



sartorius

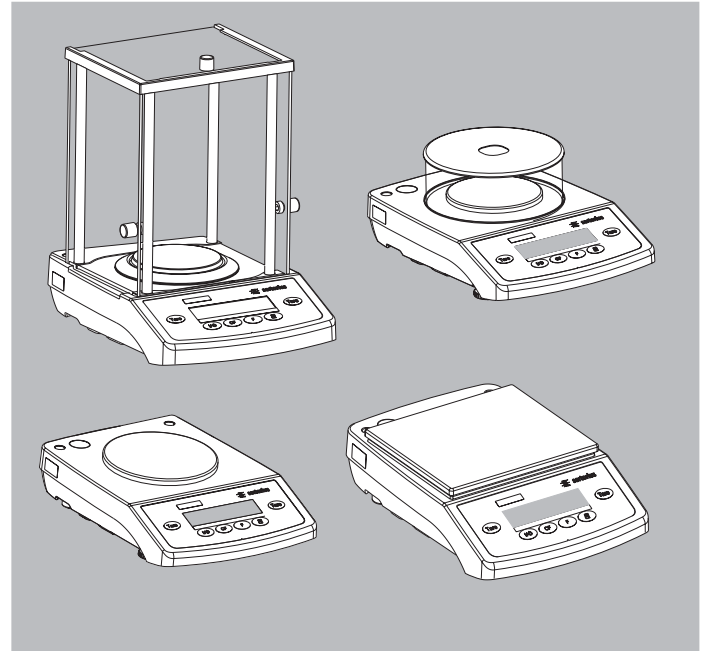
Service Manual

Sartorius Talent | Gem, Gold

TE Models

Electronic Analytical and Precision
Balances and Precious Metal Scales

Including Service Specification Sheets



WTE5001-e03101

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Generals Information

Important Information

Any persons servicing or working on high-resolution Sartorius Competence balances/scales should have successfully completed a service course at the Sartorius headquarters in Goettingen. Do not perform any unauthorized repair work!

Service Concept for TE- Balances/Scales

Valid until further notice

- All calibration/adjustment work required for starting up operations and tests must be carried out in accordance with the operation instructions.
- Quality defects.
 - o Immediately report all quality defects that may occur to the Quality Assurance Department (WQM).
- Defective balances/scales
 - o Warranty.
 - Within the first 6 months of installation, any defective balance/scale covered by the warranty should be exchanged.
 - o Seal of warranty.
 - If you have to remove the Seal of Warranty, please affix your Company control seal to the unit!
 - o In other cases, proceed according to the OAW135 (standard operating procedure for returns for repairs).
 - Defective weighing systems.
Proceed as described in the Service Concept for Weighing Cells, refer to (Service Information Document 6.2001 / OAW135-2/3).
 - Defective electronics.
These balances/scales along with an error record should be sent back to the Central Mechanics Workshop (ZW) in Goettingen (OAW135-2).
 - Other service situations can be dealt with on site, for example:
Broken draft shields; weighing pan can no longer be used; replacing small parts, ... etc

General Notes

Service Guide


1. Check the repeatability
 - Balance/Scale with strain gauge system (standard deviation, see page 34)
 - Balance/Scale with double lever system (standard deviation, see page 39)
2. Check the off-center loading error and adjust as required
 - Balance/Scale with strain gauge system (see page 35)
 - Balance/Scale with double lever system (see page 40/41)
3. Adjust the sensitivity with external calibration weight
 - Balance/Scale with strain gauge system (see page 36)
 - Balance/Scale with double lever system (see page 46)
4. Adjust the linearity is preferably performed using the sequential method, or with calibrated weights,
 - Balance/Scale with strain gauge system (see page 37)
 - Balance/Scale with double lever system (see page 47)

Activating the BPI Mode/
Deactivating write-protect

Perform only before working with the Sartorius Service Software;
for calibration/adjustment. Linearization and programming a data record when
exchanging the main PCB.

