

Service manual

METTLER-TOLEDO **Electronic precision scales** **SM/PJ serie**

Current status of the service manual, see section E

SM3000 / SM6000

SM12 / SM15 / SM15000

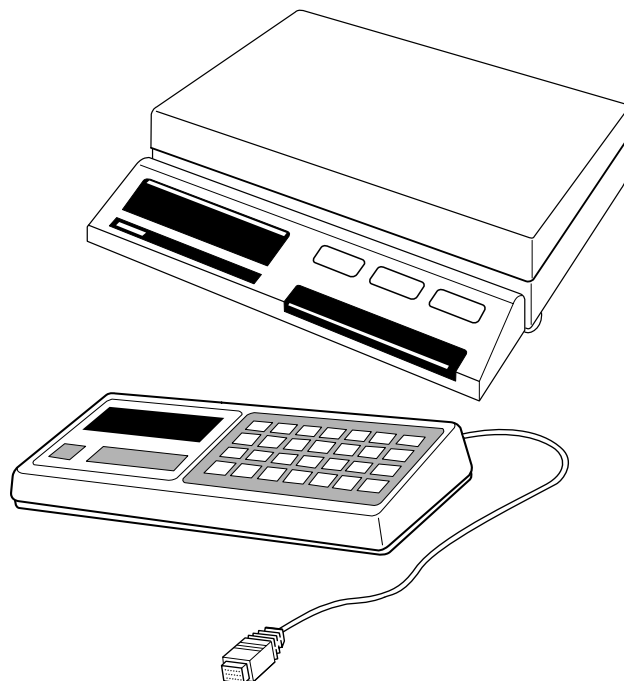
SM1220 DeltaRange

SM1520 DeltaRange

SM-AF / SM-AL

PJ12 / PJ15

PJ1220 DeltaRange



P702434

Spare parts

Exploded view diagrams
Spare parts lists
Packings
Tools

Checking

Checklists
ServicePacs

Troubleshooting

Troubleshooting
Error messages
Checking voltages

Repairs and adjustment

Repairs
Settings
Adjustment

Service bulletins

Supplements

Data section

Customized configuration
Technical data and adjustment tolerances
Special types and certified scales
Component diagrams and schemes

Organization of the service manual

The service manual contains instructions for the service engineer.

To facilitate your search for a particular topic, the binder is divided into different parts (sections).

The first page of each part comprises a table of contents.

The top of each page carries the designation of the appropriate subsection and part.

The page numbering of each part always starts with 1.

Update of summer 1990

In addition to changes in the design and improvements in the software, the following new simple applications have been introduced:

- Net total scale with **NetEasy-M** program cassette.
- Statistics scale with **StatEasy-M** program cassette.
- Counting scale with **CountEasy-M**. program cassette

How to use this documentation efficiently

Exploded view diagrams

The exploded view diagrams serve as an assembly and orientation aid as well as to determine the spare part numbers.

Spare parts lists

Spare parts must be ordered using the information given in the spare parts list. The spare parts list specifies the order numbers of the parts itemized in the exploded view diagram.

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1. Exploded view diagrams

1.1 Item numbers and order numbers

Important!

The update of summer 1990 has resulted in certain changes to the spare parts range.
Please order using the order numbers in this service manual.

1.2 Overview of SM/PJ series

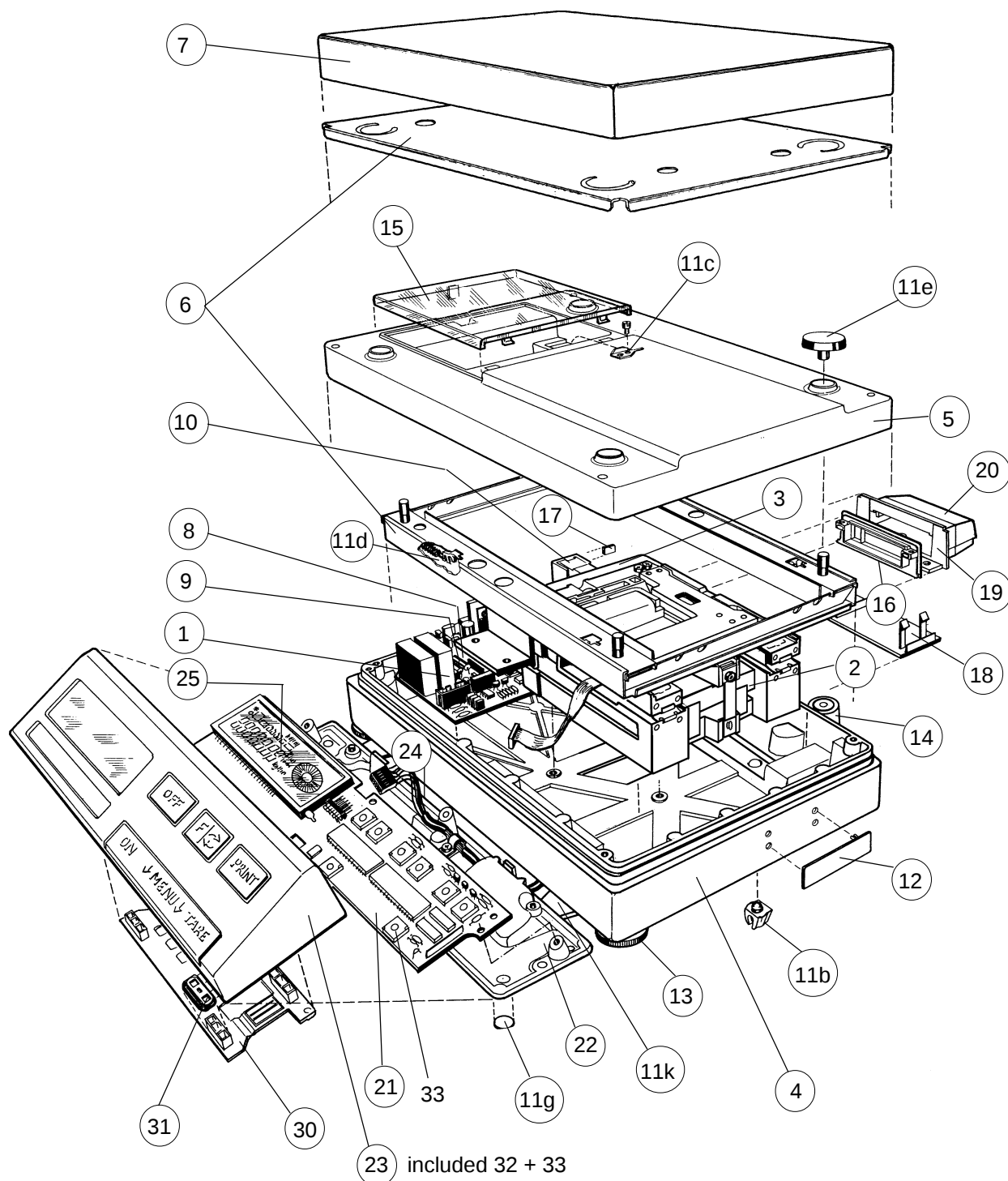
- Although the design of the scales of the SM/PJ series is virtually identical, there are a few mechanical and electronic differences.

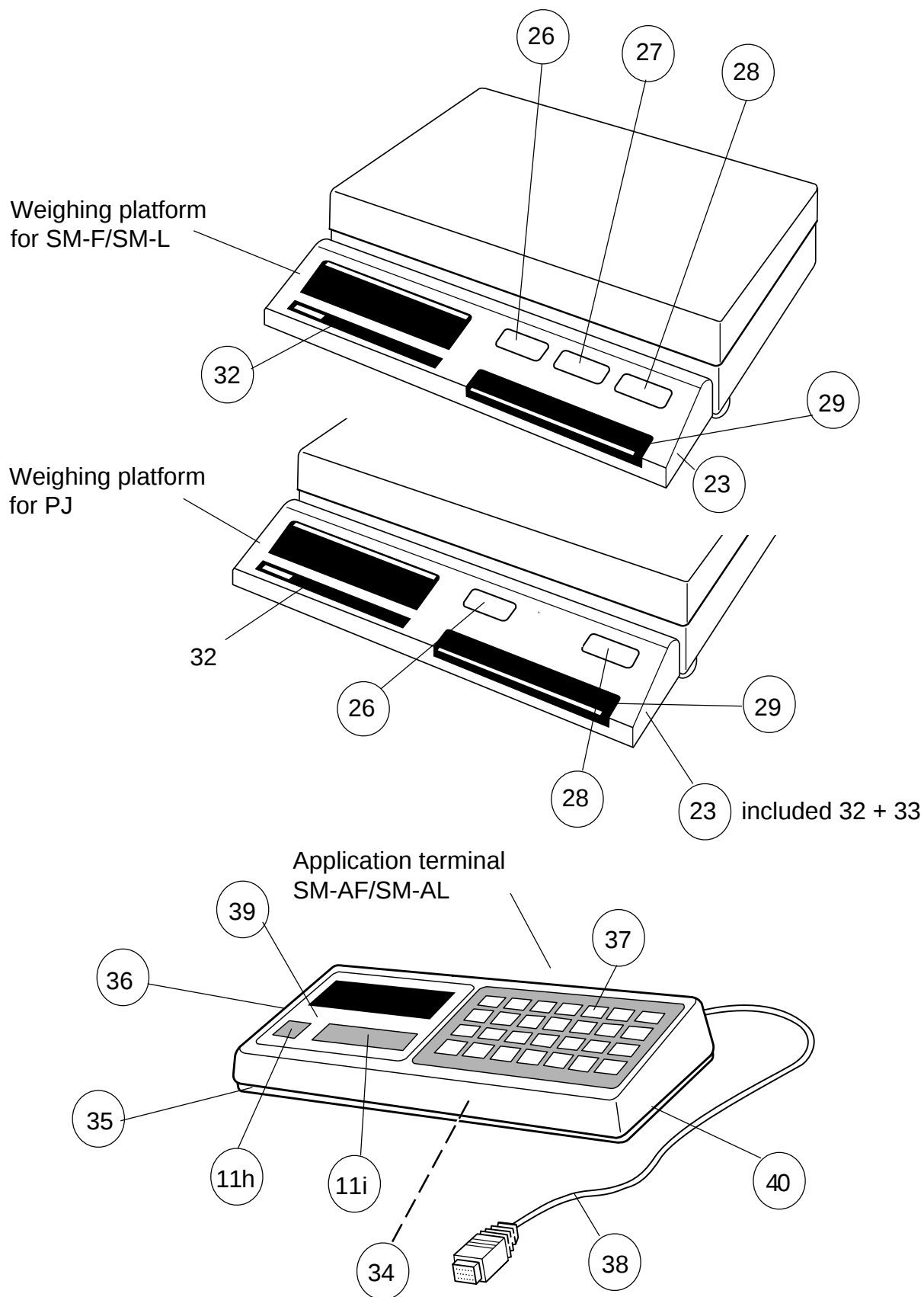
Scale type Distinguishing feature	SM				PJ
	SM-F + SM3000 SM6000 SM12 SM15 SM15000 SM1220 SM1520	SM-L + SM3000 SM6000 SM12 SM15 SM15000 SM1220 SM1520	SM-AF + SM3000 SM6000 SM12 SM15 SM15000 SM1220 SM1520	SM-AL + SM3000 SM6000 SM12 SM15 SM15000 SM1220 SM1520	PJ-F + PJ12 PJ15 PJ1220
Fluorescent display	yes	no	yes	no	yes
Liquid crystal display	no	yes	no	yes	no
RS232C/CL data interface	yes	yes	yes	yes	¹⁾ Opt. 019
GM data interface	yes	yes	yes	yes	²⁾ no
Application terminal	accessory	accessory	integral	integral	no
DeltaTrac	yes	yes	yes	yes	no
	yes	yes	yes	yes	no
Battery operation possible	yes	yes	yes	yes	no

¹⁾ Option 019 comprises a special PJ program cassette. This controls the I/O interface thus allowing communication.

²⁾ Although the GM interface is not intended for the connection of GM instruments, the ServicePac-M keypad can be attached.

1.3 Exploded view diagram SM/PJ scales





2. Spare parts lists

2.1 Spare parts list for SM3000 / SM6000 / SM12 / SM1220 Weighing Platforms

Spare parts		SM3000	SM6000	SM12	SM1220
Item	Designation	ME-Nr.	ME-Nr.	ME-Nr.	ME-Nr.
1	Scale board	34482	34482	34482	34482
2	Weighing system, adjusted	626070	626070	626075	626075
3	Hanger				
	Chock	34258	34258	34258	34258
	Eccentric	34376	34376	34376	34376
4	Bottom housing, complete	626069	626069	626069	626069
5	Top housing, complete	626071	626071	626071	626071
6	Platform support	34217	34217	34217	34217
7	Weighing platform	34218	34218	34218	34218
	Overload protection	34212	34212	34212	34212
8	Reference resistor set (je 1 x 125, 155, 165 Ω)	81829	81829	81829	81829
9	Calibration resistor set				
	Set of 73 Stk., 560 Ω ...1 M Ω /50 ppm	41299	41299	41299	41299
	Set of 15 Stk., 3.6 k Ω ...13 k Ω /15 ppm	47042	47042	47042	47042
10	Standard program cassette	600274	600274	600274	600274
11	Small parts set for SM/PJ				
	b) Cable holders	89416	89416	89416	89416
	c) Certification plates	34289	34289	34289	34289
	Sealing screw	76274	76274	76274	76274
	d) Springs for overload protection	34273	34273	34273	34273
	e) Caps for platform support	34223	34223	34223	34223
	h) Keys, square, for application terminal	32910	32910	32910	32910
	i) Keys, rectangular, for application terminal	32909	32909	32909	32909
	Grounding plate	34208	34208	34208	34208

Spare parts		SM3000	SM6000	SM12	SM1220
Item	Designation	ME No.	ME No.	ME No.	ME No.
13	Leveling screw, compl.	600026	600026	600026	600026
14	Level	70947	70947	70947	70947
15	Cover for top section	34214	34214	34214	34214
16	Connector plate	34209	34209	34209	34209
17	Shorting plug, 2-pin, for certified scales	89404	89404	89404	89404
18	Connector cover, bottom	34210	34210	34210	34210
19	Connector flange	34461	34461	34461	34461
20	Flange cover	34462	34462	34462	34462

2.2 Spare parts list for SM15 / SM1520 / SM15000 Weighing Platforms

Spare parts		SM15	SM1520	SM15000
Item	Designation	ME-Nr.	ME-Nr.	ME-Nr.
1	Scale board	34482	34482	34482
2	Weighing system, adjusted	626075	626075	626075
3	Hanger			
	Chock	34258	34258	34258
	Eccentric	34376	34376	34376
4	Bottom housing, complete	626069	626069	626069
5	Top housing, complete	626071	626071	626071
6	Platform support	34217	34217	34217
7	Weighing platform	34218	34218	34218
	Overload protection	34212	34212	34212
8	Reference resistor set (je 1 x 125, 155, 165 Ω)	81829	81829	81829
9	Calibration resistor set			
	Set of 73 Stk., 560 Ω ...1 M Ω /50 ppm	41299	41299	41299
	Set of 15 Stk., 3.6 k Ω ...13 k Ω /15 ppm	47042	47042	47042
10	Standard program cassette	600274	600274	600274
11	Small parts set for SM/PJ			
	b) Cable holders	89416	89416	89416
	c) Certification plates	34289	34289	34289
	Sealing screw	76274	76274	76274
	d) Springs for overload protection	34273	34273	34273
	e) Caps for platform support	34223	34223	34223
	h) Keys, square, for application terminal	32910	32910	32910
	i) Keys, rectangular, for application terminal	32909	32909	32909
	Grounding plate	34208	34208	34208

Spare parts		SM15	SM1520	SM15000
Item	Designation	ME No.	ME No.	ME No.
13	Leveling screw, compl.	600026	600026	600026
14	Level	70947	70947	70947
15	Cover for top section	34214	34214	34214
16	Connector plate	34209	34209	34209
17	Shorting plug, 2-pin, for certified scales	89404	89404	89404
18	Connector cover, bottom	34210	34210	34210
19	Connector flange	34461	34461	34461
20	Flange cover	34462	34462	34462
	Hanger for weighing below the balance	34589	34589	34589

