12.000 lb	15.000 kg / 30.000 lb	35.000 kg / 70.000 lb	60.000 kg / 120.000 lb
Resolution	15000d / 12000d	12000d	15000d	17500d / 14000d	12000d
Certification class	–	–	–	–	–
Readability (standard)	0.0002 kg / 0.0005 lb	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb	0.002 kg / 0.005 lb	0.005 kg / 0.01 lb
Linearity	+/–0.00005 kg +/–0.0001 lb +/–0.00015 kg* +/–0.0003 lb*	+/–0.0001 kg +/–0.0002 lb +/–0.0002 kg* +/–0.0005 lb*	+/–0.0002 kg +/–0.0005 lb +/–0.0002 kg * +/–0.0005 lb*	+/–0.0005 kg +/–0.001 lb +/–0.0005 kg* +/–0.001 lb*	+/–0.001 kg +/–0.002 lb +/–0.001 kg* +/–0.002 lb*
Repeatability s	0.00005 kg / 0.0001 lb 0.00015 kg / 0.0003 lb*	0.0001 kg / 0.0002 lb 0.0002 kg / 0.0005 lb*	0.0002 kg / 0.0005 lb 0.0002 kg / 0.0005 lb*	0.0005 kg / 0.001 lb 0.0005 kg / 0.001 lb*	0.001 kg / 0.002 lb 0.001 kg / 0.002 lb*
Calibration weight (full load)	3 kg	6 kg	15 kg	35 kg	60 kg
Min. calibration weight	0.1 kg / 0.1 lb	0.1 kg / 0.2 lb	0.2 kg / 0.3 lb	0.4 kg / 0.7 lb	0.6 kg / 1.2 lb
Overload stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Corner load stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Corner load test weight	1 kg / 2 lb	2 kg / 4 lb	5 kg / 10 lb	11.7 kg / 23.3 lb	20 kg / 40 lb
Corner load tolerance	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb	0.002 kg / 0.005 lb	0.005 kg / 0.01 lb	0.01 kg / 0.02 lb

* For scales with protection degree IP65 (BBA425)

Note on calibration

It is recommended that non-certifiable scales are also calibrated under full load. If required, however, these can also be calibrated at less than full load (minimum approx. 25% of full load). The calibration tolerance given in the table applies to calibration under full load. It is reduced in proportion to the calibration weight used.

Note on linearity

The linearity of noncertified scales must be verified at 0%, 50% and 100% of the full load. Tolerances are given in the calibration diagrams in the preceding subsection.

If there are not enough test weights available to verify the linearity at 0%, 50% and 100% of the full load, then the preset values can be changed.

8.1.3 Certifiable and certified compact scales with MonoBloc load cells

The following data apply to all certifiable and certified compact scales with MonoBloc load cells

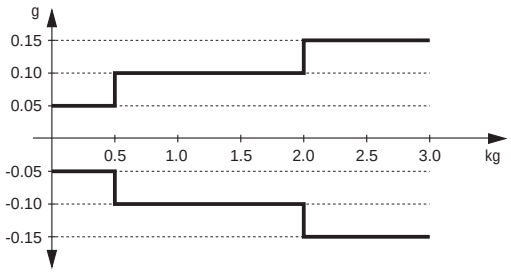
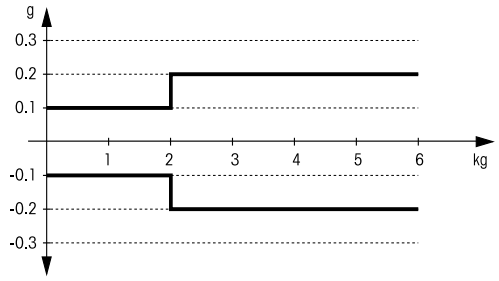
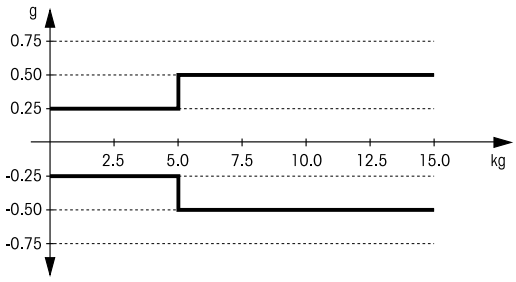
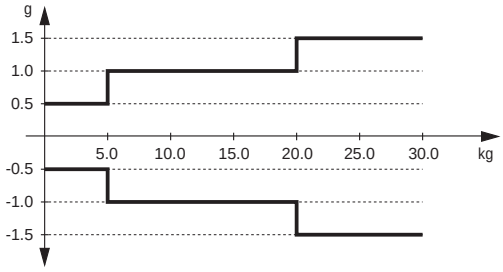
Scale capacity	3 kg / 6 lb	6 kg / 12 lb	15 kg / 30 lb	35 kg / 70 lb
Weighing range	3.000 kg / 6.000 lb	6.000 kg / 12.000 lb	15.000 kg / 30.000 lb	35.000 kg / 70.000 lb
Resolution (acc. NTEP)	30000d	30000d / 24000d	30000d	35000d
Certification class	II	II	II	II
Verification value	0.0001 kg / 0.0002 lb	0.0002 kg / 0.0005 lb	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb
Readability (standard)	0.00001 kg / 0.00002 lb	0.00002 kg / 0.00005 lb	0.00005 kg / 0.0001 lb	0.0001 kg / 0.0002 lb
Linearity	+/–0.00002 kg / 0.00004 lb	+/–0.0001 kg / 0.0002 lb	+/–0.0001 kg / 0.0002 lb	+/–0.0001 kg / 0.0002 lb
Repeatability s	0.000008 kg / 0.000016 lb	0.00008 kg / 0.00016 lb	0.00008 kg / 0.00016 lb	0.00008 kg / 0.00016 lb
Calibration weight (full load)	3 kg	6 kg	15 kg	35 kg
Min. calibration weight	0.1 kg / 0.1 lb	0.1 kg / 0.2 lb	0.2 kg / 0.3 lb	0.4 kg / 0.7 lb
Overload stop, small platform Overload stop, large platform	fixed, not adjustable –	fixed, not adjustable –	– 0.3 mm	– 0.3 mm
Corner load stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Weight class	F1	F1	F1	F1
Corner load test weight	1 kg / 2 lb	2 kg / 4 lb	5 kg / 10 lb	12 kg /23 kg
Corner load tolerance	0.0001 kg / 0.0002 lb	0.0002 kg / 0.0005 lb	0.0005 kg / 0.001 lb	0.001 kg / 0.002 lb

Note on calibration

Certified/certifiable scales should be calibrated under full load. For the limits of permissible calibration errors for each weighing range, refer to the diagrams on the next page.