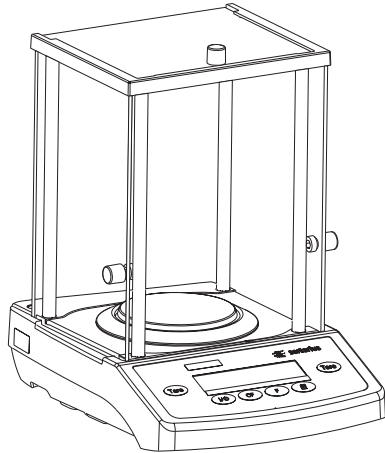
Reset write-protect	After working with the Sartorius Service Software, always make sure to conclude with the „Close“ function (returning the balance from BPI back to SBI mode), otherwise write-protect is not set, and the balance/scale remains in the BPI mode (see Page 25). If all else fails, reset the SBI mode by selecting menu reset (9-1°).
Exchanging the Main PCB	When ordering replacement PCBs, always state the model and the serial number, based on this information a preprogrammed new PCB set can be delivered.
Weighing systems	- Double lever system, Strain gauge system
Opening the housing	<ul style="list-style-type: none"> - Unscrew the 2 (sealed) screws on the reverse side and slide the upper half of the housing back. - After closing the balance/scale, the service technician or service organization must reaffix another control seal!
Service software	<ul style="list-style-type: none"> - Must be used for adjusting weighing instruments when tolerance levels are exceeded by $\pm 2\%$ (span, linearity, offset, zeropoint). Do not use out-dated software versions.
Adjusting the off-center load	<ul style="list-style-type: none"> - Strain-gauge weighing systems and model TE3102 devices are adjusted by filing the thin parts. Model TE214S and TE313S devices are adjusted using the off-center value adjustment screws.
Span adjustment	<ul style="list-style-type: none"> - Can be performed using external calibrated (i.e., certified) weights.

BPI switch

- (BPI = Binary Prozessor Interface) to prepare for working with Sartorius service software, log out with „CLOSE“ function (to reset for SBI functions).
- Or if all else fails by resetting the operating menu (9-1°)
Be careful, the factory settings are activated.
" ERR 30 is also shown after pressing the  key, if the wrong interface cable is used!

Models with Special Weighing Systems

Model



TE-Modell-Nr1.eps

Model 1

Weighing system:
Double Lever Systems
with off-center
adjustment screws (P)
(see right)

Resolution: 0.1 mg

TE64

TE124S

TE214S

Resolution: 1 mg

TE313S-DS

Weighing system:
(Strain gauge) (see right)