2.3 Spare parts list for PJ12 / PJ1220 / PJ15 Weighing Platforms

Spare parts		SM15	SM1520	SM15000
Item	Designation	ME-Nr.	ME-Nr.	ME-Nr.
1	Scale board	34482	34482	34482
2	Weighing system, adjusted	626075	626075	626075
3	Hanger			
	Chock	34258	34258	34258
	Eccentric	34376	34376	34376
4	Bottom housing, complete	626069	626069	626069
5	Top housing, complete	626071	626071	626071
6	Platform support	34217	34217	34217
7	Weighing platform	34218	34218	34218
	Overload protection	34212	34212	34212
8	Reference resistor set (je 1 x 125, 155, 165 Ω)	81829	81829	81829
9	Calibration resistor set			
	Set of 73 Stk., 560 Ω ...1 M Ω /50 ppm	41299	41299	41299
	Set of 15 Stk., 3.6 k Ω ...13 k Ω /15 ppm	47042	47042	47042
10	Standard program cassette	626119	626119	626119
11	Small parts set for SM/PJ			
	b) Cable holders	89416	89416	89416
	c) Certification plates	34289	34289	34289
	Sealing screw	76274	76274	76274
	d) Springs for overload protection	34273	34273	34273
	e) Caps for platform support	34223	34223	34223
	h) Keys, square, for application terminal	32910	32910	32910
	i) Keys, rectangular, for application terminal	32909	32909	32909
	Grounding plate	34208	34208	34208

Spare parts		PJ12	PJ1220	PJ15
Item	Designation	ME No.	ME No.	ME No.
13	Leveling screw, compl.	600026	600026	600026
14	Level	70947	70947	70947
15	Cover for top section	34214	34214	34214
16	Connector plate	34209	34209	34209
17	Shorting plug, 2-pin, for certified scales	89404	89404	89404
18	Connector cover, bottom	34210	34210	34210
19	Connector flange	34461	34461	34461
20	Flange cover	34462	34462	34462
	Hanger for weighing below the balance	34589	34589	34589

2.4 Spare parts list for weighing terminal and application terminal

Item	Designation	SM-F ME-No.	SM-L ME-No.	SM-AF ME-No.	SM-AL ME-No.	PJ ME-No.
21	Display board	34370	34190	–	–	34548
22	Bottom housing	625018	625018	–	–	626072
23	Top housing, mounted (with keys and model plate)	625019	625020	–	–	626074
24	Connection cable	34371	34191	–	–	34371
25	Hatched sticker for certified scales (49)	31350	31350	31350	31350	31350
26	„PRINT“ key set complete for PMG/SM/PSG	21202376	21202376			21202376
30	Key support	34281	34281	–	–	34281
31	Gasket	34284	34284	–	–	34284
34	Terminal board AF/AL 24	–	–	626061	32922	
35	Bottom housing	–	–	32908	32908	–
36	Top housing	–	–	626062	626062	–
37	Membrane keypad (without Pac overlay**)	–	–	626066	626062	–
38	Connection cable	–	–	32906	32906	–
39	Overlay (with model designation)	–	–	216137	216136	–
40	Housing seal	–	–	32917	32917	–

** Overlays, see next page

2.5 Spare parts list for overlays for weighing and application terminal

Overlay for...	Program cassette	Overlay german	Overlay english	Overlay french	Overlay spanish	Overlay italian
Designation	No.	No.	No.	No.	No.	No.
CalcPac	626118		216189			
CountPac	626113	216180	216181	216182	216183	216184
DataPac	**		216185			
SQC52 DataPac	**		216114			
SQC60 DataPac	**		216186			
DosPac	216135		216134			
FlowPac	216118		216117			
GoldPac	600228		216190			
LabPac	626117	216170	216171	216172	216173	216174
PharmaPac	626114	216165	216166	216167	216168	216164
ProPac	626116	216176	216177	216178	216179	216175
SQC12 StatPac	626115		216187			
XPac	626111		216191			
ServicePac • Type	600255		33943			
• Adjustment	600254					

** Standard program cassette No. 600274

3. Accessories for SM/PJ scales

Accessories			SM ME No.	PJ ME No.
Protective covers for weighing platform			34216	34216
Protective cover for weighing terminal <i>(only SM-L, SM-F, not available for SM-AL, SM-AF)</i>			34222	34222
Power supply unit (to national codes)	115V	USA	34297	34297
	230V	Europe	34298	34298
	240V	UK	34296	34296
	240V	Australia	34295	34295
Set of batteries			34374	—
Battery charger for separate battery set (connection to power supply unit)			34480	—
System connector (scales without terminal, controlled by a computer)			34490	—
Program cassette Option 019 (I/O interface)			—	34561

Changed numbers or text are in bold italic print (Nov. 2001)

4. Tools and working aids

In addition to the normal tools (screwdriver, soldering iron, multimeter, etc.), the following working aids are needed:

No.	Designation	Art No.
1	Service case, complete * (incl. LC-PT45 service printer)	229167
1	Calibration resistor set (set of 73, 50 ppm, 560 ...1 M)	41299
1	Calibration resistor set (set of 15, 15 ppm, 3.6 k ... 13 k)	47042
1	Torx screw driver T20 **	
	Test weights F1 ***	

* The LC-PT45 service printer (with software version 3.00) can also be used for balances of the M line (AM, PM, SM, ...) with the appropriate PM adjustment cassette 216627 (with software version 91.68). The corresponding balance models are stored in the LC-PT45 service printer.

The older ServicePac-M 73611 is thus no longer needed for the M line!

** needed in replacement of the measuring cell (fastening measuring cell - frame)

*** as described in section F (2. Technical data and adjustment tolerances)

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1. Checklists

1.1 Checklist maintenance

Caution

Although the measurement system and parts of the electronics are dead after the OFF key has been pressed, this is not the case with all parts of the display. To avoid short circuits, disconnect the power supply unit and, if used, the battery before opening the instrument.

Visual check

- Completeness check in accordance with standard equipment.
- Check condition of the following parts:
 - Housing
 - Front glass
 - Weighing platform
 - Platform support
 - Control bar
 - Leveling screws
 - Rubber feet
 - Level
 - Protective cover
 - Power cable
 - Fuse
 - Data transmission cable
 - Hand/foot switch

Function check

- Leveling
- Check control bar(s)
- Check overload protection of the weighing platform (snap load)
- Check reproducibility
- Hysteresis check with full load and with minimum load
- Check cornerload and linearity
Test weights and tolerances, see section F.
- Check plug-in connections
 - Connector socket of power supply unit, GM connection and DATA I/O connection
 - Check data transmission cable and peripherals
 - Check Pac application

Cleaning

- Disconnect power plug.
- For cleaning in the region of the front glass, it may be necessary to remove the control bar, see section D.

Caution

Never use nitro solvents!

1.2 Checklist repairs and adjustment

Troubleshooting

Repairs

- Disconnect power plug.
- Replacement of damaged and/or defective parts, see section D.

Adjustment

- Print out customer's configuration or record in the list in section F.
- If present, disconnect peripherals from the scale.
- With the power plug disconnected, withdraw the customer's cassette and insert the adjustment cassette (service module).
- Check stop and readjust if necessary.
- Level.
- Adjust cornerload.
- Perform adjustment, see section D.

Final worksteps

- With the power plug disconnected, reinsert customer's cassette.
- Set up original customer configuration.
- Attach peripherals.
- Perform work specific to certified weighing units, see section 2.6.
- Calibrate if necessary.

2. ServicePacs

2.1 General

Use of the ServicePacs

ServicePacs are needed to

- perform the adjustment,
- load the EAROM on the scale board with type and measuring cell parameters after board replacement,
- overwrite the measuring cell parameters in the EAROM after measuring cell replacement,
- clear the EAROM contents.

Special ServicePacs for the M and J series

The **ServicePac-M** comprises the following components:

- Terminal (entry keypad)
- Type cassette for balances/scales of the M series and AJ...L balances (type module M, **grey** cassette).
- Adjustment cassette for balances/scales of the M series and AJ...L balances (service module M, **grey** cassette).

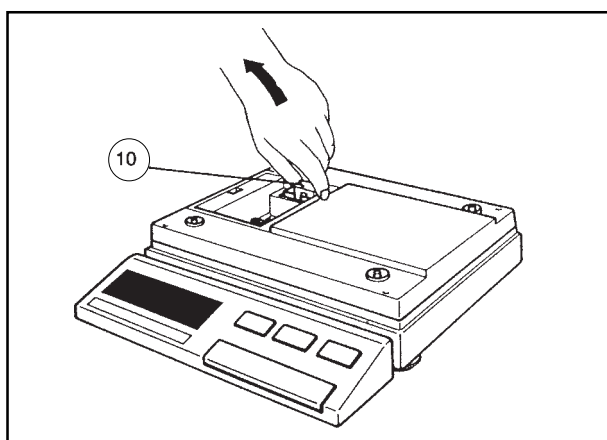
The **Service-Pac-J** comprises the following components:

- Type cassette for balances/scales of the J series (type module J, **red** cassette)
- Adjustment cassette for balances/scales of the J series (service module J, **red** cassette)
- Data interface for attachment of the terminal of the ServicePac-M. Not needed for PJ large (required only for PJ small, see service manual of AM/PM/CM/J balances and scales).
- **Use** the terminal of the **ServicePac-M** as entry keypad.

Functions of type and adjustment cassettes

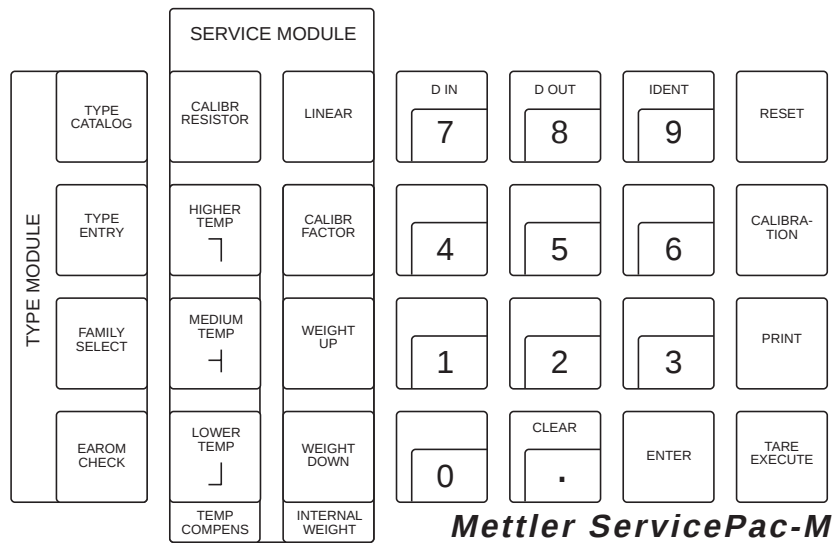
Type cassette (type module)	Adjustment cassette (service module)
Loading type parameters and certification type Clearing the EAROM	Resistance- and Linearity adjustment Calibration Temperature compensation Entering measuring cell parameters

2.2 Attaching the ServicePacs

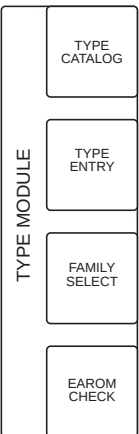


- Disconnect power plug.
- Withdraw customer's cassette using bracket (10) and insert ServicePac cassette.
- Attach terminal to GM interface of the scale.

2.3 Keypad of ServicePacs terminal

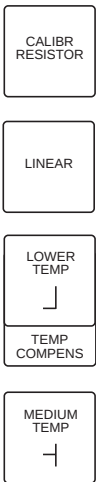


Keys with the type cassette (type module)



- Display and printer list all scale types whose type parameters are stored in the type cassette.
- Loads the type parameters of the types in question into the EAROM. Entry of the type parameters must be confirmed twice with ENTER.
- Switching between AM/CM/PM and SM types when loading the type parameters.
- Checks the operability and content of the EAROM.

Keys with the adjustment cassette (service module)



- Checking and performing the resistance adjustment.
- Checking and adjusting the linearity.
- Start of the adjustment cycle in the temperature compensation at the lowest temperature step.
- Start of the adjustment cycle in the temperature compensation at the middle temperature step.

	Start of the adjustment cycle in the temperature compensation at the highest temperature step.
	Inactive
	Inactive
	Inactive
	

General field

	Calibration.
	In adjustment: Triggering of the next step or measurement cycle. When display switched on: Taring.
	Start of entry of cell parameters. The next number line (0...20) to be keyed in appears in the display. If a keying error occurs during entry the number line does not change, the entry must be repeated.
	Printout of the store measuring cell parameters.
	Printer outputs identification No. of the cell parameters stored in the EARAM.
	Entry of the type designation or cell parameters.
	Conclusion of each numeric entry.
	Print command.
	With the type cassette: Separation between type designation and version in entry of the type, e.g. 15.10. With the adjustment cassette: Clearing of the last inputted digit.
	With the type cassette: Clearing of the EARAM content.

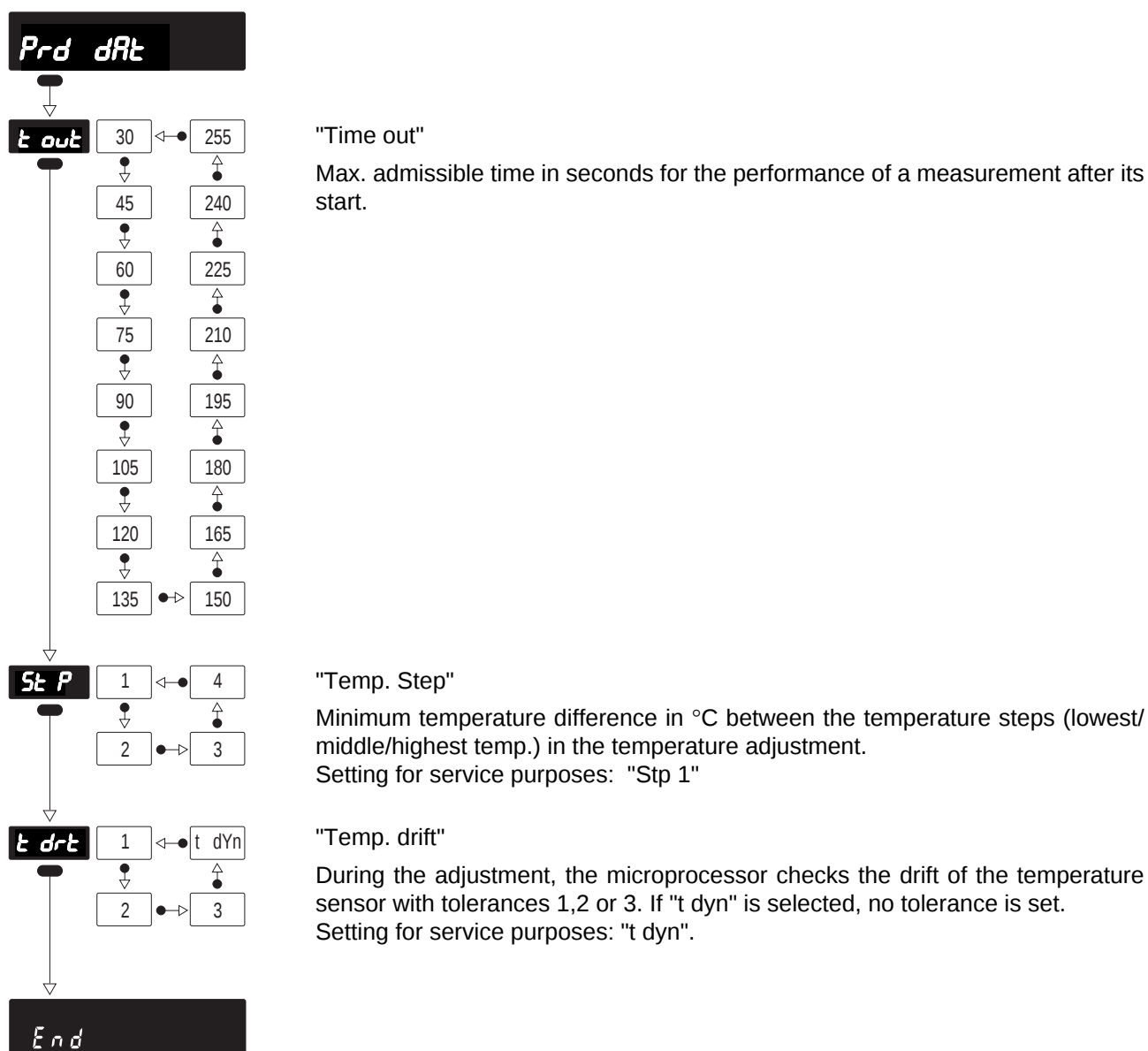
2.4 Configuration register of adjustment cassette

The "ConF" register of the adjustment cassette has the menu sections

- "SCALE",
- "I-FACE" and
- "Prd dAt".