Note on linearity

The linearity of certified or certifiable scales must be verified at 0%, 25%, 50%, 75% and 100% of the full load. Tolerances are given in the following calibration diagrams.
If there are not enough test weights available to verify the linarity at 0%, 25%, 50%, 75% and 100% of the full load, then the preset values can be changed.

Scale	Readability	e value	Certification diagram
3 kg	0.00001 kg	0.0001 kg	
6 kg	0.0002 kg	0.0002 kg	
15 kg	0.0005 kg	0.0005 kg	
35 kg	0.0001 kg	0.0001 kg	

8.1.4 Non-certifiable compact scales with MonoBloc load cells

The following data apply to all non-certifiable compact scales with MonoBloc load cells

Scale capacity	3 kg / 6 lb	6 kg / 12 lb	15 kg / 30 lb	35 kg / 70 lb
Weighing range	3.000 kg / 6.000 lb	6.000 kg / 12.000 lb	15.000 kg / 30.000 lb	35.000 kg / 70.000 lb
Resolution	300000d	300000d / 240000d	300000d	350000d
Certification class	–	–	–	–
Readability (standard)	0.00001 kg / 0.00002 lb	0.00002 kg / 0.00005 lb	0.00005 kg / 0.0001 lb	0.0001 kg / 0.0002 lb
Linearity	+/–0.00002 kg / 0.00004 lb	+/–0.0001 kg / 0.0002 lb	+/–0.0001 kg / 0.0002 lb	+/–0.0001 kg / 0.0002 lb
Repeatability s	0.000008 kg / 0.000016 lb	0.00008 kg / 0.00016 lb	0.00008 kg / 0.00016 lb	0.00008 kg / 0.00016 lb
Calibration weight (full load)	3 kg	6 kg	15 kg	35 kg
Min. calibration weight	0.1 kg / 0.1 lb	0.1 kg / 0.2 lb	0.2 kg / 0.3lb	0.4 kg / 0.7 lb
Overload stop, small platform Overload stop, large platform	fixed, not adjustable –	fixed, not adjustable –	– 0.3 mm	– 0.3 mm
Corner load stop	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable	fixed, not adjustable
Corner load test weight	1 kg / 2 lb	2 kg / 4 lb	5 kg / 10 lb	12 kg /23 lb
Corner load tolerance	0.0001 kg / 0.0002 lb	0.0002 kg / 0.0005 lb	0.0005 kg /0.001 lb	0.001 kg / 0.002 lb

Note on calibration

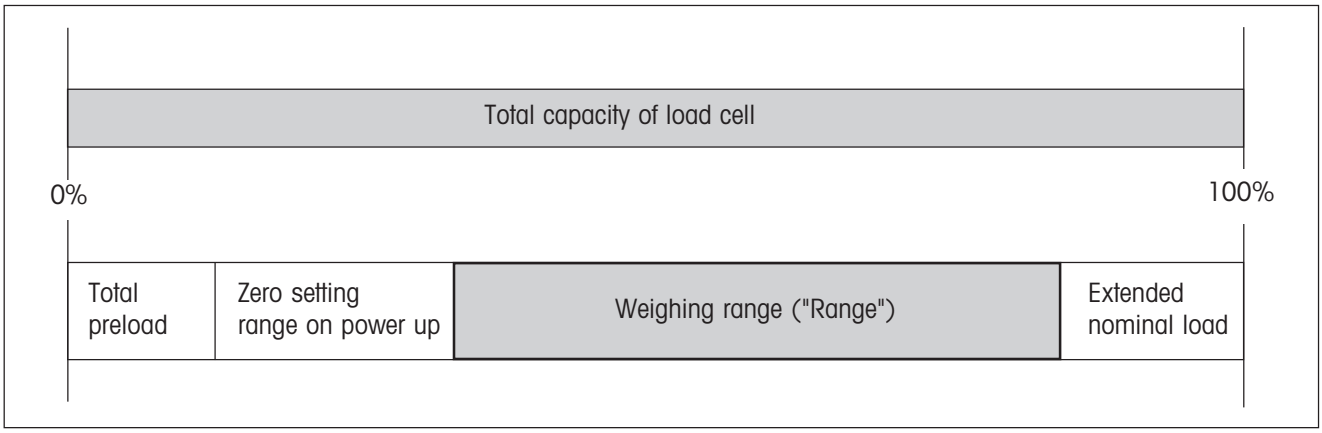
It is recommended that non-certifiable scales are also calibrated under full load. If required, however, these can also be calibrated at less than full load (minimum approx. 25% of full load). The calibration tolerance given in the table applies to calibration under full load. It is reduced in proportion to the calibration weight used.

Note on linearity

The linearity of non-certified scales must be verified at 0%, 25%, 50%, 75% and 100% of the full load. Tolerances are given in the calibration diagrams in the preceding subsection.
If there are not enough test weights available to verify the linearity at 0%, 25%, 50%, 75% and 100% of the full load, then the preset values can be changed.

8.2 Notes on load cell capacities

The following diagram is a schematic summary of the distribution of the total capacity of a load cell.



Total capacity of load cell

The total capacity of the load cell is the combined sum of the weighing range, the total preload, the zero setting range and any extended nominal load (if any).

Total preload

The sum of all fittings and equipment that are acting on the load cell upon calibration (load plate support, load plate, roller track, etc.).

Zero setting range on power-up

The menu for service technicians offers a choice of two zero setting ranges (–2%/18% or –2%/2%).

Weighing range

The weighing range ("Range") is specified in the technician mode (Chapter 7). Dual-range scales have two weighing ranges.

Note: If the resolution for certifiable scales is set to "e = 10d" in the technician mode, then the last decimal place of the weighing result is shown in brackets (parentheses). These indicate that the last decimal position is not considered for the calibration tolerance. If the resolution is set to "e = d", then the weighing result is shown without parentheses.