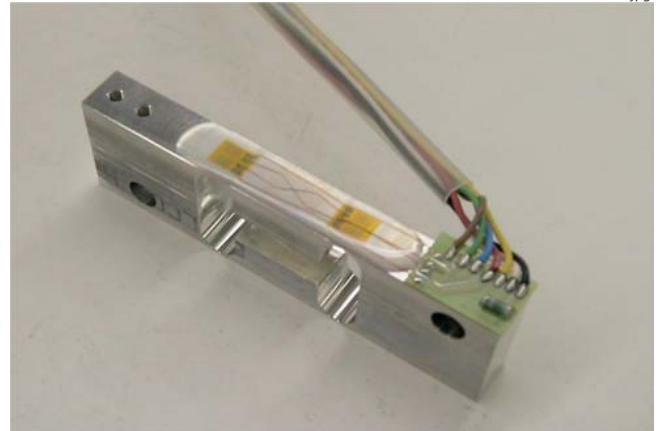
Resolution: 1 mg

TE153S-DS

Weighing Systems

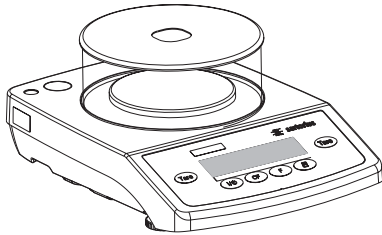


Aut12402.jpg



AUT_4906a.JPG

Model



Bauform-Nr2.eps

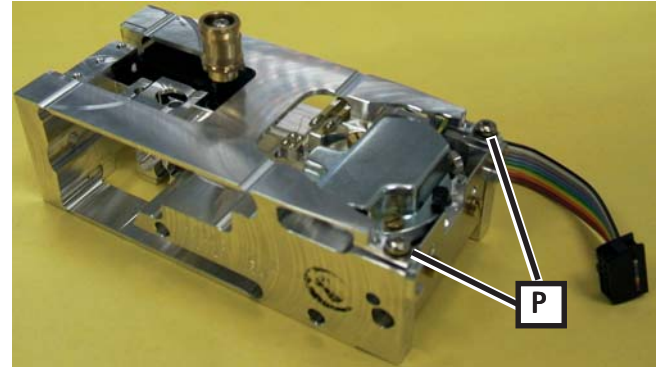
Model 2

Weighing system:
Double Lever Systems
(see right)

Resolution: 1mg
TE313S

Resolution: 0,001ct
GD103
GD603

Weighing Systems

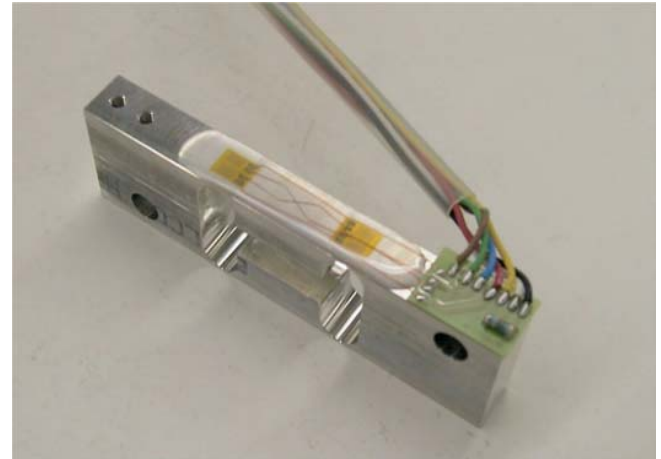


Aut12402.jpg

Weighing system:
Strain gauge (see right)

Resolution: 0,001g
TE153S

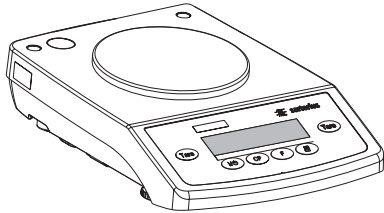
Resolution: 0,01ct
GD252



AUT_4906a.JPG

Model

Weighing Systems



TE-Modell-Nr3.eps

Model 3

Weighing system:
(Strain gauge) (see right)