The available settings in the menu sections **"SCALE"** and **"I-FACE"** are identical to the possible settings of the standard cassette, see operating instructions of the scale.

The menu **"Prd dAt"** contains additional parameters that can be set for service operations.



2.5 Selecting the types

Type	Entry	Display	Entry	Display
SM3000	3	<i>P. 3000</i>	Family select	<i>S. 3000</i>
SM6000	6	<i>P. 6000</i>	Family select	<i>S. 6000</i>
SM12 (12 kg cell)	1	<i>S. 12</i>	-	
SM12 (15 kg cell)	1	<i>S. 125</i>	-	
SM1220 (12 kg cell)	1	<i>S. 1220</i>	-	
SM1220 (15 kg cell)	1	<i>S. 1225</i>	-	
SM15	1	<i>P. 15</i>	Family select	<i>S. 15</i>
SM1520	1	<i>S. 1520</i>	-	
SM15000	1 3	<i>S. 1503</i>	-	
PJ12 (12 kg cell)	1	<i>P. 12</i>	-	
PJ12 (15 kg cell)	1	<i>P. 125</i>	-	
PJ1220 (12 kg cell)	1	<i>P. 1220</i>	-	
PJ1220 (15 kg cell)	1	<i>P. 1225</i>	-	
PJ15	1	<i>P. 15</i>	-	

2.5.1 Special feature of the SM12/1220 and PJ12/1220

Overview

For rationalization purposes, the SM12/1220 and PJ12/1220 are now equipped only with the 15 kg weighing cell and no longer with the 12 kg cell. The 12 kg weighing cell (34204/V) is also no longer available as a spare part; it has been replaced by the **15 kg weighing cell (626075)**.

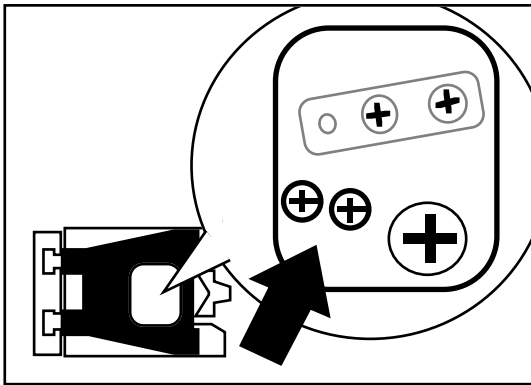
Distinguishing the scales with the 12 kg and 15 kg weighing cells

The scales can not be distinguished outwardly. Even the actual weighing cells can not be distinguished when they are installed. Yet if the scale board is changed a distinction is necessary.

Feature of the new 12 kg scales with 15 kg weighing cell:

The serial number allows no distinction between these new 12 kg scales and the old 12 kg scales with 12 kg weighing cell. FNR 217045 appears on the label plate in each case.

However, on the parameter sticker of the weighing cell the type designation for scales with the 15 kg weighing cell is SM125, SM1225 or PJ125, PJ1225 and the reference resistance is 165 Ω (possibly 155 Ω) as with 15 kg scales.



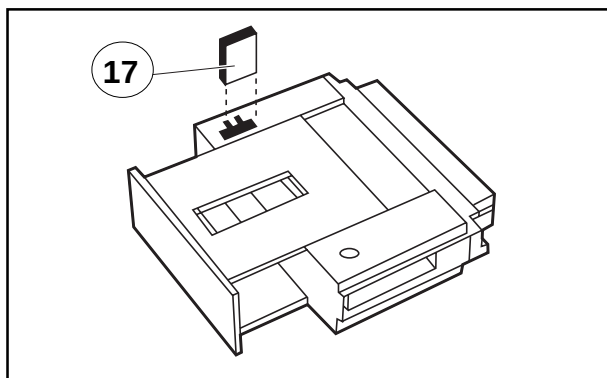
An external feature of the 15 kg weighing cell is a counterweight on the lower beam (on the inside) whose **two Phillips fastener screws** are visible from the outside.

Replacing a 12 kg by a 15 kg weighing cell in servicing

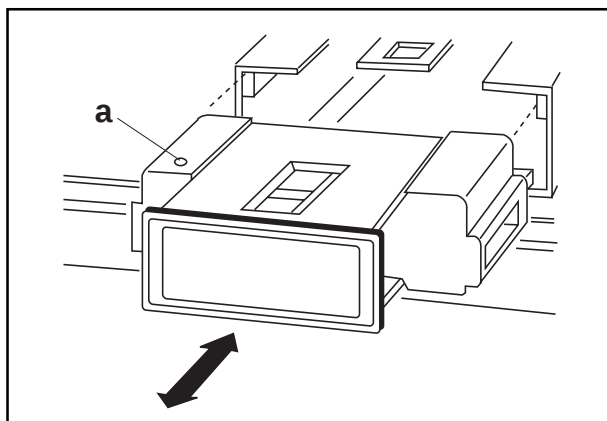
- Replace weighing cell and solder in enclosed reference resistance of 155 Ω . If the replacement cell has no number: write "626075" on the magnet system.
- Clear EARM in accordance with service manual, section D, 3.1.1.
- Load type definition for appropriate scale with 15 kg weighing cell.
- Key in the weighing cell parameters of the new cell printed on the enclosed parameter sticker.
- Calibrate with adjustment cassette.

2.6 Special features of certified scales

After servicing:



- Calibrate scale with the adjustment cassette.
- Disconnect power plug, remove adjustment cassette and insert customer's cassette without shorting plug (17).
- Wait until warmed up.
- Level and calibrate.
- Set up customer's configuration.
- Disconnect power plug.
- Remove customer's cassette and connect shorting plug (17) to both pins of the cassette.



- Insert customer's cassette.
- Secure cassette with screw (a).
- Close scale.
- Check calibration.
- Seal scale if applicable.

2.7 Special features of custom versions

The type parameters of custom versions are not contained in the type cassette but in the appropriate scale cassette (software version V60.xx.XX, XX = 50 ... FF).

Replacing the scale board

- Install new board.
- Load the basic type with the type cassette (see parameter strips of table in section F). If the basic type can not be loaded, clear the EARAM contents, see section D.
- Read in parameter strips.
- Perform adjustment.
- Calibrate with the adjustment cassette.
- Insert cassette for custom version and the correct parameters of the custom version will be read in automatically.

Replacing the measuring cell

- Install new measuring cell.
- Insert adjustment cassette.
- Attach terminal.
- Key in cell parameters.
If the cell parameters can not be entered, clear the EARAM contents (see section D) and load the basic type (see parameter strips of table in section F).
- Perform adjustment.
- Insert cassette for custom version and the correct parameters of the custom version will be read in.
- Calibrate.

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1. Troubleshooting

Fault	Possible cause	Rectification
Scale can not be switched on	- No line voltage - SM PowerPac Battery is discharged - Board defective	Check power supply Attach power supply, replace battery if necessary Check voltage (C 3.1), replace board (D 1.2.5)
Taring not possible	- Push button defective - Board defective - Terminal cable not attached	Replace push button Replace board (D 1.2.5) Attach terminal cable
Individual segments of the display do not light up	- Display defective - Cassette defective	Check voltage, replace board Replace cassette
Weighing system does not stabilize	- Board defective - Weighing cell defective	Replace board (D 1.2.5) Replace weighing cell (D 1.2.4)
Overload/under load display	- Board defective - Wrong reference resistance	Replace board (D 1.2.5) Solder in correct reference resistor
Overload display before full load reached	cf. Calibration not possible	
Underload display in resistance adjustment	Coil current too low as reference resistor still missing or wrong	Load small weight as preload, until reference resistor is soldered in
Abrupt change of the display	- Poor plug-in contact/soldering point - Weighing cell defective - Board defective	Replace weighing cell (D 1.2.4) Replace board (D 1.2.5)
Hysteresis or unstable display	- Weighing cell defective - Cell cable touching	Replace weighing cell (D 1.2.4)
Display drift	- Temperature compensation poor - Board defective - Weighing cell defective	Perform temperature compensation (D 3.2.7) Replace board (D 1.2.5) Replace weighing cell (D 1.2.4)
Cornerload not adjustable	- Locking plates for adjustment not loosened - Weighing cell defective	Replace weighing cell (D 1.2.4)

Fault	Possible cause	Rectification
Linearity not adjustable	• Cornerload not adjusted • Weighing cell defective • Board defective	Adjust cornerload (D 2.2) Replace weighing cell (D 1.2.4) Replace board (D 1.2.5)
Calibration not possible	• Protective cover touching • Certification seal • Wrong test weight • Resistance adjustment not correct • Wrong reference resistor • Board defective	Use correct test weight Perform resistance adjustment (D 3.2.3) Solder in correct reference resistor Replace board (D 1.2.5)

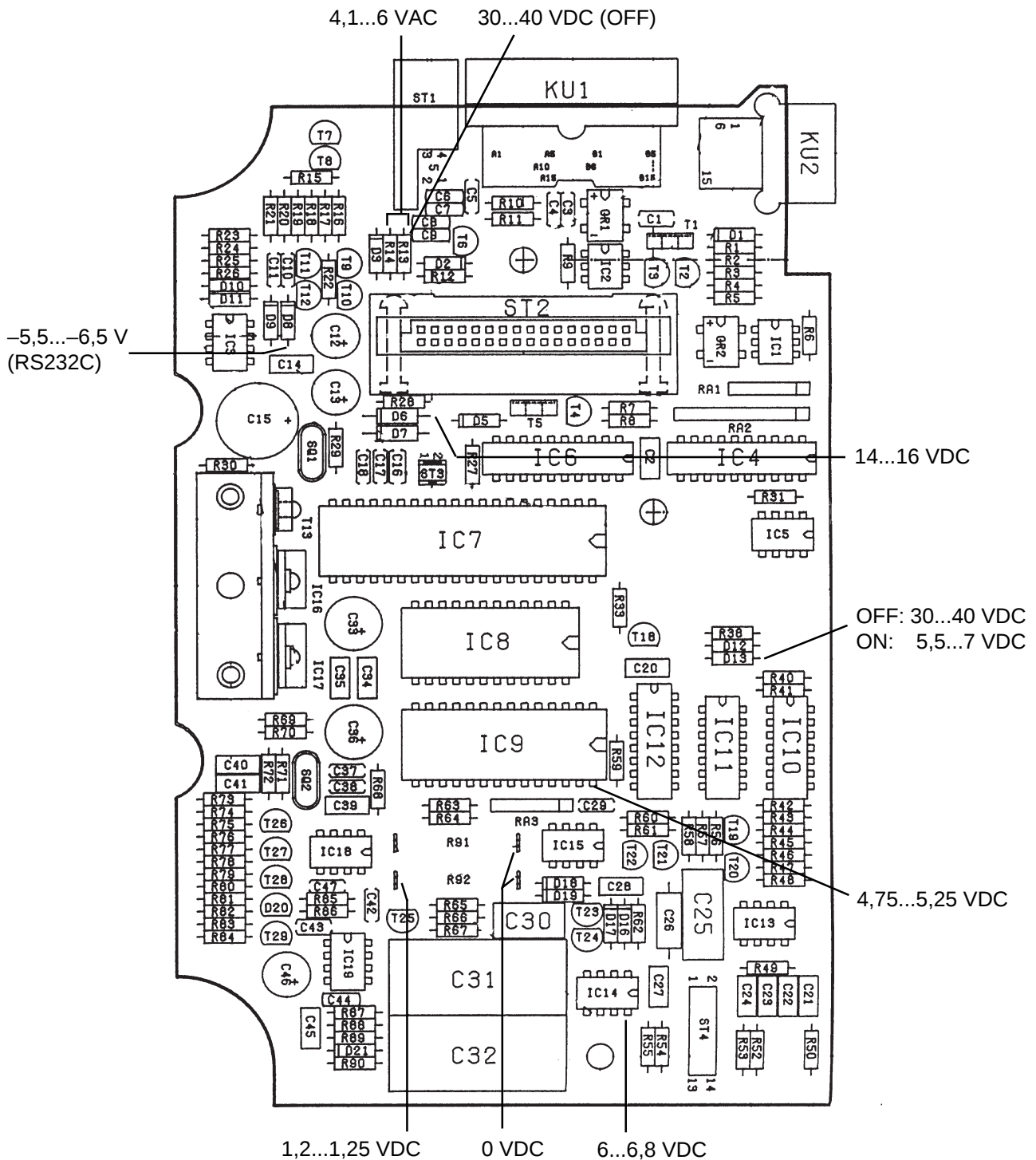
2. Error messages

Display	Meaning / Cause	Rectification
E null	Dead load wrong - Weights are still on the weighing platform when the scale requests zero - Wrong weighing platform	Unload scale, repeat measurement
E tout	Measurement time exceeded	Press tare bar, repeat measurement Change "t out"
E unstb	Scale unstable	Check location
E Lin	Linearity deviation too large	Perform linearity adjustment (D 3.2.4)
E res	Total resistance not appropriate for scale type - Adjustment resistor R91* missing - Reference resistance wrong - Wrong type read in or test weight wrong.	* old SM scale: R60 Solder in R91* Solder in correct reference resistor Check type and test weight
E t rn9	Wrong temperature range in TC adjustment	Select different temperature step
E t ust	Temperature recording supplies unstable measured values - Temperature unstable - Wrong setting of "t drt"	Establish stable temperature conditions Set "t dyn"
E count	- Overflow in microprocessor - Board defectiv	Switch scale off and on, repeat measurement Replace board (D 1.2.5)
E Input	Wrong measuring cell data entered	Repeat entry
E CHS	Wrong checksum Input error for measuring cell parameters	Repeat entry
E Empf	Sensitivity outside tolerance Measurement error	Repeat measurement
E out r	Out of Range Weighing system defective	Replace weighing system
Error 1, 2, 5, 6 Error 3	- Fault on scale board - Read/function error of cassette	Replace board (D 1.2.5) Replace cassette

Display	Meaning / Cause	Rectification
Error 4	Error in temperature measurement	Repeat measurement
Error 8	No temperature adjustment	Perform TC adjustment (D 3.2.7)
Error 9	Wrong scale type loaded	Load correct scale type (B 2.5)