8.3 Overview of load cells and preloads

8.3.1 Strain gauge load cells

Model	Weighing pan	Weighing range	Replacement cell no.	Preload load plate support	Preload weighing pan	Total of load plate support and weighing pan	Mechanical preload reserve	Preload reserve switch-on zero (18% of weighing range) *	Cell capacity
Px (small)	7.9" x 9.5"	3 kg 6 lb	21203873	0.280 kg 0.620 lb	0.54 kg 1.19 lb	0.82 kg 1.81 lb	1.18 kg 3.19 lb	0.54 kg 1.08 lb	5 kg 11 lb
Px (small)	7.9" x 9.5"	6 kg 12 lb	21203874	0.280 kg 0.620 lb	0.54 kg 1.19 lb	0.82 kg 1.81 lb	3.18 kg 8.19 lb	1.08 kg 2.16 lb	10 kg 22 lb
Sx (large)	9.5" x 13.8"	15 kg 30 lb	21203885	0.84 kg 1.85 lb	0.88 kg 1.94 lb	1.72 kg 3.79 lb	3.28 kg 10.21 lb	2.7 kg 5.4 lb	20 kg 44 lb
Sx (large)	9.5" x 13.8"	35 kg 70 lb	21203886	0.84 kg 1.85 lb	0.88 kg 1.94 lb	1.72 kg 3.79 lb	13.28 kg 36.21 lb	6.3 kg 12.6 lb	50 kg 110 lb
Sx (large)	9.5" x 13.8"	60 kg 120 lb	21203887	0.84 kg 1.85 lb	0.88 kg 1.94 lb	1.72 kg 3.79 lb	38.28 kg 96.21 lb	10.8 kg 21.6 lb	100 kg 220 lb

* On certified scales the switch-on zero range is +/–2 % of the weighing range

8.3.2 MonoBloc load cells

Model	Weighing pan	Weighing range	Replacement cell no.	Preload load plate support	Preload weighing pan	Total of load plate support and weighing pan	Mechanical preload reserve	Preload reserve switch-on zero (18% of weighing range) *	Cell capacity
Px (small)	6.5" x 6.5"	3 kg 6 lb	11102685	0.320 kg 0.710 lb	0.21 kg 0.46 lb	0.53 kg 1.17 lb	0.57 kg 1.87 lb	0.54 kg 1.08 lb	4.10 kg 9.04 lb
Px (small)	7.9" x 9.5"	6 kg 12 lb	11102686	0.280 kg 0.620 lb	0.54 kg 1.19 lb	0.82 kg 1.81 lb	3.18 kg 8.19 lb	1.08 kg 2.16 lb	10.00 kg 22.00 lb
Sx (large)	9.5" x 13.8"	15 kg 30 lb	11102687	0.84 kg 1.85 lb	0.88 kg 1.94 lb	1.72 kg 3.79 lb	27.28 kg 63.21 lb	2.7 kg 5.4 lb	44.00 kg 97.00 lb
Sx (large)	9.5" x 13.8"	35 kg 70 lb	11102687	0.84 kg 1.85 lb	0.88 kg 1.94 lb	1.72 kg 3.79 lb	7.28 kg 23.21 lb	6.3 kg 12.6 lb	44.00 kg 97.00 lb

* On certified scales the switch-on zero range is +/–2 % of the weighing range

8.4 Notes on attaching weighing platforms to terminals and to the optional analog interface of compact scales

All analog weighing platforms can be attached to terminals if they conform to the required specifications (see below). The standard delivery of the terminal includes an appropriate Sub D connector for the weighing platform.

A second weighing platform can be attached to terminals and scales equipped with the **optional analog interface** (applications 43., 44. and 46. only). Compact two-scale systems can therefore be constructed using just one terminal or scale.

The standard interface for the weighing platform as well as the optional analog interface for a second weighing platform employ 9-pin Sub D sockets located on the rear of the terminal or the scale, respectively.

8.4.1 Requirements for the weighing cell

Nominal load	0.1 ... 999 999.9 (g, kg, lb, oz, t)
Admissible impedance	80 Ohm Measure between Si+ and Si– or Ex+ and Ex– while weighing cell is disconnected
Differential signal	–1 mV ... 25 mV (see example below)

Example for calculating the differential signal:

Data of the weighing cell: sensitivity of 2 mV/V and cell capacity of 100 kg

Calculating the **differential signal for nom. load** (60 kg): 2 mV/V • 8.2 V • 60 kg/100 kg = 9.84 mV

Calculating the **differential signal for half load** (30 kg): 2 mV/V • 8.2 V • 30 kg/100 kg = 4.92 mV

Requirements for certifiable scales

- Certifiable weighing cell with SENSE lines (6 wires), sensitivity of the cell of 2 mV/V or 3 mV/V.
- The scale must be configured in the technician setup as certifiable.
- Approved markings from the manufacturer.

8.4.2 Selecting the weighing cell(s)

The following data must be known in order to determine the capacity of the weighing cell:

- **Scale capacity**: This generally corresponds to the heaviest load that is to be weighed with the weighing system.
- **Preload**: This is the total weight of all parts applied to the weighing cell. This includes the upper part of the weighing platform, the weighing pan and all other components such as a roller track, a fixed weighing container, etc.
- **Total zero setting range**: This consists of the switch-on zero setting range and the zero setting range that the user has available with the →0← key.

The sum of the weighing capacity, preload and total zero setting range thus gives the total capacity of the weighing cell required. An additional safety margin should also be included in order to prevent weighing cells from being overloaded.

Total capacity of weighing cell(s) = scale capacity + preload + total zero setting range + safety margin

For **systems with several weighing cells**, the total theoretical capacity is divided by the number of cells (max. 4) in order to determine the capacity of the individual cell. A sufficient safety margin is especially important if the weighing platform is heavily loaded in the corner areas so that the load is no longer evenly distributed over all cells.

For **systems with lever mechanisms**, the total theoretical capacity is divided by the transmission ratio of the lever system in order to determine the capacity of the cell.

When selecting the weighing cell(s), other parameters are also to be taken into account. These include:

– the smallest display step desired
– requirements for admissibility for certification
– number and type of weighing ranges

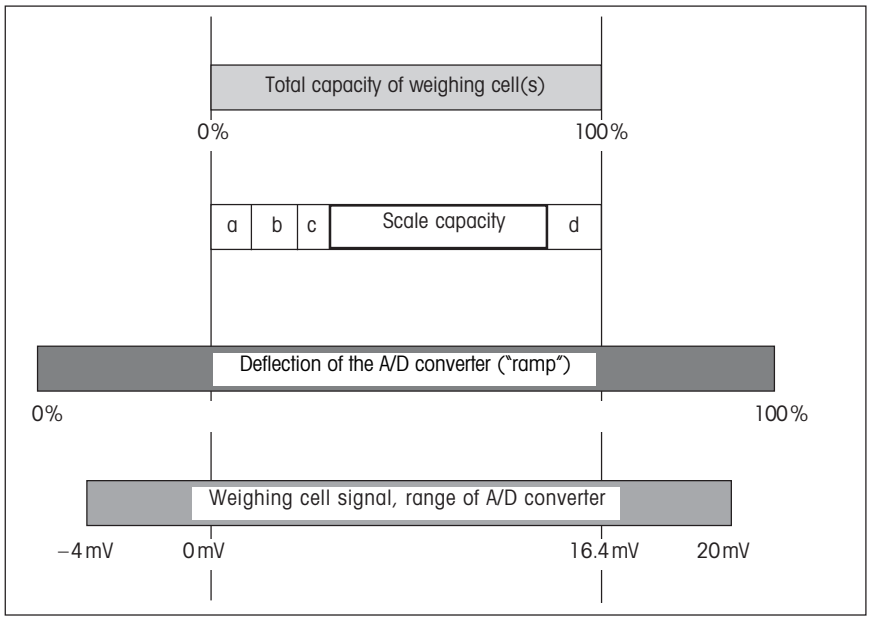
The terminal supplies a **voltage** of 8.2 V to the weighing cell(s). The **maximum weighing signal** is determined by multiplying the power supply voltage by the sensitivity of the weighing cell:

Sensitivity of the cell	2 mv/V	3 mv/V
Power supply voltage	8.2 V	8.2 V
Max. weighing signal [1)]	16.4 mV	24.6 mV [1)]
Min. weighing signal per display step (for certifiable weighing systems)	1.3 µV/e	1.3 µV/e

1) Only 20 mV measurable by the A/D converter, so that scale capacity is only max. 81% of the cell capacity.

8.4.3 Measuring ranges of the terminals and scales

When setting up a weighing system, consider the measuring ranges of the terminals and scales according to the summary given below.



a: Total preload applied to weighing cell when calibrating (upper part of platform, weighing pan, roller track, etc.)

b: Switch-on zero capturing range (adjustable in the menu)

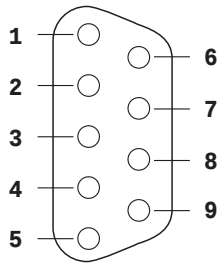
c: Zero setting range with →0← key (adjustable in the menu)

d: Safety margin

8.4.4 Attaching the weighing platform

The illustration at left shows the numbering of the individual pins of the Sub D sockets at the back of the terminal or scale (looking onto the socket). The pin assignment of the interface is shown in the following table. The pin assignment is the same for the standard weighing platform interface and the optional analog interface for a second weighing platform.

Pin assignment

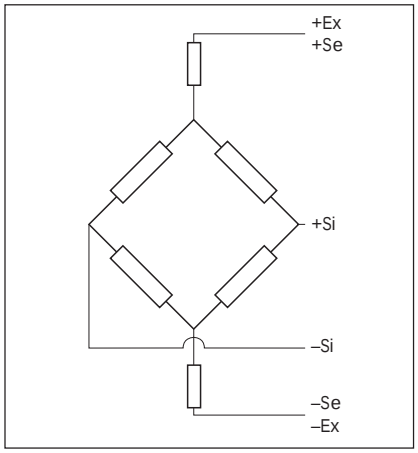


Pin	Assignment
Pin 1	+ Excitation (+8.2 V)
Pin 2	+ Sense
Pin 3	Shield
Pin 4	– Sense
Pin 5	– Excitation (GND)
Pin 6	not assigned
Pin 7	+ Signal
Pin 8	– Signal
Pin 9	not assigned

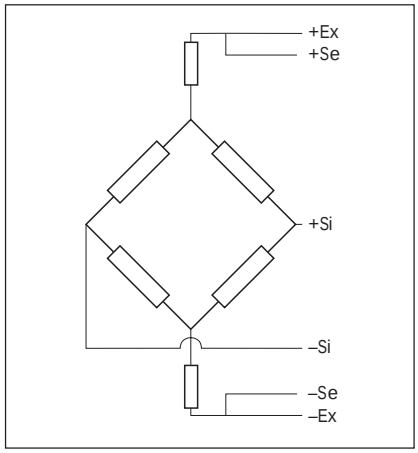
Solder the wires of the weighing platform to the appropriate pins of the Sub D connector observing the wiring scheme supplied with the weighing platform.

Important: In case the weighing platform employs a measuring cell without SENSE lines, pins 1 (+ Excitation) and 2 (+ Sense) must be short-circuited at the Sub D connector, as well as pins 5 (– Excitation) and 4 (– Sense).

Cells without SENSE lines



Cells with SENSE lines
(required for certifiable weighing systems)



Plug the Sub D connector of the weighing platform into the appropriate socket of the terminal or scale (standard weighing platform socket or socket of optional analog interface). **Note**: Connecting a second weighing platform to the optional analog interface of IND4.. terminals assumes that a primary weighing platform is already attached to the standard interface of the terminal.

Attaching weighing platforms with several weighing cells

Up to 4 weighing cells can be connected in parallel to a terminal. These weighing cells can be connected in the usual way using a junction box.

The sum of the rated capacities of the individual cells corresponds to the total capacity of the weighing system. When entering the weighing capacities in the menu-driven dialog (section 7 of this Service Manual), the values should be selected so that the individual cells are not overloaded!

8.4.5 Connection of a second weighing platform to the analog option

The analog option, which allows the connection of a second weighing platform, is housed in the OptionPac. The connection of a second weighing platform to the analog option requires that a weighing platform already be connected to the terminal.
The analog second weighing platform is connected directly to the OptionPac via a 9-pin Sub-D connector.
METTLER TOLEDO offers analog weighing platforms that are already equipped with a connector that is suitable for connection to the analog option, so that no installation work is required.

Pin	Assignment
1	+ Excitation (+8,2 VDC)
2	+ Sense
3	Shield
4	– Sense
5	– Excitation
6	not assigned
7	+ Signal
8	– Signal
9	not assigned

Connection of analog weighing platforms without suitable connector
Connect analog weighing platforms that do not have a suitable connector to the analog option in accordance with the adjacent connection assignment. Also observe the connection assignment of the weighing platform.

Important: The analog second weighing platform is configured as a reference scale in the factory setting. "Bulk" (bulk scale) or "Auxiliary" (auxiliary scale) can furthermore be selected in the interface menu "COMMUNICATION –> Option –> Mode". The weighing platform can be deactivated with the "Bypass" setting.
Then calibrate the weighing platform ("SCALE 2").