Resolution: 0,01g

TE212 TE212-L

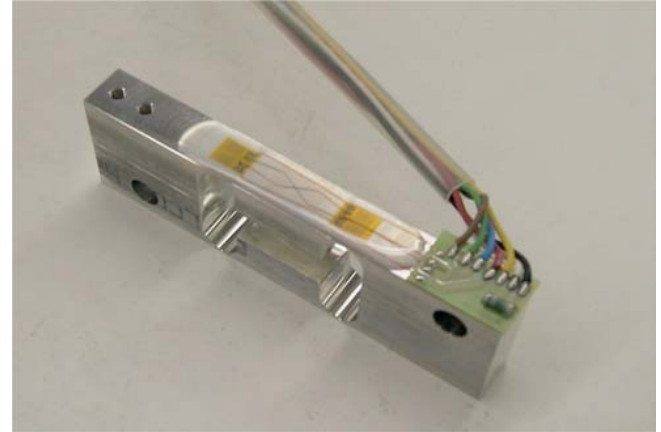
TE412 TE412-L

TE612 TE612-L

GE212

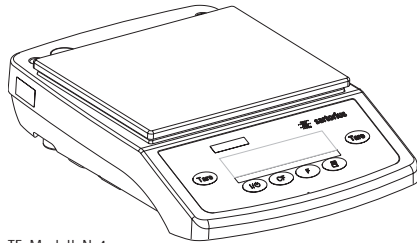
GE412

GE812



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Model



TE-Modell-Nr4.eps

Model 4

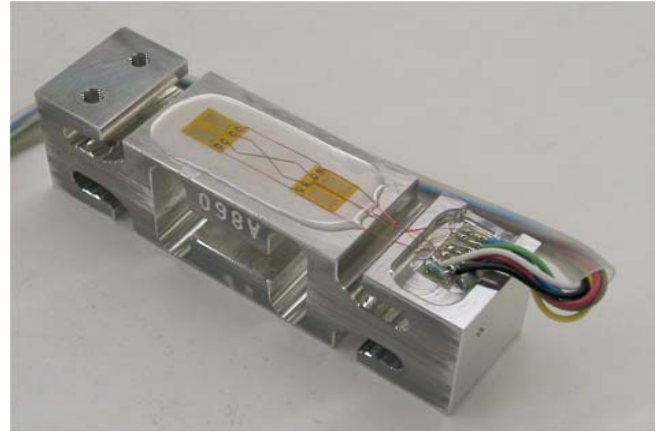
Weighing system:
Strain gauge (see right)
Resolution: 0,01g
TE1502S
GE1302, GE2102

Resolution: 0,1g
TE601 TE601-L
TE2101 TE2101-L
TE4101 TE4101-L
TE6101 TE6101-L
GE811, GE2101, GE7101,
GE4101

Resolution: 1g
TE12000 TE12000-L
TE6100 TE6100-L
TE4100 TE1200-OCE

Weighing system:
Double Lever Systems
(see right)
Resolution: 0,01g
TE3102S

Weighing Systems



AUT_4910a.JPG



Aut12407.jpg

Auxiliary Service Tools, Equipment and Weights

Caution:

After removing the seal (warranty label) and finishing service work, reaffix your company control seal!

Please make sure that you use the proper tools and equipment and that the balance/scale is set up on a solid, levelled surface and in a clean work area, free of vibrations and drafts.

Sartorius service software		6740-33
BPI- connecting / Service Data output		6740-71
RS232 connecting cable	(25-Pin /25-Pin)	7357312
RS232 connecting cable	(25-Pin / 9-Pin)	7357314

Accompanying Literature

Operating Instructions Sartorius Talent/TE Series/Sartorius Gem Publication
No: WTE6003-d03071

Weights

In addition to your standard tools and equipment, you will need the following sets of weights when working on Sartorius balances/scales:

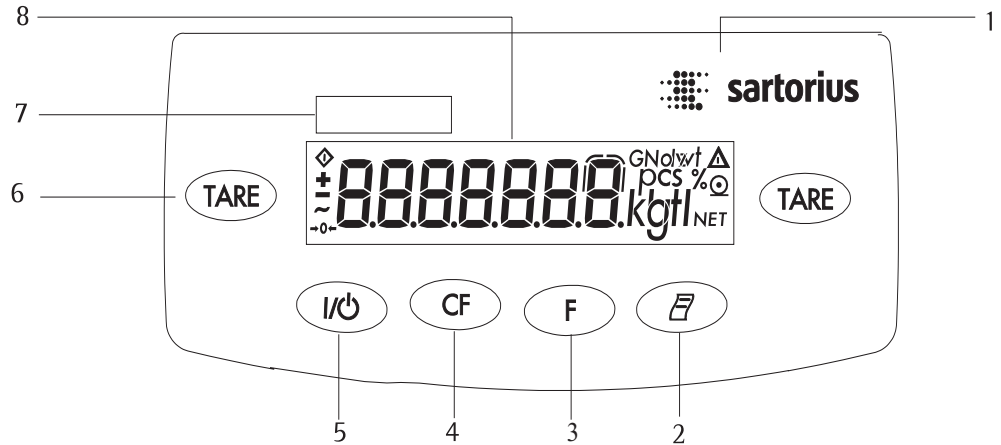
Model	Accuracy class (OIML)	Weight in grams	Catalog No.:
TE214S TE212, TE212-L	E2	1x200	YCW5228
TE124S, GD603	E2	1x100	YCW5128
TE64	E2	1x50	YCW4528
TE313S, TE313S-DS	E2 E2	1x200 + 1x100	YCW5228 + YCW5128
GD103	E2	1x50	YCW4528
GD252	F1	1x50	YCW4538
TE153S, TE153S-DS	E2 E2	1x100 + 1x50	YCW5128 + YCW4528
TE612, TE612-L	F2	1x500 + 1x100	YCW5548 + YCW5128
TE412, TE412-L GE412	F2	2x200	YCW5248