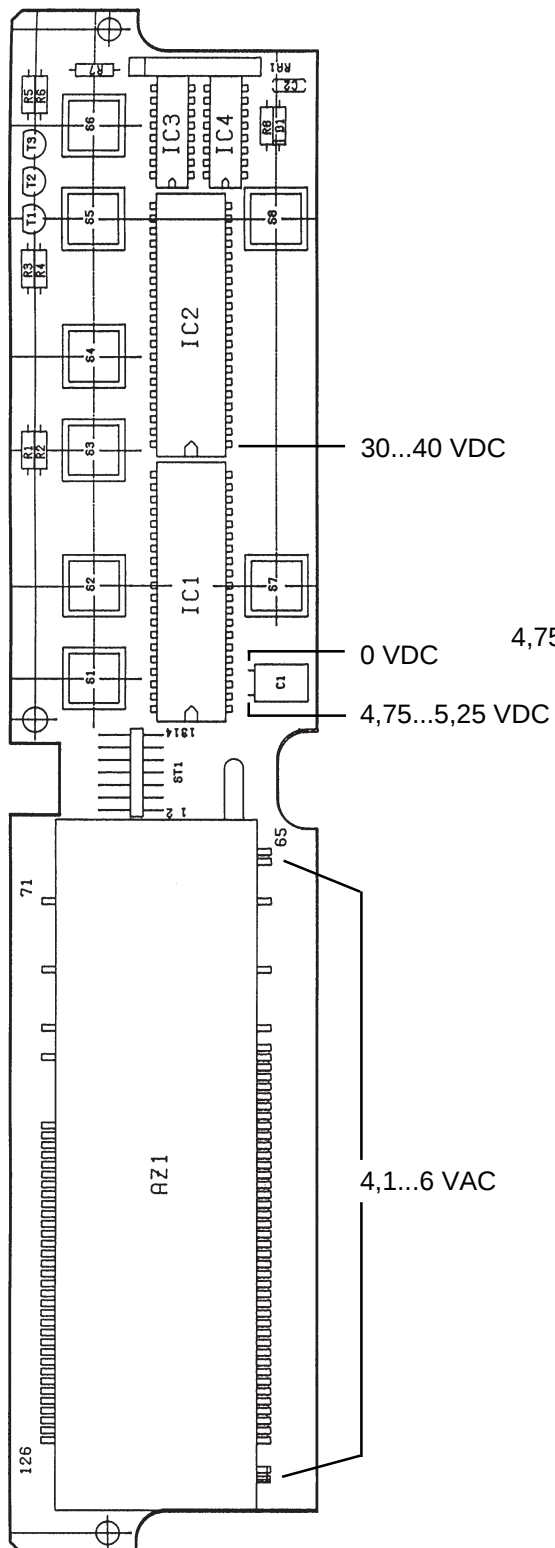
3. Checking voltages

3.1 Scale board

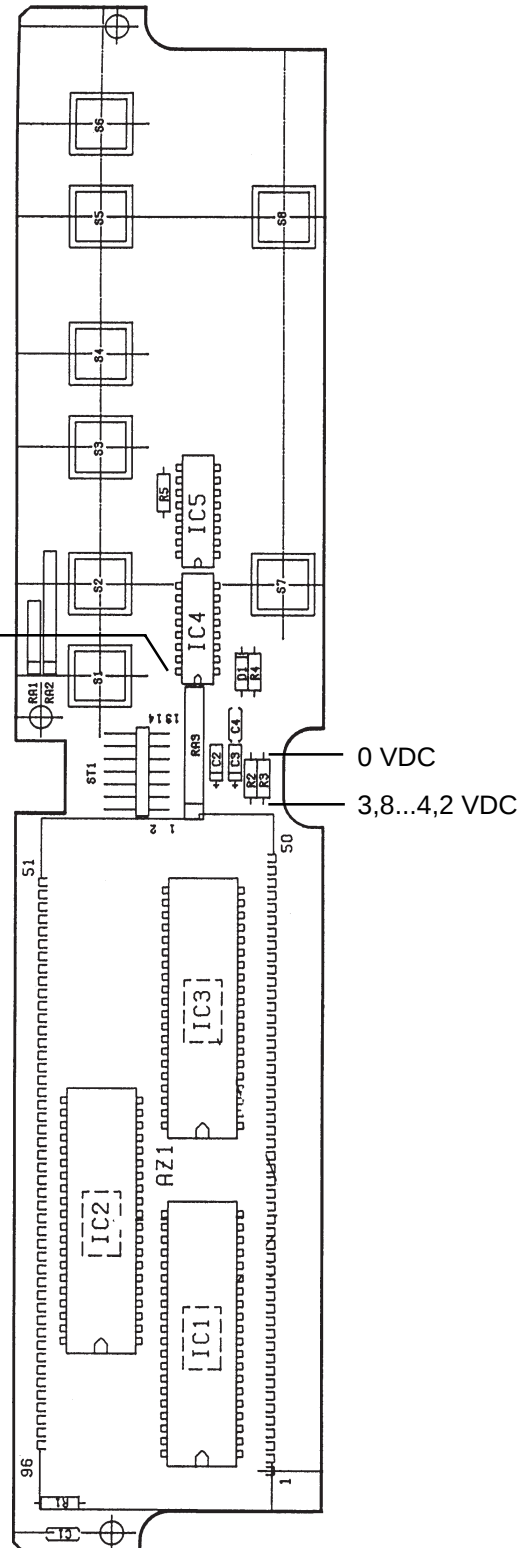


3.2 Display board weighing terminal (SM-F/SM-L)

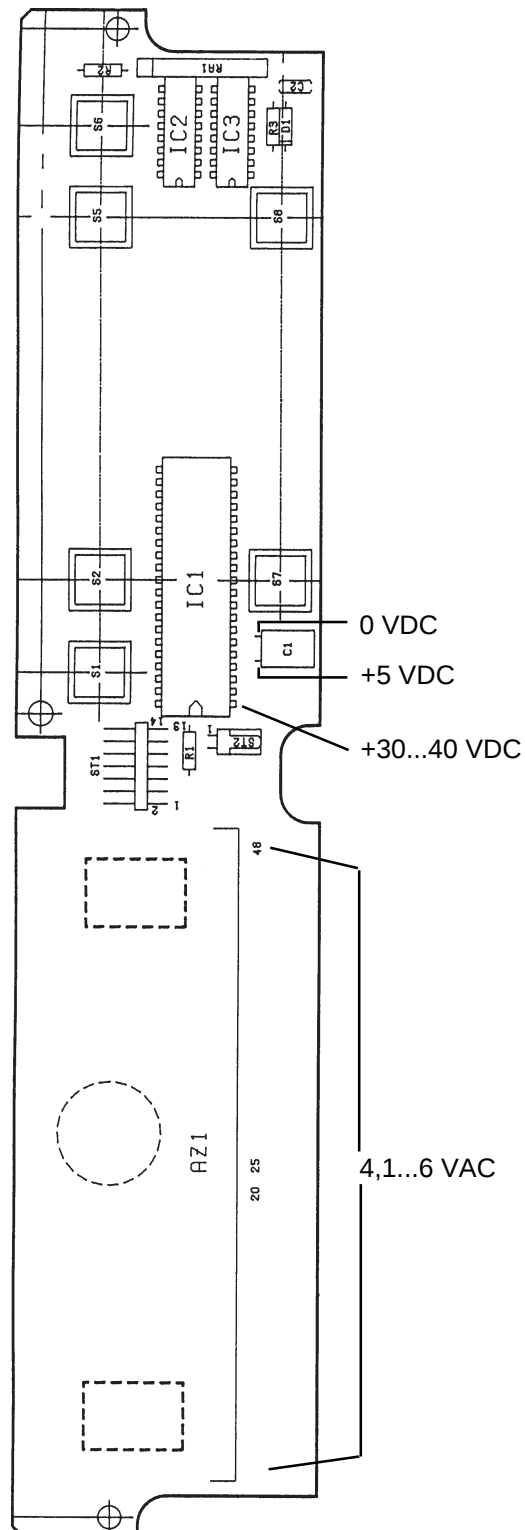
SM-F



SM-L

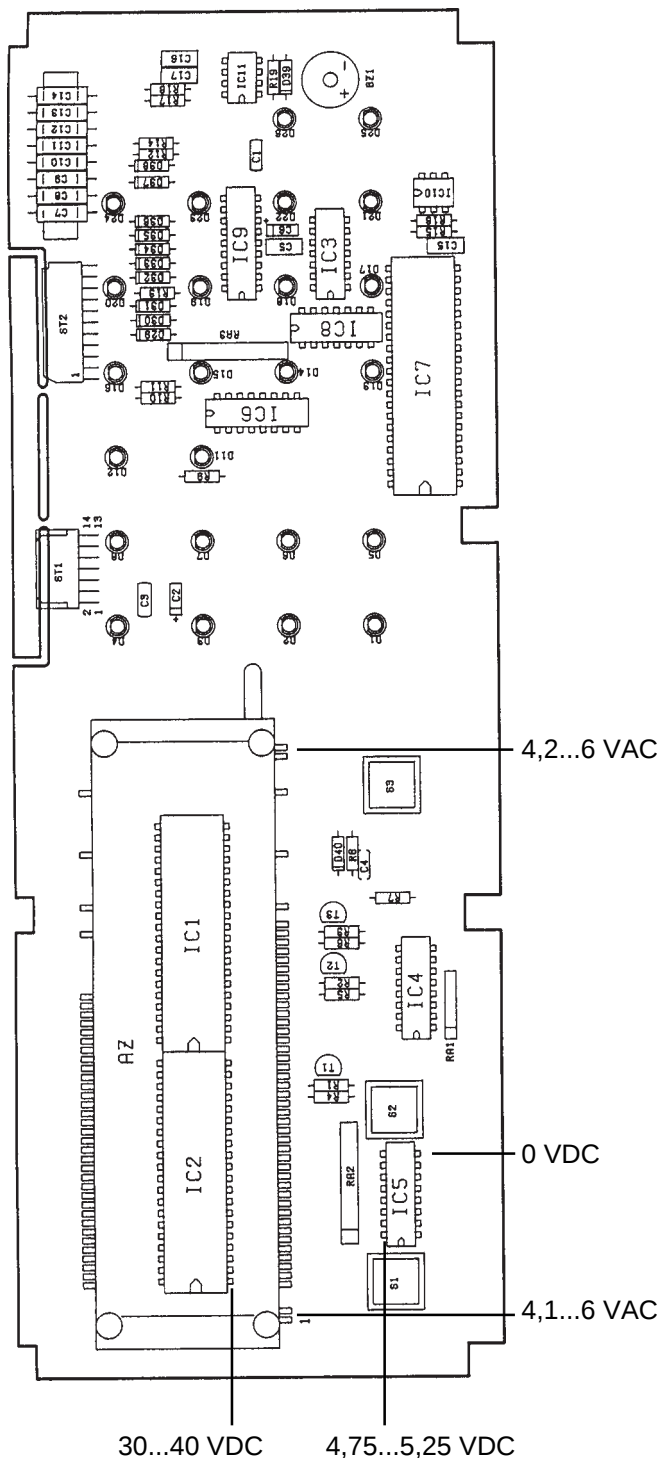


3.3 Display board weighing terminal (PJ-F)

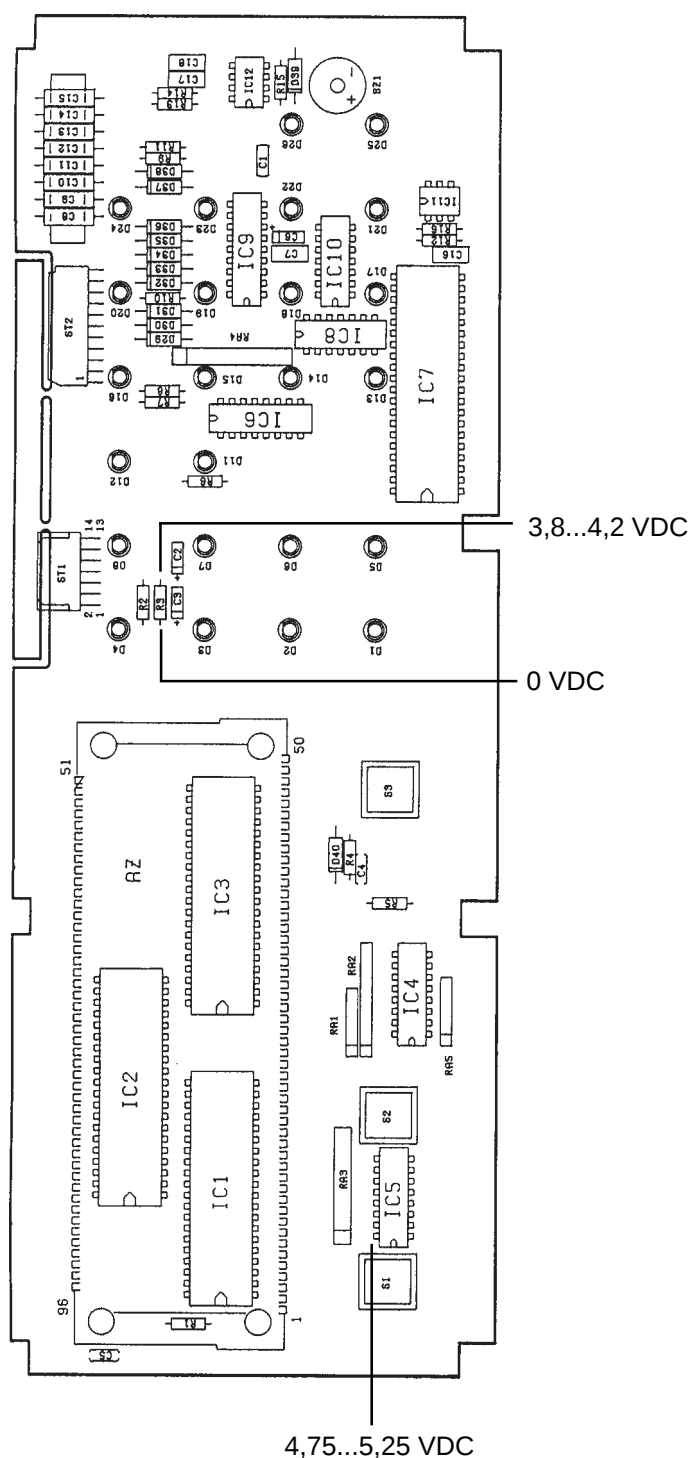


3.4 Display board application terminal (SM-AF/SM-AL)

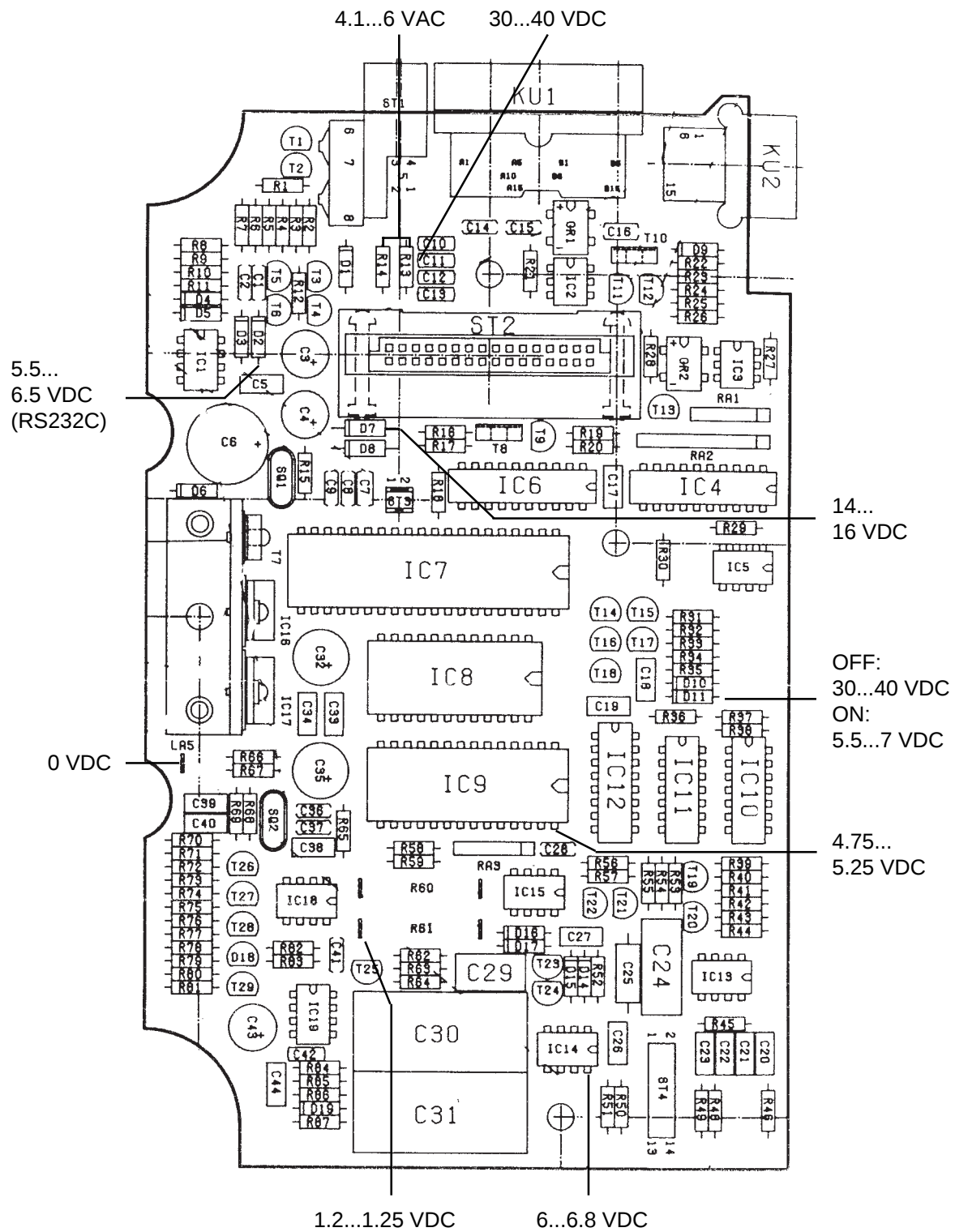
AF 24



AL 24



3.5 Scale board old SM scale



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1. Repairs

1.1 Terminal

The replacement of housing parts and the display of the terminal needs no description.