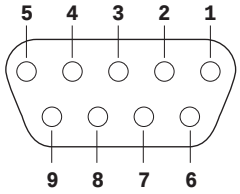
8.5 Table of geo values

Geographical latitude in the northern or southern hemisphere in degrees and minutes	Elevation above sea level in meters										
	0	325	650	975	1300	1625	1950	2275	2600	2925	3250
	325	650	975	1300	1625	1950	2275	2600	2925	3250	3575
	Elevation above sea level in feet										
	0	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660
	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660	11730
0° 0' - 5° 46'	5	4	4	3	3	2	2	1	1	0	0
5° 46' - 9° 52'	5	5	4	4	3	3	2	2	1	1	0
9° 52' - 12° 44'	6	5	5	4	4	3	3	2	2	1	1
12°44' - 15° 6'	6	6	5	5	4	4	3	3	2	2	1
15° 6' - 17° 10'	7	6	6	5	5	4	4	3	3	2	2
17°10' - 19° 2'	7	7	6	6	5	5	4	4	3	3	2
19° 2' - 20° 45'	8	7	7	6	6	5	5	4	4	3	3
20°45' - 22° 22'	8	8	7	7	6	6	5	5	4	4	3
22°22' - 23° 54'	9	8	8	7	7	6	6	5	5	4	4
23°54' - 25° 21'	9	9	8	8	7	7	6	6	5	5	4
25°21' - 26° 45'	10	9	9	8	8	7	7	6	6	5	5
26°45' - 28° 6'	10	10	9	9	8	8	7	7	6	6	5
28° 6' - 29° 25'	11	10	10	9	9	8	8	7	7	6	6
29°25' - 30° 41'	11	11	10	10	9	9	8	8	7	7	6
30°41' - 31° 56'	12	11	11	10	10	9	9	8	8	7	7
31°56' - 33° 9'	12	12	11	11	10	10	9	9	8	8	7
33° 9' - 34° 21'	13	12	12	11	11	10	10	9	9	8	8
34°21' - 35° 31'	13	13	12	12	11	11	10	10	9	9	8
35°31' - 36° 41'	14	13	13	12	12	11	11	10	10	9	9
36°41' - 37° 50'	14	14	13	13	12	12	11	11	10	10	9
37°50' - 38° 58'	15	14	14	13	13	12	12	11	11	10	10
38°58' - 40° 5'	15	15	14	14	13	13	12	12	11	11	10
40° 5' - 41° 12'	16	15	15	14	14	13	13	12	12	11	11
41°12' - 42° 19'	16	16	15	15	14	14	13	13	12	12	11
42°19' - 43° 26'	17	16	16	15	15	14	14	13	13	12	12
43°26' - 44° 32'	17	17	16	16	15	15	14	14	13	13	12
44°32' - 45° 38'	18	17	17	16	16	15	15	14	14	13	13
45°38' - 46° 45'	18	18	17	17	16	16	15	15	14	14	13
46°45' - 47° 51'	19	18	18	17	17	16	16	15	15	14	14
47°51' - 48° 58'	19	19	18	18	17	17	16	16	15	15	14
48°58' - 50° 6'	20	19	19	18	18	17	17	16	16	15	15
50° 6' - 51° 13'	20	20	19	19	18	18	17	17	16	16	15
51°13' - 52° 22'	21	20	20	19	19	18	18	17	17	16	16
52°22' - 53° 31'	21	21	20	20	19	19	18	18	17	17	16
53°31' - 54° 41'	22	21	21	20	20	19	19	18	18	17	17
54°41' - 55° 52'	22	22	21	21	20	20	19	19	18	18	17
55°52' - 57° 4'	23	22	22	21	21	20	20	19	19	18	18
57° 4' - 58° 17'	23	23	22	22	21	21	20	20	19	19	18
58°17' - 59° 32'	24	23	23	22	22	21	21	20	20	19	19
59°32' - 60° 49'	24	24	23	23	22	22	21	21	20	20	19
60°49' - 62° 9'	25	24	24	23	23	22	22	21	21	20	20
62° 9' - 63° 30'	25	25	24	24	23	23	22	22	21	21	20
63°30' - 64° 55'	26	25	25	24	24	23	23	22	22	21	21
64°55' - 66° 24'	26	26	25	25	24	24	23	23	22	22	21
66°24' - 67° 57'	27	26	26	25	25	24	24	23	23	22	22
67°57' - 69° 35'	27	27	26	26	25	25	24	24	23	23	22
69°35' - 71° 21'	28	27	27	26	26	25	25	24	24	23	23
71°21' - 73° 16'	28	28	27	27	26	26	25	25	24	24	23
73°16' - 75° 24'	29	28	28	27	27	26	26	25	25	24	24
75°24' - 77° 52'	29	29	28	28	27	27	26	26	25	25	24
77°52' - 80° 56'	30	29	29	28	28	27	27	26	26	25	25
80°56' - 85° 45'	30	30	29	29	28	28	27	27	26	26	25
85°45' - 90° 00'	31	30	30	29	29	28	28	27	27	26	26

8.6 Interface data

BBA/BBK4.. compact scales and IND4.. terminals are fitted as standard with one RS232C interface (DIN 66020; CCITT V24/ V.28). They are optionally available with an additional interface (RS2323, RS485/422, Ethernet, USB, Digital I/O or analog second scale interface (Count, Count+)). BBA/BBK462 and IND465 are supplied as standard with 3 RS232C interfaces and one PS2 keyboard interface. As an option extra further interface combinations are available.

The pins of individual interfaces are assigned as below:



Pin view of connector

RS232C standard interface

Pin	COM1
1	VCC (+5V power supply) 2) 4)
2	TxD 1 (transmit data)
3	RxD 1 (receive data)
4	3)
5	GND (signal ground)
6	3)
7	3)
8	3)
9	3)

Optional interface: RS232C + RS232C

Pin	COM1 (RS232)	COM2 (RS232)
1	1)	1)
2	TxD 1 (transmit data)	TxD 2 (transmit data)
3	RxD 1 (receive data)	RxD 2 (receive data)
4	1)	1)
5	GND (signal ground)	GND (signal ground)
6	1)	1)
7	1)	1)
8	1)	1)
9	VCC (+5V power supply) 2) 4)	VCC (+5V power supply) 2) 4)

1) unassigned

2) The VCC load on one interface must not exceed 100 mA

3) must not be connected

4) can be deactivated in the scale menu

Optional interface: RS232C and analog second scale

Pin	COM1 (RS232)	Analog second scale
1	VCC (power supply +5V) [2) 4)]	+Excitation (+8.2 VDC)
2	TxD 1 (transmit data)	+Sense
3	RxD 1 (receive data)	shield
4	[3)]	–Sense
5	GND (Signal ground)	–Excitation
6	[3)]	[1)]
7	[3)]	+Signal
8	[3)]	–Signal
9	[3)]	[1)]

Optional interface: RS485/422 + RS232C

Pin	COM1 (RS422, 4-wire) [7)]	COM1 (RS485, 2-wire) [7)]	COM2 (RS232)
1	[1)]	[1)]	[1)]
2	TxD–	TxD–/RxD–	TxD 2 (transmit data)
3	RxD–	[1)]	RxD 2 (receive data)
4	[1)]	[1)]	[1)]
5	GND (Signal ground)	GND (Signal ground)	GND (Signal ground)
6	[1)]	[1)]	[1)]
7	TxD+	TxD+ / RxD+	[1)]
8	RxD+	[1)]	[1)]
9	VCC (power supply +5V) [2) 4)]	VCC (power supply +5V) [2) 4)]	VCC (power supply +5V) [2) 4)]