Model	Accuracy class (OIML)	Weight in grams	Catalog No.:
TE212, TE212-L GE212	F2	2x100	YCW5148
GE812	F1	1x500 +	YCW5538 +
	F1	1x200 +	YCW5238 +
	F1	1x100	YCW5138
TE1502S	F1	1x1000 +	YCW6138 +
	F1	1x500	YCW5538
GE2102	E2	1x2000 +	YCW6228 +
	E2	1x200	YCW5228
GE1302	E2	1x1000 +	YCW6128 +
	E2	1x200 +	YCW5228 +
	E2	1x100	YCW5128
TE3102S	E2	1x2000 +	YCW6228 +
	E2	1x1000 +	YCW6128 +
	E2	1x100	YCW5128
TE6101, TE6101-L	F1	1x5000 +	YCW6538 +
	F1	1x1000 +	YCW6138 +
	F1	1x100	YCW5138
TE4101, TE4101-L GE4101	F2	2x2000 +	YCW6248 +
	F2	1x100	YCW5148

Model	Accuracy Accuracy	Weight in grams	Catalog No.:
GE7101	F1	1x5000 +	YCW6538 +
	F1	1x2000 +	YCW6238 +
	F1	1x100	YCW5138
TE2101, TE2101-L GE2101	F2	2x1000 +	YCW6148 +
	F2	1x100	YCW5148
TE601, TE601-L	F2	1x500 +	YCW5548 +
	F2	1x100	YCW5148
GE811	F2	1x500 +	YCW5548 +
	F2	1x200 +	YCW5248 +
	F2	1x100	YCW5148
TE12000, TE12000-L	F2	1x10000 +	YCW7148 +
	F2	1x2000	YCW6248
TE6100, TE6100-L	F2	1x5000 +	YCW6548 +
	F2	1x1000 +	YCW6148 +
	F2	1x100	YCW5148
TE4100	F2	1x2000 +	YCW6248 +
	F2	1x100	YCW5148

Handling and Operating the TE Balances/Scales

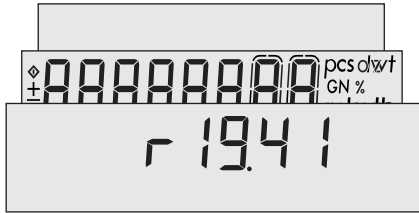
Function of the Keys





Position	Description
1	Weighing unit
2	Data output (Print)
3	Function key: activates selected applications program
4	Activate calibration/adjustment mode
5	ON/OFF key: Switches the display on and off. (The balance/scale may remain on - depending on the factory setting.)
6	Taring
7	Manufacturer's ID label
8	Weight display depending on the selected basic unit

Bedienfeld-TE.eps

Displaying the Hardware and Software Versions



Anz-rel07F.eps

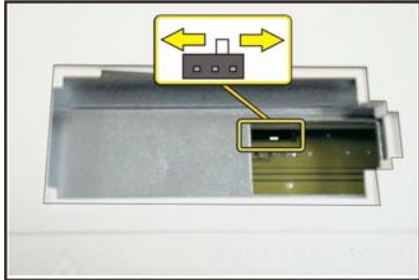
- Turn the balance/scale off and back on again with the  button.
 - While all display segments are lit („Segment Test“), briefly press the  key, the pattern shown to the left appears in the display.
 - This remains displayed for around 3 sec.
 - The first number shows the hardware generation; the last two numbers the software version.
-
- The display returns to the normal weight readout mode.