1.1.1 Weighing terminal keys

- Remove the four keys; grip the keys underneath and pull out from above.
- Detach key holders from the inside and replace.
- Mount keys from outside and press into key holders (support key holders) so they lock in.

Note key marking. Order from left to right:

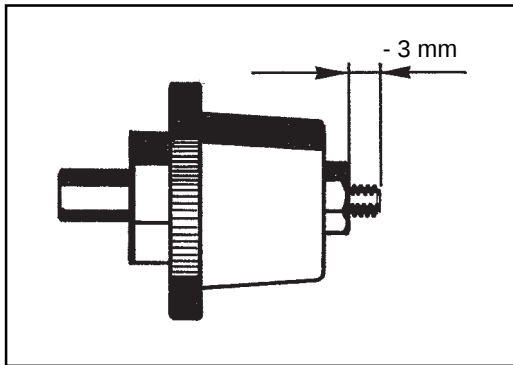
, , .

1.1.2 Cable fastening

- Insert sprayed retainer spigot (strain relief) of the new connection cable in the hole provided in the housing.
- Clamp cable with bright shielding under cable clip.

1.2 Weighing platform

1.2.1 Screw feet



Disassembly: Unscrew screw feet.

Assembly:

- Adjust nut such that the thread protrudes max. 3 mm.
- Insert screw feet in housing recess to stop, then screw in to required position.

1.2.2 Level

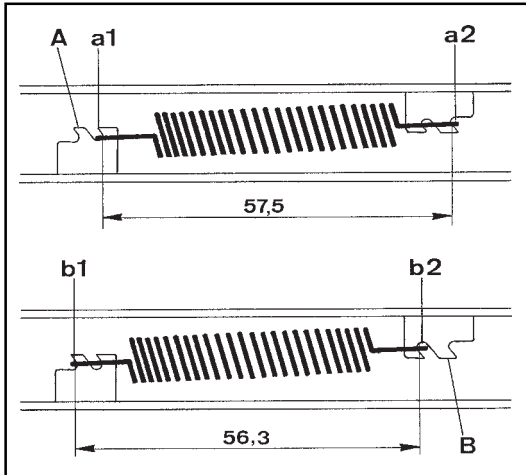
- Place weighing unit with mounted weighing platform upside down (screw feet upward) on the bench. If a stand is attached, this should hang down in the front of the bench; disconnect cable, unscrew stand.
- Insert a driftpin, punch or similar tool into the hole below the level (do not damage thread) and knock out faulty level.
- Turn scale over, clean level hole (adhesive residues).
- Lay test level (if not available, replacement level) in the middle of the weighing platform and level scale with screw feet; check that horizontal positioning of scale in the cross and longitudinal directions (parallel to the bench) is adequate.
- Insert level with adhesive (e.g. ME-71505) and immediately position it by pressing around the edge such that the air bubble is in the center.

1.2.3 Overload protection

The mechanical parts are identical for all SM scales.

The 4 tension springs are, however, mounted differently.

Only the version for all 12 kg and 15 kg scales is supplied as a spare part; for SM3000/6000 the tension springs must be fitted in a different manner. Check snap load!



SM/PJ1220/12/15/1520/15000:

Springs attached at a1, a2.
Distance 57.5 mm.
Snap load approx. 15...20 kg.

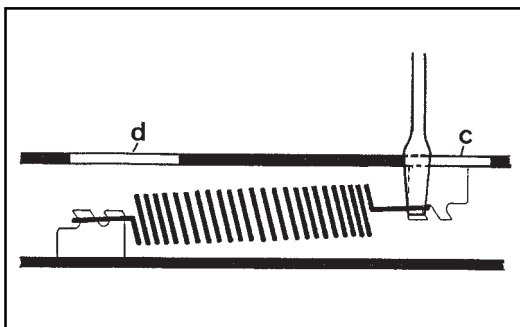
SM3000/6000:

Springs attached at b1, b2.
Distance 56.3 mm.
Snap load approx. 7...10 kg.

The different distance is a result of the different teeth widths of A and B.

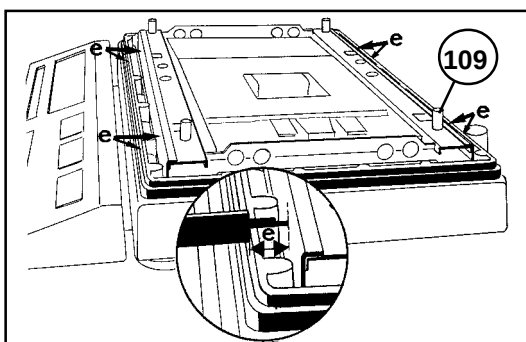
Hooking springs in a different position

Warning: Do not attach more than one spring at a time, otherwise the overload protection could fall apart!
Always reattach one spring after another.



- Place overload protection upside down on the bench.
- At the end of the spring with the smaller cutout c), insert a No. 2 screwdriver through the eye of the spring; detach spring by tilting the screwdriver.
- Hook spring into other position in the larger cutout d).
- Again insert screwdriver in eye at cutout c), tension spring by tilting the screwdriver and hook it into the appropriate notch.

Each spring must therefore be hooked into the other notch at **both** ends.



Installation of the overload protection

- Loosely screw overload protection to traverse (3). Any shims fitted between overload protection and traverse should be reused (part of hanger).
- Align overload protection in a manner such that the distance e) between the housing (raised edge, outside) and the overload protection ist the **same** near all 4 bolts (109). Measure distance e) with depth gauge; tolerance on equality ± 0.3 mm. If necessary, turn or shift the measuring cell slightly. Reason: If distance e) differs, the caps (11e) can brush against the in-use cover of the weighing unit.

- Tighten measuring cell and overload protection.

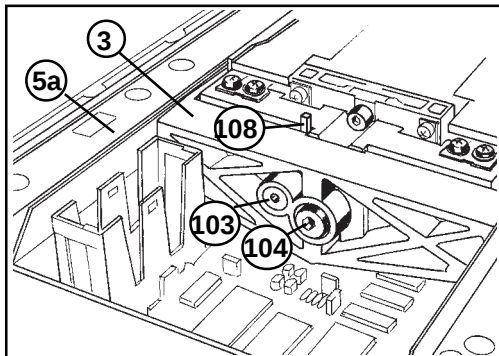
1.2.4 Replacement of measuring cell

- Dismount overload protection and traverse as in 1.2.5.
- Pull out ribbon cable from PCB, unscrew measuring cell: 3 screws underneath housing; stand base of scale on its side and hold measuring cell.
- The packing for the measuring cell contains the type-specific parameter labels belonging to the new cell (same identity no.).
- The parameter label relating to the type of scale under repair (type designation on label) must be stuck on the upper guide (as on the faulty cell); throw away the other parameter labels.
Warning: When keying in the cell parameters, the only numbers that will be accepted are those on the label showing the same type designation as the scale.**)
- Mount replacement measuring cell. Tighten screws only **gently**.
- Mount overload protection and traverse as in 1.2.5.
- Align measuring cell and overload protection in such a way that the distance e) between the bolts (109) of the overload protection and the housing wall is the same for all 4 bolts (see 1.2.3, below).
- Tighten fastening screws of measuring cell and overload protection.
- Put on top housing (5), insert 4 caps (11e).
- Put on pan support and load plate.

**) SM/PJ12/1220: On replacement of cell ME-34204 by ME-34501, see section E, Checking 2.5.1

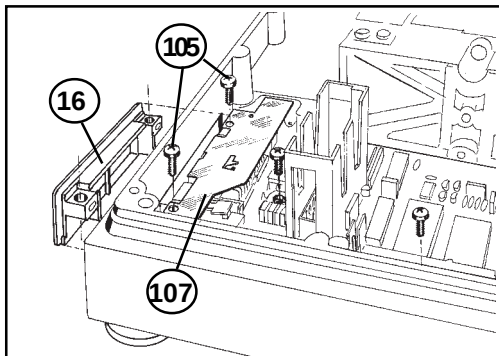
1.2.5 Replacing the scale board

- Remove overload protection (5a) with traverse (3):



- Undo eccentric fastener (103).
- Unscrew socket head screw (104), take off overload protection and traverse.
Warning: If tilted, eccentric fastener will drop out.
- Remove key (108).

- Detach connector sockets:



- Take off plug covers, pull out cable plug (from terminal) on underside of platform.
- Remove 2 screws (105), take off plug plate (16) in outward direction.
(Do not remove screening plate (107).)

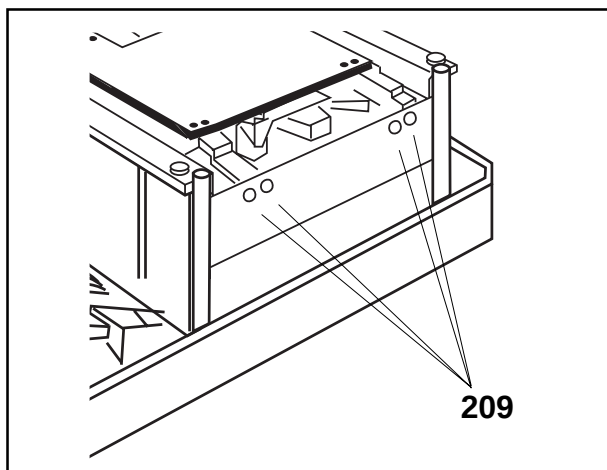
- Pull out ribbon cable connector (from measuring cell), undo 3 screws of scale PCB, lift out board vertically.
- Transfer reference resistor R92 [old SM scale: R61] from defective board to new board (but not adjustment resistor R91 [old SM scale: R60]).
- Insert new board, connect ribbon cable and cable from terminal, replace plug covers.
- Mount overload protection and traverse:
 - Fasten to hanger with screw (104), do not tighten.
 - Push in key (108) from above along side of eccentric fastener until top edge is **flush** with hanger.
 - Insert eccentric fastener (103), push in fully, tighten.
 - Tighten screw (104).

2. Settings

2.1 Beam stop

The beam stop does not have to be adjusted since the spare part weighing system supplied has already been adjusted in the factory. No readjustment during operation is needed.

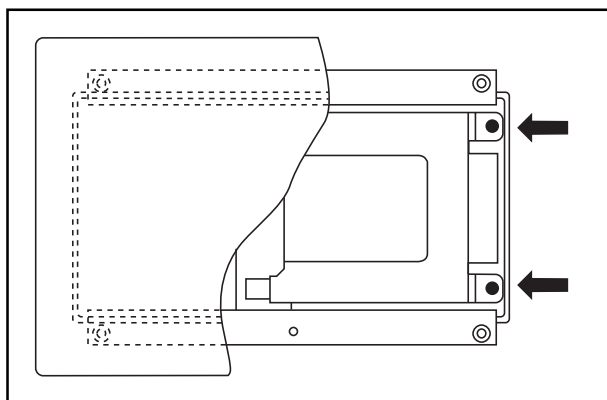
2.2 Setting cornerload



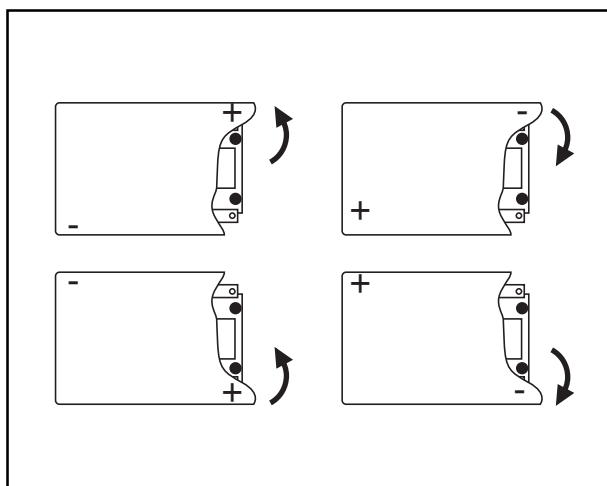
Preparation

Before every setting operation, undo the two upper screws of locking plates (209) and then retighten loosely.

Test weight for cornerload setting, see table in section F.



Setting is by turning the two screws, adjustment tolerances can be found in the table in section F.



- Place test weight in the middle of the weighing platform.
- Tare.
- Shift weight on the weighing platform diagonally up to the edge.
- Note weight value with sign at corners.
- Correct greatest deviation each time according to diagram opposite.
- After every correction, the weight must again be placed in the middle and taring performed.

Caution

After setting the cornerload, retighten the screws of the locking plates!

3. Adjustment

On completion of the repair work, the scale must be adjusted.

Note

There are two possibilities:

- Adjustment with ServicePac-M (art. No. 73611)
Containing: 1 x adjustment cassette, 1 x type cassette and 1 x service keypad)
⇒ see 3.1 - 3.2
- Adjustment with LC-PT45 service printer
⇒ see service manual R/G/B (art. No. 705116, section 7)

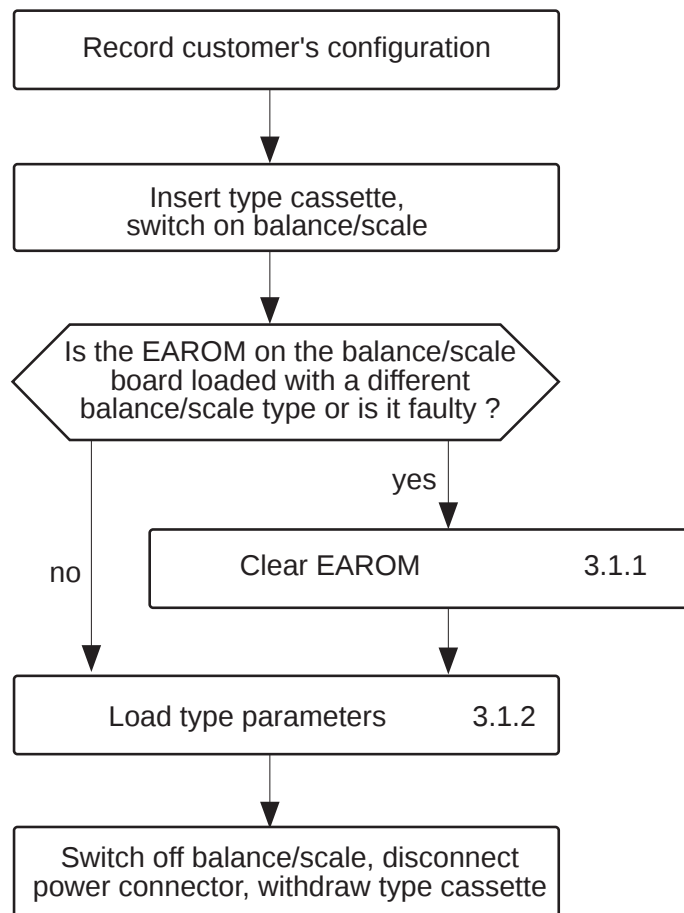
3.1 Adjustment with the type cassette

The type cassette must be inserted only if the type parameters have to be reloaded. This is the case if

- the scale board has been replaced or
- the EAROM content is faulty.

Overview

You will find a detailed description of the individual steps of the adjustment in the specified subsections.



3.1.1 Clearing EARM

Scale display	Actions at service keypad
<i>tYP.PAC</i>	Press and hold RESET key (approx. 4 sec.) until
<i>RESET</i> flashes	Press ENTER key (within 4 sec.)
<i>EMPTY</i> or <i>FAILED</i>	The EARM is cleared Repeat or replace PCB

3.1.2 Loading type parameters

Beispiel: SM15, OIML certified

Scale display	Actions at service keypad
<i>tYP.PAC</i>	Press TYPE ENTRY key
<i>tYPE</i>	Enter type and certification code* Key sequence 1 ÷ 1 ENTER
<i>5. 15. 10</i>	Press ENTER key again
<i>i.o.</i> or <i>Unconf</i>	if measuring cell parameters entered if measuring cell parameters have still to be entered

- * Code .00 Normal scale, code does not need to be entered
 Code .10 Certified scale with blockable calibration and configuration
 Code .20 Certified scale, calibration facility

National certified versions

- Code .11, Code .21 Certified scales the Netherlands
 Code .13, Code .23 Certified scales USA, Canada
 Code .24 France

Further information regarding code in section F.