Optional interface: RS232C and Digital I/O

Pin	COM1 (RS232)	COM2 (Digital I/O)
1	[1)]	GND
2	TxD 1 (transmit data)	OUT 0 [6)]
3	RxD 1 (receive data)	OUT 1 [6)]
4	[3)]	OUT 2 [6)]
5	GND (Signal ground)	OUT 3 [6)]
6	[3)]	IN 0 [5)]
7	[3)]	IN 1 [5)]
8	[3)]	IN 2 [5)]
9	VCC (power supply +5V) [2) 4)]	IN 3 [5)]

[1)] unassigned
[2)] The VCC load on one interface must not exceed 100 mA
[3)] must not be connected
[4)] can be deactivated in the scale menu
[5)] External 5 ... 30 VDC for control inputs
[6)] External 5 ... 30 VDC / max. 100 mA for control outputs
[7)] can be switched in the scale menu under "Handshake"

Standard interfaces Smart+: RS232C + RS232C + RS232C

Pin	COM1 (RS232)	COM2 (RS232)	COM3 (RS232)
1	1)	1)	1)
2	TxD 1 (transmit data)	TxD 2 (transmit data)	TxD 3 (transmit data)
3	RxD 1 (receive data)	RxD 2 (receive data)	RxD 3 (receive data)
4	1)	1)	1)
5	GND (Signal ground)	GND (Signal ground)	GND (Signal ground)
6	1)	1)	1)
7	1)	1)	1)
8	1)	1)	1)
9	VCC (power supply +5 V) 2) 4)	VCC (power supply +5 V) 2) 4)	VCC (power supply +5 V) 2)

Optional interfaces Smart+: RS232C + RS232C + RS232C + analog second scale

Pin	COM1/COM2 (RS232) 3)	COM3 (RS232)	Analog second scale
1	VCC 2 (power supply +5V) 2)	1)	+Excitation (+8.2 VDC)
2	TxD 1 (transmit data)	TxD 3 (transmit data)	+Sense
3	RxD 1 (receive data)	RxD 3 (receive data)	shield
4	1)	1)	–Sense
5	GND (Signal ground)	GND (Signal ground)	–Excitation (GND)
6	1)	1)	1)
7	RxD 2 (receive data)	1)	+Signal
8	TxD 2 (transmit data)	1)	–Signal
9	VCC 1 (power supply +5 V) 2) 4)	VCC (power supply +5 V) 2)	1)

Optional interface Smart+: RS485/422 + RS232C + RS232C

Pin	COM1 (RS422, 4-wire)5)	COM1 (RS485, 2-wire)5)	COM2 (RS232)	COM3 (RS232)
1	1)	1)	1)	1)
2	TxD–	TxD– / RxD–	TxD 2 (transmit data)	TxD 3 (transmit data)
3	RxD–	1)	RxD 2 (receive data)	RxD 3 (receive data)
4	1)	1)	1)	1)
5	GND (Signal ground)	GND (Signal ground)	GND (Signal ground)	GND (Signal ground)
6	1)	1)	1)	1)
7	TxD+	TxD+ / RxD+	1)	1)
8	RxD+	1)	1)	1)
9	VCC (power s. +5 V) 2) 4)	VCC (power s. +5 V) 2) 4)	VCC (power s. + 5V) 2) 4)	VCC (power s. +5 V) 2)

1) unassigned
2) The VCC load on one interface must not exceed 100 mA
3) COM2 only possible via Y cable (21203892)
4) can be deactivated in the scale menu
5) can be switched in the scale menu under "Handshake"

Optional interfaces Smart+: RS485/422 + RS232C + analog second scale

Pin	COM1 (RS422, 4-wire)[3]	COM1 (RS485, 2-wire)[3]	COM2 (RS232)	Analog second scale
1	[1]	[1]	[1]	+Excitation (+8.2 VDC)
2	TxD–	TxD– / RxD–	TxD 2 (transmit data)	+Sense
3	RxD–	[1]	RxD 2 (receive data)	shield
4	[1]	[1]	[1]	–Sense
5	GND (Signal ground)	GND (Signal ground)	GND (Signal ground)	–Excitation (GND)
6	[1]	[1]	[1]	[1]
7	TxD+	TxD+ / RxD+	[1]	+Signal
8	RxD+	[1]	[1]	–Signal
9	VCC (power s. +5 V) [2] [4]	VCC (power s. +5 V) [2] [4]	VCC (power s. +5 V) [2]	[1]

Optional interfaces Smart+: RS232C + Digital I/O + RS232C

Pin	COM1 (RS232)	COM2 (Digital I/O)	COM3 (RS232)
1	[1]	GND	[1]
2	TxD 1 (transmit data)	OUT 0 [6]	TxD 3 (transmit data)
3	RxD 1 (receive data)	OUT 1 [6]	RxD 3 (receive data)
4	[1]	OUT 2 [6]	[1]
5	GND (Signal ground)	OUT 3 [6]	GND (Signal ground
6	[1]	IN 0 [5]	[1]
7	[1]	IN 1 [5]	[1]
8	[1]	IN 2 [5]	[1]
9	VCC (power supply +5 V) [2] [4]	IN 3 [5]	VCC (power supply +5 V) [2]

Optional interfaces Smart+: RS232C + Digital I/O + analog second scale

Pin	COM1 (RS232)	COM3 (Digital I/O)	Analog second scale
1	[1]	GND	+Excitation (+8.2 VDC)
2	TxD 1 (transmit data)	OUT 0 [6]	+Sense
3	RxD 1 (receive data)	OUT 1 [6]	shield
4	[1]	OUT 2 [6]	–Sense
5	GND (Signal ground)	OUT 3 [6]	–Excitation (GND)
6	[1]	IN 0 [5]	[1]
7	[1]	IN 1 [5]	+Signal
8	[1]	IN 2 [5]	–Signal
9	VCC (power supply +5V) [2] [4]	IN 3 [5]	[1]

[1] unassigned
[2] The VCC load on one interface must not exceed 100 mA
[3] can be switched in the scale menu under "Handshake"
[4] can be deactivated in the scale menu
[5] External 5 ... 30 VDC für control inputs
[6] External 5 ... 30 VDC / max. 100 mA for control outputs

Standard interface Smart+: PS2

Pin	PS2 (Mini DIN)
1	Data
2	1)
3	GND
4	VCC (+5V power supply) 2)
5	Pulse
6	1)

1) unassigned

2) The VCC load on one interface must not exceed 100 mA

9 Software

9.1 Software architecture

All compact scales and terminals have a Flash memory chip on the digital board, which cannot be replaced. On these scales the software can be loaded into the Flash memory via a PC (see Chapter 9.5).