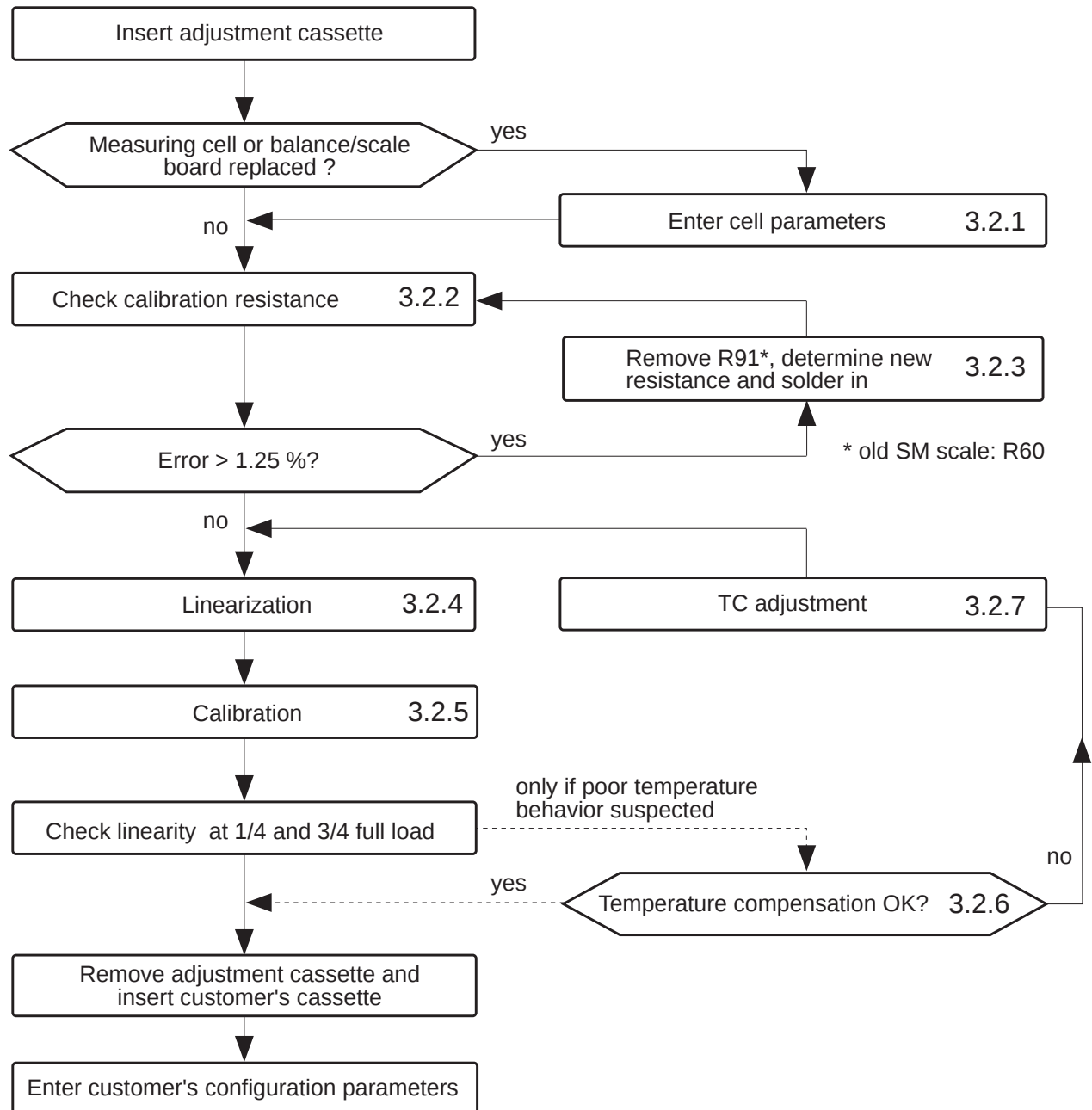
3.2 Adjustment with the adjustment cassette

Note

Before inserting adjustment cassette, print out the customer's configuration parameters or record them in the list in section F!

Overview

You will find a detailed description of the individual steps in the specified subsections.



3.2.1 Entering cell parameters

The measuring cell parameters, scale type, linearization and temperature compensation are contained in 21 5-7 digit numbers. These numbers are printed on the parameter sticker on the inside of the rear panel of the scale.

Actions at service keypad	Scale display
Press D IN key	-00-
Enter digit sequence of line 00 and close with ENTER key	-01-
Enter digit sequence of lines 01 - 19 and close in each case with ENTER key	-02- . . . -20-
Enter digit sequence of line 20 and close with ENTER key	-OFF-
Press tare bar	Display test

3.2.2 Checking calibration resistance

Example: SM6000

Actions at service keypad	Scale display
Press CALIBR. RESISTOR key	-r-
Press tare bar	2000.0 g flashes
Load requested calibration weight	-0.45 %
Press tare bar	0.0 g flashes
Remove calibration weight	1.0. E rES

3.2.3 Determining calibration resistance

The calibration resistance can be calculated from the following formula:

$$R_{91} \text{ (old SM scale: R60)} = \frac{\text{loaded weight} \cdot \text{reference resistance}^*)}{\text{error}}$$

Example: SM6000

Actions	Scale display
Press tare bar	<i>0.0</i> g
Load control weight	<i>20 10.4</i> g

$$R_{91} \text{ (old SM scale: R60)} = \frac{2000 \text{ g} \cdot 165 \Omega}{10.4 \text{ g}} = 31\,730 \Omega \approx 33 \text{ k}\Omega$$

3.2.4 Linearity adjustment

Example: SM6000

Actions at service keypad	Scale display
Press LINEARITY key	<i>PUSH</i> blinkt
Press down weighing platform until maximum load and release	<i>3000.0</i> g flashes
Load half load	<i>6000.0</i> g flashes
Load full load	<i>Lin error</i>
Remove weights	

*) See table in section F.

3.2.5 Calibration

Example: SM6000

Actions at service keypad	Scale display
Press CALIBRATION key	<i>2000.0</i> g flashes
Load calibration weight	<i>0.0</i> g flashes
Remove weights	<i>1.0.</i>

3.2.6 Checking temperature compensation

Example: SM6000

Actions at service keypad	Scale display
Switch on scale and allow to warm up for 5 minutes	0.1 g
Tare	0.0 g
Load full load (6 kg) and print out/note full load display	5999.8 g
Remove weight	0.0 g
Press key 4 Print out/note temperature value 297904	297904 t
Tare and allow scale to warm up for 2 hours Print out/note zero point change	0.0 g... 0.1 g
Tare	0.0 g
Load full load and print out/note full load display	6000.1 g
Press key 4 and print aout/note temperature value	3 12 108 t

Evaluation

Temperature difference in °C = $\frac{\text{difference in temperature values}}{2000}$

Zero point drift = $\frac{\text{zero point change}}{\text{temperature difference}}$

Sensitivity drift = $\frac{\text{difference in full load displays}}{\text{temperature difference}}$

Tolerances for zero point and sensitivity drift, see section F.

If the scale exceeds the tolerance by a factor of 1.5 to 2, the temperature adjustment must be performed.

Evaluation of the example

$$\text{Temperature difference} = \frac{312108 - 297904}{2000} \text{ }^{\circ}\text{C} = 7 \text{ }^{\circ}\text{C}$$

$$\text{Zero point drift} = \frac{0.1 \text{ g}}{7 \text{ }^{\circ}\text{C}} = 0.014 \text{ g/}^{\circ}\text{C}$$

$$\text{Tolerance zero point drift} = \frac{1.6 \text{ g}}{10 \text{ }^{\circ}\text{C}} = 0.16 \text{ g/}^{\circ}\text{C} > 0.014 \text{ g/}^{\circ}\text{C}$$

$$\text{Sensitivity drift} = \frac{16000.1 \text{ g} - 15999.8 \text{ g}}{7 \text{ }^{\circ}\text{C}} = \frac{0.3 \text{ g}}{7 \text{ }^{\circ}\text{C}} = 0.04 \text{ g/}^{\circ}\text{C}$$

$$\text{Tolerance sensitivity drift} = \frac{0.6 \text{ g}}{10 \text{ }^{\circ}\text{C}} = 0.06 \text{ g/}^{\circ}\text{C} > 0.04 \text{ g/}^{\circ}\text{C}$$

The determined zero point and sensitivity drifts are within the prescribed tolerances.

3.2.7 Performing temperature compensation

Example: SM6000

Settings in the configuration register	Scale display
Set temperature step to 1	<i>t StP 1</i>
Set temperature drift to dynamic	<i>t dyn</i>

Test (clears the old TC parameters)

Actions at service keypad	Scale display
Press HIGHER TEMP key	<i>-tEST-</i>
Press tare bar	<i>3000.0 g</i> flashes
Load half load	<i>6000.0 g</i> flashes
Load full load	<i>0.0 g</i> flashes
Remove weights	<i>1.0.</i>

Adjustment at the highest temperature step

Actions at service keypad	Scale display
Allow scale to warm up for approx. 4 hours, press key [4] Print out/note temperature display	<i>3 12 108 t</i>
Press HIGHER TEMP key	<i>-[ONP]-</i>
Press tare bar	<i>P [°] 7</i>
Press down weighing platform until full load and release	<i>3000.0 g</i> flashes
Load half load	<i>6000.0 g</i> flashes
Load full load	<i>1.0.</i>
Remove weights	<i>P [°] -1</i>

Adjustment at the lowest temperature step

Actions at service keypad	Scale display
Place scale for approx. 4 hours in refrigerator Press key [4] and note temperature value	<i>283700 t</i>
Press LOWER TEMP key	<i>-[ONP]-</i>
Press tare bar	<i>P [°] 1</i>
Press down weighing platform until full load and release	<i>3000.0 g</i> flashes
Load half load	<i>6000.0 g</i> flashes
Load full load	<i>1.0.</i>
Remove weights	<i>P [°] -1</i>

Adjustment at middle temperature step

Actions at service keypad	Scale display
Press key 4	284000 t
Allow scale to warm up to mean value of both temperature values	297904 t
Press MEDIUM TEMP key Press tare bar	P t° -1
Press down weighing platform until full load and release	3000.0 g flashes
Load half load	6000.0 g flashes
Load full load	1.0.
Printout of temperature values, weight values and temperature coefficients	Print t t° -1

Exiting the temperature adjustment

Actions at service keypad	Scale display
Press MEDIUM TEMP key, press tare bar	t t° -1
Press down weighing platform until full load and release	3000.0 g flashes
Load half load	6000.0 g flashes
Load full load	ALL 1.0.
Remove weights	0.0 g
Press D OUT key	tcc dAtA
Printout of new cell parameter strip	0.0 g
Copy new cell parameter strip and fix in scale	

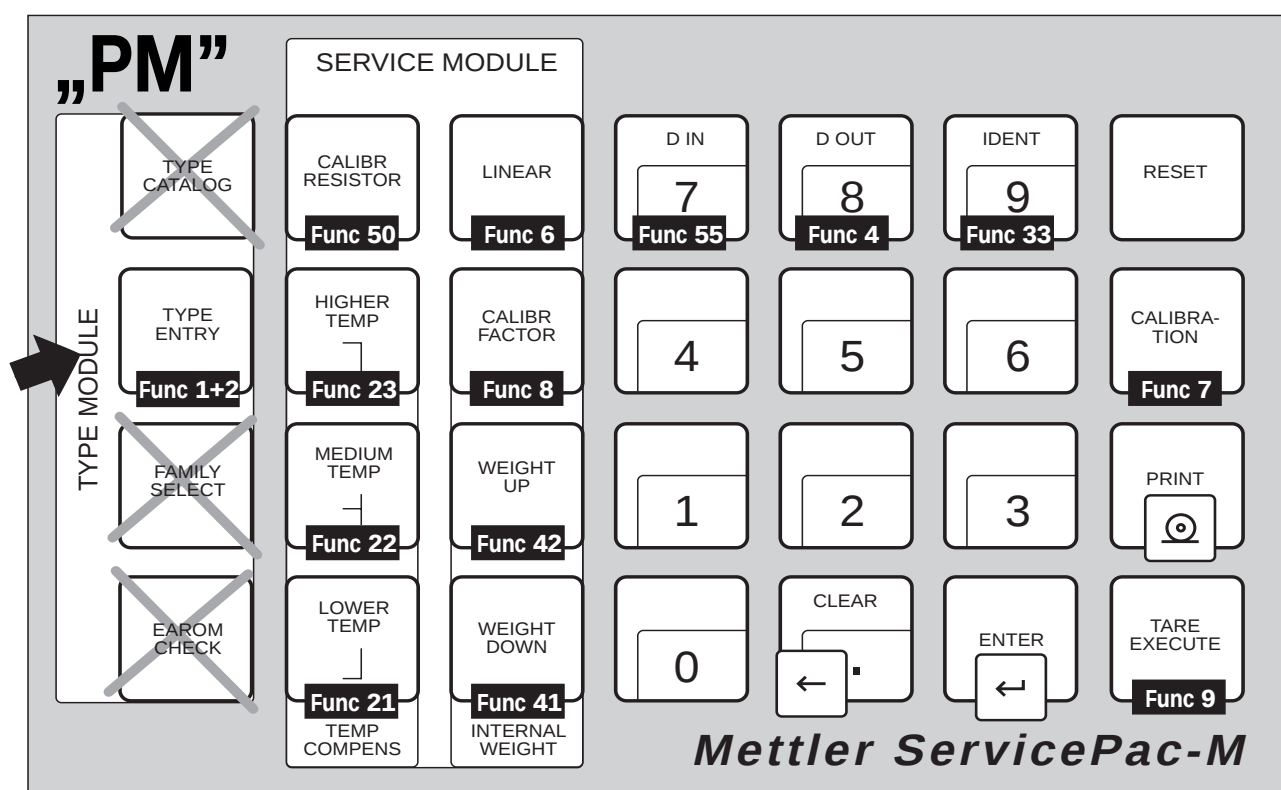
4. Adjustment of the AM/BB/CM/PM/SM/J balances with LC-PT45

ServicePac-M keypad and *type cassette* no longer needed. However, the *adjustment cassette* (BB: the adjustment and type EPROM) must continue to be used.

The adjustment procedure remains exactly the same as before except that the functions of the *ServicePac-M* are initiated using the keypad of the LC-PT45 and the type parameters are taken from the type EPROM of the LC-PT45. (The TYPE MODULE functions are an exception: none apply. Printing of TYPE ENTRY is replaced by the execution of Func 1 and Func 2.)

Please consult the appropriate service manual for the adjustment procedure and explanations of the messages on the balance display. (Exceptions BB: Shorting plug of EPROM must be plugged in at the left. LC-PT45 can be plugged into the data I/O connection directly without an adapter cable) 

ServicePac-M and LC-PT45, allocation of the functions for the AM/BB/CM/PM/SM/J balances



ServicePac PM Tast.

➡ Loading type parameters

- Switch off balance and LC-PT45
- Insert adjustment cassette (BB: adjustment EPROM)
- Switch on balance and then the LC-PT45 ➡ page 6-5, printout „ServicePac M/J/BB, RS active“
- Determine the TDNR number allocated to the balance (list in section 1, page 1-37, e.g. for AJ100.00 10051010).
- Load type parameters into EAROM of the balance using Func 1 and Func 2.

Adjustment functions of the ServicePac-M

Example: Instead of pressing the LINEAR key, execute Func 6 using the LC-PT45.

4.1 Contents of the type EPROM (service software V 4.03)

M balances, sorted by balance type. Explanation of the designations see corresponding service manual!

Balance type	TDNR	Balance type	TDNR	Balance type	TDNR
AJ100.00	10051010	PJ400.10	1xx53040	PM34.10	1xx30030
AJ100.10	1xx51010	PJ4000.00	10054040	PM400.00	10003010
AJ150.00	10022010	PJ4000.10	1xx54040	PM400.10	1xx03010
AJ150.10	1xx22010	PJ6.00	10054060	PM4000.00	10005010
AM100.00	10021010	PJ6.10	1xx54060	PM4000.10	1xx05010
AM100.10	1xx21010	PJ600.00	10053050	PM460.00	10003030
AM260.00	10023010	PJ600.10	1xx53050	PM460.10	1xx03030
AM260.10	1xx23010	PJ6000.00	10054050	PM4600.00	10005030
AM50.00	10021020	PJ6000.10	1xx54050	PM4600.10	1xx05030
AM50.10	1xx21020	PM100.00	10002020	PM480.00	10003020
BB120.00	10072020	PM100.10	1xx02020	PM480.10	1xx03020
BB1200.00	10073040	PM11-K	10036030	PM4800.00	10005020
BB1300.00	10073030	PM11-K	1xx36030	PM4800.10	1xx05020
BB240.00	10071010	PM11-N	10031030	PM6.00	10006020
BB2400.00	10073010	PM11-N	1xx31030	PM6.10	1xx06020
BB244.00	10071020	PM11.10 4)	1xx31030	PM600.00	10004020
BB2440.00	10073020	PM11.00 3)	10030010	PM600.10	1xx04020
BB3.00	10074020	PM11.00 4)	10031030	PM6000.00	10006010
BB300.00	10072010	PM11.10 3)	1xx30010	PM6000.10	1xx06010
BB3000.00	10074010	PM1200.00	10011010	PM6100.00	10013010
BB600.00	10073050	PM1200.10	1xx11010	PM6100.10	1xx13010
CJ150.00	10052010	PM15-K	10036020	SM12	10043060
CJ150.10	1xx52010	PM15-K	1xx36020	SM12	1xx43060
CJ500.00	10052020	PM15.00	10031020	SM12	10043040
CJ500.10	1xx52020	PM15.10	1xx31020	SM12	1xx43040
CM1200.00	10014010	PM16-K	10036010	SM12.00 1)	10040010
CM1200.10	1xx14010	PM16-K	1xx36010	SM12.00 2)	10043040
CM200.00	10021030	PM16.00	10031010	SM12.10 1)	1xx40010
CM200.10	1xx21030	PM16.10	1xx31010	SM12.10 2)	1xx43040
CM2000.00	10007030	PM200.00	10002010	SM1220	10043050
CM2000.10	1xx07030	PM200.10	1xx02010	SM1220	1xx43050
CM400.00	10003050	PM2000.00	10004010	SM1220.00 1)	10040020
CM400.10	1xx03050	PM2000.10	1xx04010	SM1220.00 2)	10043050
PJ12.00 1)	10061010	PM2100.00	10007010	SM1220.10 1)	1xx40020
PJ12.00 2)	10062020	PM2100.10	1xx07010	SM1220.10 2)	1xx43050
PJ12.10 1)	1xx61010	PM2500.00	10007020	SM15.00	10043030
PJ12.10 2)	1xx62020	PM2500.10	1xx07020	SM15.10	1xx43030
PJ1220.00 1)	10061020	PM30-K	10034030	SM15000	10043010
PJ1220.00 2)	10062030	PM30-K	1xx34030	SM15000	1xx43010
PJ1220.10 1)	1xx61020	PM30-N	10035020	SM1520.00	10043020
PJ1220.10 2)	1xx62030	PM30-N	1xx35020	SM1520.10	1xx43020
PJ15.00	10062010	PM30.00	10030040	SM3000.00	10041020
PJ15.10	1xx62010	PM30.10	1xx30040	SM3000.10	1xx41020
PJ200.00	10053010	PM300.00	10003040	SM3600.00	10041030
PJ200.10	1xx53010	PM300.10	1xx03040	SM3600.10	1xx41030
PJ2000.00	10054010	PM3000.00	10012010	SM6000.00	10041010
PJ2000.10	1xx54010	PM3000.10	1xx12010	SM6000.10	1xx41010
PJ300.00	10053020	PM30000	10030020		
PJ300.10	1xx53020	PM30000	1xx30020		
PJ3000.00	10054020	PM30000-K	10032010		
PJ3000.10	1xx54020	PM30000-K	1xx32010		
PJ360.00	10053030	PM34-K	10032020		
PJ360.10	1xx53030	PM34-K	1xx32020		
PJ3600.00	10054030	PM34-N	10035010		
PJ3600.10	1xx54030	PM34-N	1xx35010		
PJ400.00	10053040	PM34.00	10030030		

Notes

- 1) with 12 kg cell No. 34204/V
- 2) with 15 kg cell No. 34501/V or 626075
- 3) with cell No. 56580/V
- 4) 16 kg cell No. 625014

M balances, sorted by TDNR.

Explanation of the designations see corresponding service manual!

TDNR	Balance type	TDNR	Balance type	TDNR	Balance type
1xx02010	PM200.10	1xx53010	PJ200.10	10040010	SM12.00 1)
1xx02020	PM100.10	1xx53020	PJ300.10	10040020	SM1220.00 1)
1xx03010	PM400.10	1xx53030	PJ360.10	10041010	SM6000.00
1xx03020	PM480.10	1xx53040	PJ400.10	10041020	SM3000.00
1xx03030	PM460.10	1xx53050	PJ600.10	10041030	SM3600.00
1xx03040	PM300.10	1xx54010	PJ2000.10	10043010	SM15000
1xx03050	CM400.10	1xx54020	PJ3000.10	10043020	SM1520.00
1xx04010	PM2000.10	1xx54030	PJ3600.10	10043030	SM15.00
1xx04020	PM600.10	1xx54040	PJ4000.10	10043040	SM12.00 2)
1xx05010	PM4000.10	1xx54050	PJ6000.10	10043040	SM12
1xx05020	PM4800.10	1xx54060	PJ6.10	10043050	SM1220.00 2)
1xx05030	PM4600.10	1xx61010	PJ12.10 1)	10043050	SM1220
1xx06010	PM6000.10	1xx61020	PJ1220.10 1)	10043060	SM12
1xx06020	PM6.10	1xx62010	PJ15.10	10051010	AJ100.00
1xx07010	PM2100.10	1xx62020	PJ12.10 2)	10052010	CJ150.00
1xx07020	PM2500.10	1xx62030	PJ1220.10 2)	10052020	CJ500.00
1xx07030	CM2000.10	10002010	PM200.10	10053010	PJ200.00
1xx11010	PM1200.10	10002020	PM100.00	10053020	PJ300.00
1xx12010	PM3000.10	10003010	PM400.00	10053030	PJ360.00
1xx13010	PM6100.10	10003020	PM480.00	10053040	PJ400.00
1xx14010	CM1200.10	10003030	PM460.00	10053050	PJ600.00
1xx21010	AM100.10	10003040	PM300.00	10054010	PJ2000.00
1xx21020	AM50.10	10003050	CM400.00	10054020	PJ3000.00
1xx21030	CM200.10	10004010	PM2000.00	10054030	PJ3600.00
1xx22010	AJ150.10	10004020	PM600.00	10054040	PJ4000.00
1xx23010	AM260.10	10005010	PM4000.00	10054050	PJ6000.00
1xx30010	PM11.10 3)	10005020	PM4800.00	10054060	PJ6.00
1xx30020	PM30000	10005030	PM4600.00	10061010	PJ12.00 1)
1xx30030	PM34.10	10006010	PM6000.00	10061020	PJ1220.00 1)
1xx30040	PM30.10	10006020	PM6.00	10062010	PJ15.00
1xx31010	PM16.10	10007010	PM2100.00	10062020	PJ12.00 2)
1xx31020	PM15.10	10007020	PM2500.00	10062030	PJ1220.00 2)
1xx31030	PM11.10 4)	10007030	CM2000.00	10071010	BB240.00
1xx31030	PM11-N	10011010	PM1200.00	10071020	BB244.00
1xx32010	PM30000-K	10012010	PM3000.00	10072010	BB300.00
1xx32020	PM34-K	10013010	PM6100.00	10072020	BB120.00
1xx34030	PM30-K	10014010	CM1200.00	10073010	BB2400.00
1xx35010	PM34-N	10021010	AM100.00	10073020	BB2440.00
1xx35020	PM30-N	10021020	AM50.00	10073030	BB1300.00
1xx36010	PM16-K	10021030	CM200.00	10073040	BB1200.00
1xx36020	PM15-K	10022010	AJ150.00	10073050	BB600.00
1xx36030	PM11-K	10023010	AM260.00	10074010	BB3000.00
1xx40010	SM12.10 1)	10030010	PM11.00 3)	10074020	BB3.00
1xx40020	SM1220.10 1)	10030020	PM30000		
1xx41010	SM6000.10	10030030	PM34.00		
1xx41020	SM3000.10	10030040	PM30.00		
1xx41030	SM3600.10	10031010	PM16.00		
1xx43010	SM15000	10031020	PM15.00		
1xx43020	SM1520.10	10031030	PM11.00 4)		
1xx43030	SM15.10	10031030	PM11-N		
1xx43040	SM12.10 2)	10032010	PM30000-K		
1xx43040	SM12	10032020	PM34-K		
1xx43050	SM1220.10 2)	10034030	PM30-K		
1xx43050	SM1220	10035010	PM34-N		
1xx43060	SM12	10035020	PM30-N		
1xx51010	AJ100.10	10036010	PM16-K		
1xx52010	CJ150.10	10036020	PM15-K		
1xx52020	CJ500.10	10036030	PM11-K		

Notes

- 1) with 12 kg cell No. 34204/V
 2) with 15 kg cell No. 34501/V or 626075
 3) with cell No. 56580/V
 4) 16 kg cell No. 625014

Is my service manual really up to date?

At the bottom right of the title page you will find the date of issue. If you know the date of the latest edition, you can thus see whether your service manual is up to date.

If this is not the case, the latest service bulletin has not been filed. (The service bulletins represent a continuous supplement to the service manual and keep it up to date.)

The service bulletin always includes a new title page for the service manual, new pages and pages to be exchanged, as well as a new contents page for section E. All these documents have the same, latest date of issue at the bottom of the page.

First edition of the service manual "SM/PJ", Index A: November 1991 (11/91)

Contents section E

Date of issue

- | | | |
|----|---|-------|
| 1. | Service Bulletin ME-705035
Correction of spare part numbers | 02/92 |
| 2. | Service Bulletin ME-705054
Update of the service manual with the old SM scale board | 04/92 |
| 3. | Service Bulletin ME-11780285
Update of the service manual | 02/98 |

Address **Mettler-Toledo AG, CH-8606 Greifensee**
 Telephone **01-944 22 11**
 Telefax **01-944 30 80**
 Telex **826150 mig ch**

METTLER TOLEDO

Service bulletin

METTLER SM/PJ scales

Supplement to service manual ME-702434 A

Purpose of this service bulletin

The following spare parts had partly wrong numbers, the correct ones are:

Spare part	SM15	SM1520	PJ12	PJ1220	PJ15
Weighing system	34501/V	34501/V	34501/V	34501/V	
Standard program cassette			34560/V	34560/V	34560/V

Filing instructions for service manual ME-702434A, Edition Nov. 1991

Please file this page in section E, and replace the old service manual pages with the new pages enclosed.



P705035

Address **Mettler-Toledo AG, CH-8606 Greifensee**
 Telephone **01-944 22 11**
 Telefax **01-944 30 80**
 Telex **826150 mig ch**

METTLER TOLEDO

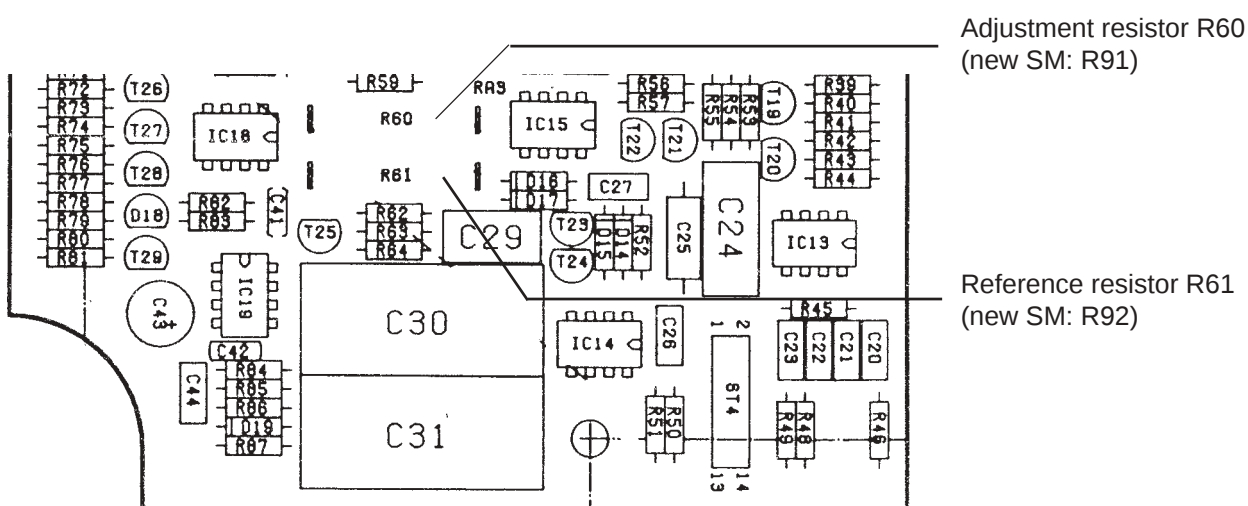
Service Bulletin

METTLER SM/PJ Scales

Supplement to service manual ME-702434A

Purpose of this service bulletin

Update of the service manual with the old SM scale board (reference and adjustment resistors had other numbers and hence all affected pages have had to be updated)



Filing recommendation for service manual ME-702434A

Please file this page at the very end of section E and replace the old service manual pages by the new ones enclosed.



P705054

Adresse **Mettler-Toledo GmbH, Postfach LAB-300, CH-8606 Greifensee**
Telefon **01-944 36 36**
Fax **01-944 31 90**

Service bulletin

METTLER-TOLEDO **Electronic precision scales** **SM/PJ scales**

Supplements to service manual 702434A

Purpose of this service bulletin

- Updating the service manual

Filing recommendation

- Exchange title page 702434A
- Section A Exchange completely
- Section D Exchange completely
- Section E Exchange page 1 and add this page at the end
- Section F Exchange page 5/6



P11780285

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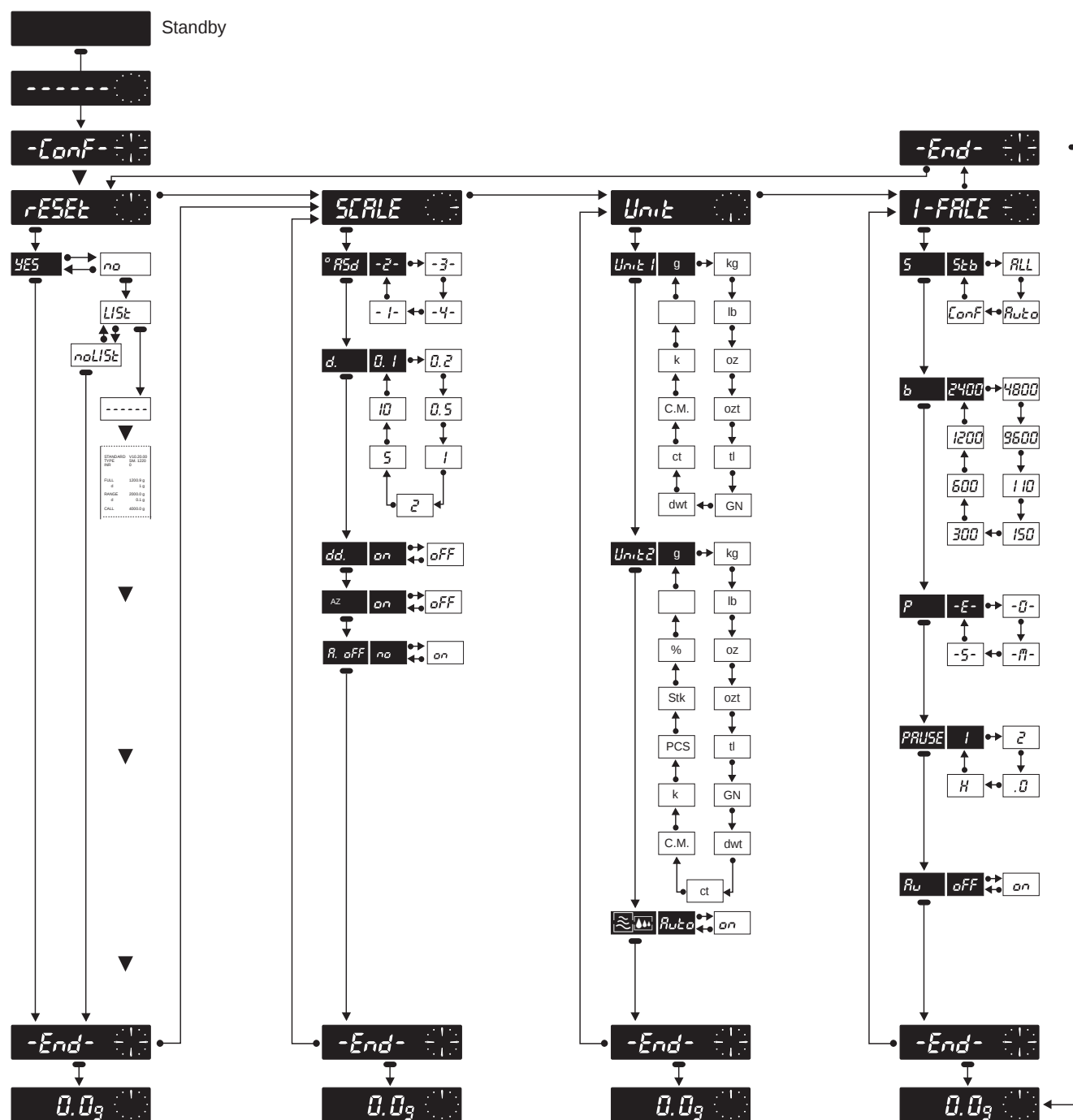
1. List for customer's configuration

Note

Please print out the existing configuration **before** starting the service work or enter it in the list so that the scale can be configured in the same manner after servicing.