The type of software depends on the type of scale and on the type of weighing cell (strain gauge or MonoBloc). The various software versions are not compatible with one another. An illegible display can indicate that an incorrect software version is installed. The various models of a particular series with an identical type of weighing cell have identical software (e.g. BBA422 6 kg MonoBloc and BBA422 15 kg MonoBloc).

On powering up, the scale carries out a display test in which the software version is also briefly displayed, e.g.: "4-1.1.07" or "14-1.1.10".

The first digit designates the scale type and weighing cell used:

7-x.x.xx: BBA42x with strain gauge cell and IND425

6-x.x.xx: BBA432 with strain gauge cell and IND435

5-x.x.xx: BBA442 with strain gauge cell and IND445

4-x.x.xx: BBA462 with strain gauge cell and IND465

17-x.x.xx: BBK422 with MonoBloc weighing cell

16-x.x.xx: BBK432 with MonoBloc weighing cell

15-x.x.xx: BBK442 with MonoBloc weighing cell

14-x.x.xx: BBK462 with MonoBloc weighing cell

20-x.x.xx: Optional analog interface (can be inquired only by printing out the menu settings)

The following digits (x.xx) designate the actual software version (e.g. "1.07").

The number after the hyphen identifies the scale capacity, see table. If the scale is not calibrated (Error 6), a space is inserted instead of a number

No.	Capacity	Note
0	3 kg	
1	6 kg	
2	15 kg	
3	35 kg	
4	60 kg	not for BBK4..
5	150 kg	IND4.. only
6	300 kg	IND4.. only
7	600 kg	IND4.. only
8	1500 kg	IND4.. only
9	3000 kg	IND4.. only
A	6000 kg	IND4.. only

The **type data** for a scale are stored in a memory chip (EAROM) **on the analog PCB** (serial number, weighing range, calibration data, etc. and also temperature compensation data for MonoBloc weighing cells). If there is a second weighing platform connected to BBA/BBK/IND465 via the **analog option**, its type data is stored on the **EAROM of the analog option board** (as well as all further settings in the "Scale 2" menu block). If the analog PCB (or analog option board) is replaced, these data no longer match the scale and must be re-entered.

Temperature compensation data (TK data) are also stored on the analog PCB of MonoBloc weighing cells and must be re-entered after replacing the analog PCB (Chapter 9.4).

Note: After replacing the analog PCB of any scale, all user settings must be re-entered as these are also stored on the analog PCB.

9.2 Error messages after service work

In addition to the errors described in the operating instructions, the following error messages may also appear after carrying out service work:

Err 6

No calibration

This error only occurs after reinitializing the EAROM, i.e. after rectifying Error 53.

Remedy: Recalibrate the scale in service mode (Chapter 7).

Err 53

Invalid data in EAROM (checksum error)

This error message indicates defective type data in the EAROM.

Remedy: Completely reset the scale by holding down the →0← key. "Flush" appears in the display. The scale restarts and then indicates Error 6. Re-enter the type data (weighing range, serial number, certification status, geographical adjustment value) in service mode and save them (Chapter 7). Access technician mode again and then calibrate and linearize the scale.

9.3 Deleting the scale data in the EAROM

In an emergency (e.g. an "Error 53") the type data of the scale can be deleted. This data is stored in the EAROM on the analog board. **Note**: This procedure does not erase the TK data of MonoBloc scales (see Chapter 9.4). **Before you delete the scale data, print it out. This makes re-entering it aftwards much easier!**

The data can be deleted as follows:

- Connect the scale to the RS232C interface of a PC using a suitable interface cable (e.g. ME-00410024).
  If the scale has several interfaces, the cable must be connected to the **first** RS232 interface (COM1).
- Set the interfaces of the scale and the PC to the same parameters (protocol, data bits/parity, baud rate). Set the operating mode of the scale interface to "DIALOG".
- Start the communication program on the PC (e.g. "HyperTerminal").
- Enter the following command to delete the data in the EAROM (_ = space character):

  "**FLU_DEL_E2**".
- Teminate the command with <CRLF> (Return). Deletion of the data is briefly confirmed in the display with "Flush", and the scale then re-starts.
- After re-starting, the scale displays "Error 6" (no calibration data). All the type data for the scale must be re-entered and then the scale must be calibrated (see Chapter 7 of this service manual). If the data in the EAROM of the analog board has been deleted, the master mode settings must also be re-entered, since these are also stored in the EAROM.

9.4 Printing out and reloading TK data (MonoBloc versions only)

For scales with **MonoBloc weighing cells**, the weighing cell and analog PCB are usually replaced at the same time as their components are a matching set: the analog PCB contains all the temperature compensation data of the weighing cell (TK data). If only the analog PCB is to be replaced, then please note the following: a printout with the TK data of the weighing cell should be included in every scale. If this is not the case, then these data must be printed out **before the analog PCB is replaced**. Otherwise, the TK data cannot be loaded into the EAROM of the new analog PCB. If, however, only the load cell is to be replaced, then its TK data must be known and loaded into the EAROM of the existing analog PCB.

Printing out the temperature compensation of the measuring cell

If no printout of the weighing cell's TK data is available, then they can be printed out as follows:

```
ITK 1   12222.08
ITK 2   12165.29
ITK 3   12106.70
ITK 4   31842.41
ITK 5   31854.69
ITK 6   31867.59
ITK 7   51455.60
ITK 8   51536.88
ITK 9   51621.13
ITK 10   0.000000
ITK 11   1.500000
ITK 12   3.00000
ITK 13   33610.08
ITK 14   30896.57
ITK 15   27987.87
ITK 16   1

Chksum   :    379172.375
```

- Connect the scale to the serial, USB or Ethernet interface of a PC using a suitable cable.
- Set the interface of the scale and PC to the same parameters (protocol, parity, baud rate). Set the operating mode of the scale interface to "Dialog".
- Start the communications program (e.g. "HyperTerminal") on the PC.
- Enter the SICS command "ITK" and terminate with «CRLF» (Return). The TK data of the weighing cell are read from the EAROM of the analog PCB and transmitted to the PC.
- Print out the TK data from the communications program. The printout will look similar to the example on the left. Keep this printout in the scale!

Note: If the TK data of a weighing cell are not available or cannot be printed out, then these can be supplied by METTLER TOLEDO. The serial number of the weighing cell must then also be stated (sticker on the cell).

Reloading the temperature compensation data

After replacing the analog PCB, the TK data of the weighing cell present must be loaded into the EAROM of the new analog PCB:

- Connect the scale to the RS323C interface of a PC using a null modem cable.
- Set the interface of the scale and PC to the same parameters (protocol, parity, baud rate). Set the operating mode of the scale interface to "Dialog".
- Start the communications program (e.g. "HyperTerminal") on the PC.
- Enter all the TK data according to the printout, and terminate every line with <CRLF> (Return). Example:

  ITK 1 12222.08 <CRLF>

  ITK 2 12165.29 <CRLF>, etc.

  The line "Chksum" must not be entered.
- Enter the command "ITK" for control purposes. The TK data that were entered are then displayed. **Important**: The checksum ("Chksum") must agree with that in the printout. If this is not the case, then one or more TK values were entered incorrectly. The incorrect lines should now be entered correctly (e.g. "ITK9...") and the checksum verified again.

9.5 Loading new scale software into Flash memory

Loading new software into the flash memory chip requires a special program, the so-called FlashLoader for the Microsoft Windows® operating system. You can obtain this program and the latest scale software from METTLER TOLEDO.

The FlashLoader is used to load the software from the PC onto the scale. If for any reason this is not possible, the digital PCB on which the Flash Memory chip is soldered must be replaced (see Section 4/5 of this service manual).

9.5.1 Prerequisites

To be able to transfer the new software to the scale you need the following:

- PC Microsoft Windows® operating system (Version NT 4.0, ME, 2000 or XP)
- Connection cable PC–scale (RS232 cable, 9-pin Sub-D connector m/f, part number 11101051 or 00410024)
- FlashLoader application
- File with new scale software

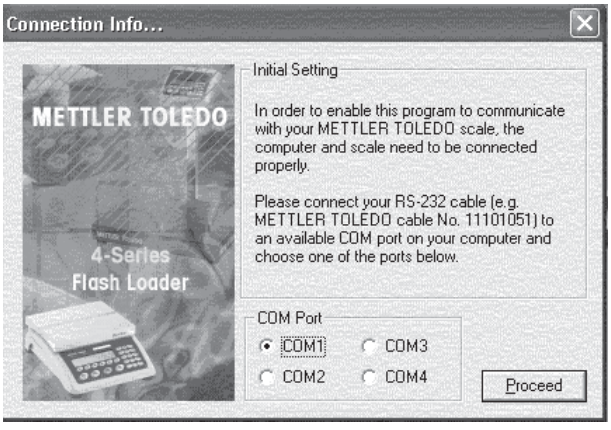
The scale/terminal has to be set to "not certified". For this purpose deactivate the certification by using the certification key, see Section 7.1.2, if necessary.
Install both the FlashLoader and the scale software **in the same folder** on any drive of the Windows PC.

9.5.2 Loading the software onto the scale

Before you can load the software onto the scale, you must connect the scale to the serial interface of the PC with the RS232 cable. **Note**: If the scale has additional optional interfaces, make sure the cable is always connected to the **standard RS232C interface (COM1)**!

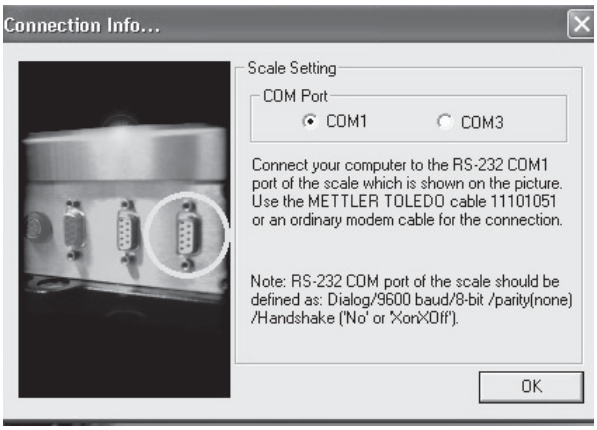
Set the COM1 interface on the scale to the following values:

Operating mode:	Dialog
Data transmission rate:	9600 baud
Data bits/parity:	8 data bits/no parity (“8 none”)
Transmission protocol:	“No” or “Xon/Xoff”



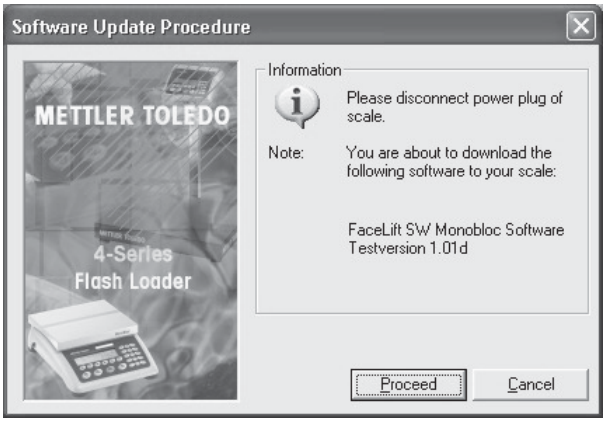
Start the FlashLoader. **The first time it is started** it prompts you to select the interface of the PC to which the scale is connected.

When you have selected the respective interface, click the “Proceed” button.



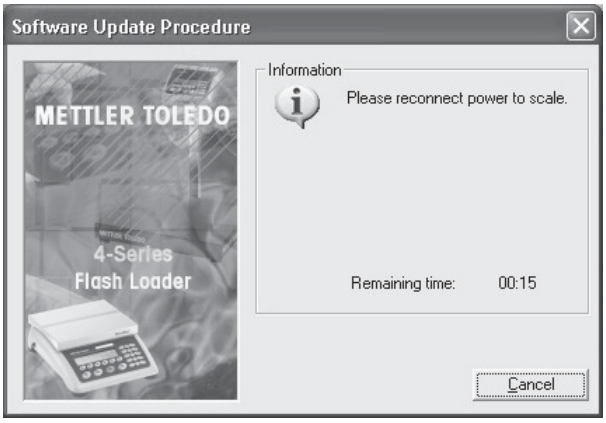
You will then be prompted to connect the interface cable to the first serial interface of the scale (COM1).

Answer the query on the loss of current data with "Proceed" to start loading the new software. You can still cancel the process at this point with "Cancel".



De-energize scale or terminal (disconnect power plug) and confirm with "Proceed".

The **"Start Software Update Procedure..."** mesage appears.



After loading, reconnect the scale or terminal to the power supply.

Exit the FlashLoader when the **"The scale is now programmed"** message appears.

9.5.3 Software for Remote application

You can acquire the software for the Remote application (BBA462 Remote, BBK462 Remote and IND465 Remote) from Support.SQC@mt.com.

22011358B

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