Make copies of the list for your own use.

Customer's configuration SM scales



Customized configuration of PJ scales

With the PJ scales, configuration is possible only if the program cassette Option 019 is inserted. Even in this case, only the sector I-FACE can be modified.

2. Technical data and adjustment tolerances

2.1 Weighing range, readability, cornerload

	Weighing range		Readability				Cornerload	
	Normal	Fine range	Normal	Fine range	Service module	Factor	Test weight	Tolerance
SM3000	3100 g	–	0.1 g	–	0.05 g	2	3 kg	0.2 g
SM6000	6100 g	–	0.1 g	–	0.05 g	2	4 kg	0.3 g
SM12	12000 g	–	0.1 g	–	0.05 g	2	6 kg	0.5 g
SM1220	12000 g	2000 g	1 g	0.1 g	0.05 g	2/20	6 kg	0.5 g
SM15	15000 g	–	1 g	–	0.1 g	10	10 kg	0.8 g
SM1520	15000 g	2000 g	1 g	0.1 g	0.05 g	2/20	10 kg	0.5 g
SM15000	15000 g	–	0.1 g	–	0.1 g	1	10 kg	0.5 g
PJ12	12000 g	–	0.1 g	–	0.05 g	2	6 kg	0.5 g
PJ1220	12000 g	2000 g	1 g	0.1 g	0.05 g	2/20	6 kg	0.5 g
PJ15	15000 g	–	1 g	–	0.1 g	10	10 kg	0.8 g

2.2 Linearity, calibration weight, temperature compensation

	Linearity ¹⁾		Calibration weight			Temperature compensation		Reference resistor
	Tolerance (up)	(down)	Normal scales	Certified scales	Service module	Tol.zero point 10 °C	Tol.sensi-bilit ²⁾ 10 °C	Reference ³⁾ resistor
SM3000	0.10 g	0.20 g	1 kg	2 kg	3 kg	0.75 g	0.30 g	165 Ω
SM6000	0.10 g	0.20 g	2 kg	4 kg	6 kg	1.20 g	0.60 g	165 Ω
SM12	0.3 g	0.4 g	4 kg	6 kg	12 kg	1.20 g	1.20 g	(125 Ω) 155 Ω
SM1220	0.3 g	0.4 g	4 kg	6 kg	12 kg	1.20 g	1.20 g	(125 Ω) 155 Ω
SM15	0.3 g	0.4 g	4 kg	6 kg	15 kg	1.6 g	0.8 g	155 Ω
SM1520	0.3 g	0.4 g	4 kg	6 kg	15 kg	0.80 g	0.40 g	155 Ω
SM15000	0.3 g	0.4 g	4 kg	6 kg	15 kg	1.6 g	0.8 g	155 Ω
PJ12	0.3 g	0.4 g	4 kg	6 kg	12 kg	1.2 g	1.2 g	(125 Ω) 155 Ω
PJ1220	0.3 g	0.4 g	4 kg	6 kg	12 kg	1.2 g	1.2 g	(125 Ω) 155 Ω
PJ15	0.3 g	0.4 g	4 kg	6 kg	15 kg	1.6 g	0.8 g	(125 Ω) 155 Ω

¹⁾ The specified tolerance is the admissible display error at 1/4, 1/2 and 3/4 full load when the zero point and full load display are free from error. After a linearity adjustment, always check at 1/4 and 3/4 full load.

²⁾ Test weight always same as full load.

³⁾ Values in brackets apply to the old 12 kg weighing cell; for differences compared with the new 15 kg weighing cell, see section Checking, page 10.

2.3 Error limits of test weights following OIML No. 20/EC tolerances

Nominal value	Class E2 ($\leq$ NIST* Class S)	Class F1 ($\approx$ NIST Class M)
100 g	$\pm 0,15$ mg	$\pm 0,5$ mg
200 g	$\pm 0,30$ mg	$\pm 1,0$ mg
500 g	$\pm 0,75$ mg	$\pm 2,5$ mg
1 kg	$\pm 1,5$ mg	± 5 mg
2 kg	$\pm 3,0$ mg	± 10 mg
5 kg	$\pm 7,5$ mg	± 25 mg
10 kg	± 15 mg	± 50 mg

* NIST = National Institute of Standards and Technology, Washington, D.C.

3. Custom version

3.1 Software versions

- When the scale is switched on. After the display test the current software number appears as a six-digit number divided into two groups.
- The program cassettes and the individual EPROM chips are inscribed with the first four characters of the software number (e.g. V10.42).

1st group	Program type
10	Standard (for weighing units of the M series)
11-19	Pac applications (for weighing units of the M series)
20-29	Standard (for weighing units of the J series)
30	Standard (for special certified weighing units, to national codes)
31-39	Pac applications (for weighing units of the M series, France only)
50	Standard (does not load type parameters in EAROM)
51-59	Pac applications (for weighing units of the M series, to national codes)
60-69	Standard (also loads type parameters for special weighing units)
80-89	Type parameters (loads EAROM for weighing units of the M/J series)
90-99	Service, development and production
2nd group	Software version/number of the custom version
0-99	Version of last software update (with certified weighing units also national version)
3rd group	Operating mode (category of EAROM loading in the weighing unit)
00	Normal weighing unit
10	Certified weighing unit with blockable calibration and configuration
11-19	Certified weighing unit (to national codes)
20	Certified weighing unit, calibration facility
21-29	Certified weighing unit (to national codes)
50-FF	Special weighing units, also letter code

For normal and certified weighing units, the type parameters are contained in the type cassette.
With special weighing units, these parameters are contained in the special standard software.

When the type parameters of certified and special weighing units are loaded, the code for the operating mode must be entered in addition to the weighing unit type.

3.2 Overview of special programs (as of June 1990)

Software of version V50.XX.XX does not change the EAROM contents.

Version	Description	Use
ME-930073 V50.32	Attachment of PM balances/scales to old DL40s	
ME-930111 V50.43	with 200 ms data output time application: consumption measurements	
ME-930109 V50.43	without ASD in taring	
ME-930110 V50.43	no * in animal weighing string	V10.45
ME-930100 V50.42	FIX 20 as piece count reference	
ME-930091 V10.42	Autostart together with the CL310 multiplexer	ME-930124 V50.45
ME-930125 V50.42	without CL software handshake	
ME-930088 V50.42	Standard Remote – Autostart – Calibration via the interface – Faster display update (approx. 106-133 ms) – Faster data output update (approx. 60 ms) – "M" commands for filter etc.	ME-930125 V50.45 V10.45 ME-930124 V50.45 ME-930124 V50.45 V10.45 or ME-930124 V50.45
ME-930022 V50.45	Dispensing/consumption software – Restart – Taring without stability detection – Full range display with 0.1 g DeltaRange balance/scales	V10.45
ME-930124 V50.45	Standard Remote – Autostart – Display - dataoutput update – Data output every 60 ms – CA, TI, M commands as with V10.45	

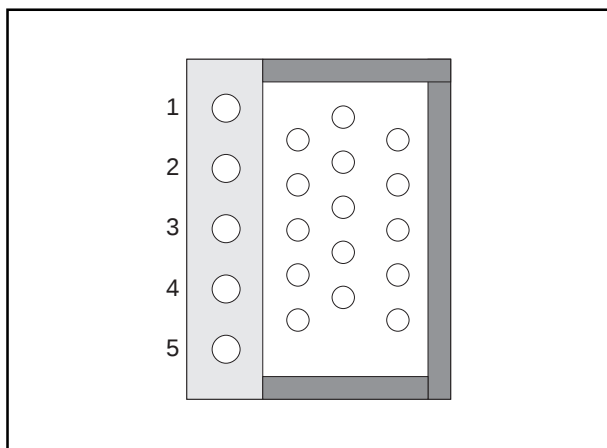
3.3 Overview of customized balances/scales

	Cassette	Software version
PM30 Post Canada (type Pac only)	–	V10.42.69
PM30000 – certified version .10 – certified version .20	ME-33452	V60.42.66 V60.42.5d V60.42.5e
PM16-REM	ME-216216	formerly 930088 for England
PM30000	ME-216220	with type data
SM...-CN (Connex)	ME-33490	V50.45
PM6-P (Post Portugal) PM30-P (Post Portugal)	ME-33497 ME-33498	V60.45.7C V60.45.6F
RA311 (Reference balance), PJ – from PM460 RA3110 (Reference balance)	ME-216232 ME-216236 ME-216233	V60.45.7D V60.45.7D V60.45.7E
PM6/PB	ME-216125	V60.45.8F
PJ6000-FP PM6000-FP	Front glass PPG Front glass PPG	
PJ3000-TH	ME-216159	V60.42.A5
PM6000-FB PJ6-FB (Australia, Berger)	(blue housing) ME-216254	V60.45.A7
College 150	Front glass	
College 3600	ME-216428	V60.40.AA

4. Component diagrams and schemas

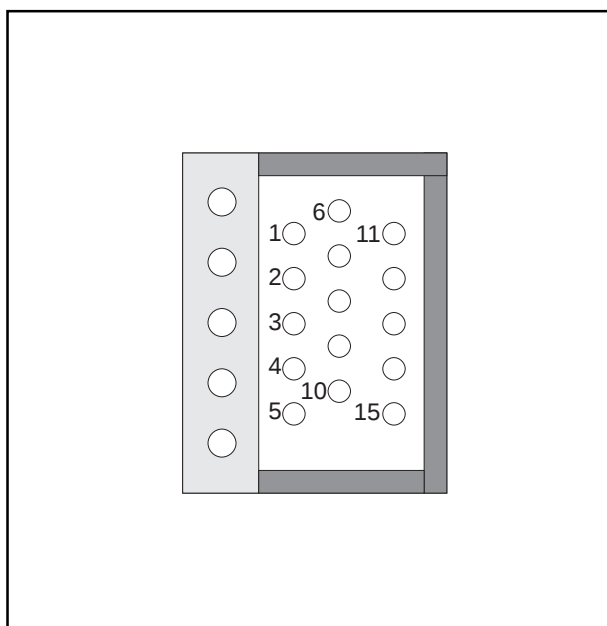
4.1 Pin assignment of solderable connector ME-33930

Assigned MiniMETTLER coding

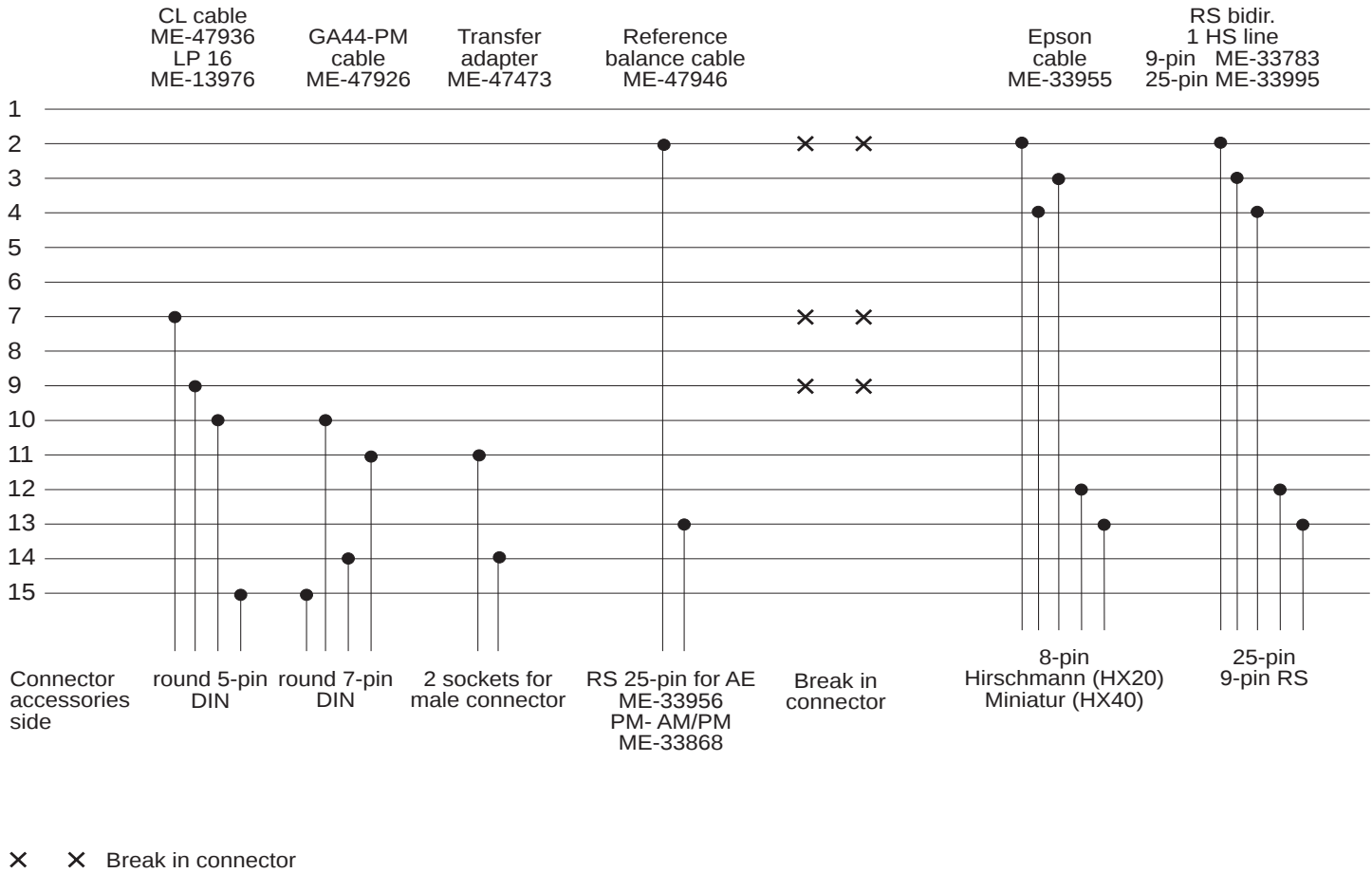


1, 2	AT, re-zero connector
1, 3	Data I/O
1, 4	Ex scales, Data I/O
1, 5	PE Pac
2, 3	AT Pac
2, 4	SM terminal, GM
2, 5	Reserve
2, 3, 4	PM Pac
3, 4	assigned by PM Pac
3, 5	Ex scales, Pac, GM
4, 5	Reserve

Pin assignment of RS and CL interface



Pin 1	Reserve
Pin 2	RS IN
Pin 3	Reservedt RS DTR
Pin 4	Reserved RS CTS-
Pin 5	Reserved RS
Pin 6	Shield
Pin 7	CL IN+
Pin 8	Reserved RS
Pin 9	CL IN-
Pin 10	CL OUT-
Pin 11	0 V
Pin 12	RS out
Pin 13	RS COM
Pin 14	Transfer
Pin 15	CL OUT+



4.2 Boards

Board	Component diagram	Electrical scheme
SM/PJ Scale board	ME-34482	ES-34483
SM Scale board old SM scale	ME-34187	ES-34185
SM-F Display board (Fluorescent display)	ME-34370	ES-34368
SM-L Display board (LCD display)	ME-34190	ES-34188
PJ Display board (Fluorescent display)	ME-34548	ES-34549
SM-AF Display / Terminal board (FD)	ME-32902	ES-32903
SM-AL Display / Terminal board (LCD)	ME-32922	ES-32923