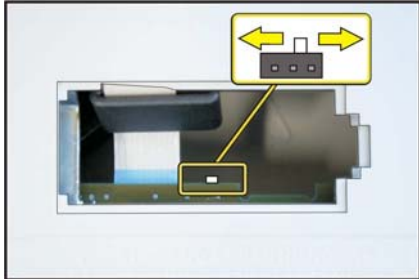
Anz-000F.eps

Operating the Menu Access Switch

The menu access switch is found only on balance/scale versions that are verified for use in legal metrology. The switch is located under a protective cap on the bottom of the balance/scale.

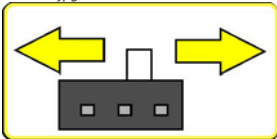


U-Switch01.jpg



U-Switch02.jpg

Switch.jpg



left

right
(Standard)

Note:

Span adjustment with external weights can be performed without the Sartorius service software if the deviation does not exceed $\pm 2\%$ of the required weight.

Procedure:

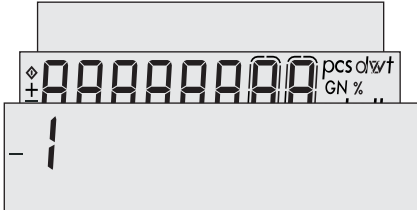
1. Open the menu access switch (move to the right)
2. Make sure menu item 1 - 5 - 1 is active (see page 36)
3. Press the **CAL** key
4. Adjust the balance/scale as needed
5. Close the menu access switch (this step is essential for verified operation of the balance/scale)

Balance/Scale Operating Menu

Accessing the Balance/Scale Operating Menu and Changing the Settings

Accessing the Menu: ON/OFF + TARE

- Turn the balance/scale off and then turn it on.
- Press TARE briefly while all display segments are lit.
- If "- 1" is displayed, the menu is locked (read-only).

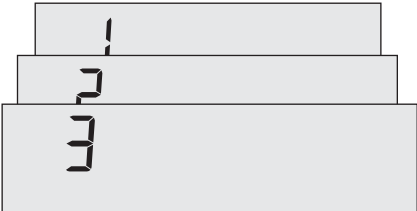


Anz-001F.eps

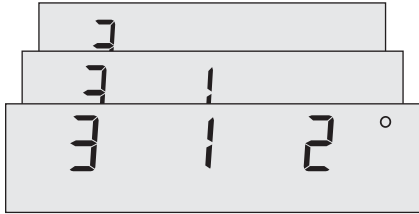
Note: To unlock the operating menu, change the active menu setting from menu item 8 - 1 - 2 to 8 - 1 - 1.

Selecting a Menu Item: EDIT and TARE

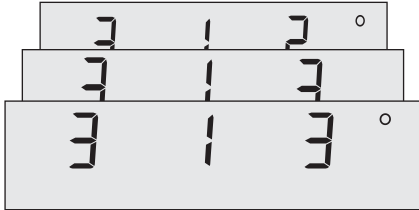
- Press the TARE key to change the selected number; the display scrolls from 1 to 9 and starts over again at 1
- Press the EDIT key to change the cursor position (the cursor moves from the 1st to the 2nd to the 3rd position and then back to the 1st, etc.)



Anz-002F.eps






Anz-003F.eps



Anz-004F.eps

Changing a Menu Code Setting: (press and hold)

- To confirm the desired code setting, press the  for approx. 2 seconds. The superscript „o” is displayed to indicate the current setting.
- To exit the balance/scale operating menu and store the new settings, press  for approx. 2 seconds.
- To exit the balance/scale operating menu without storing any changes to the settings, press .

Menu Code Settings (Rel 19.41 Version)

Menu 1 Weighing

1 1 Filter Selection

- 1 1 1 Very stable conditions
- 1 1 2 o Stable conditions
- 1 1 3 Unstable conditions
- 1 1 4 Very unstable conditions

1 3 Stability Range

- 1 3 1 1/4 digit
- 1 3 2 1/2 digit
- 1 3 3 1 digit
- 1 3 4 o 2 digits
- 1 3 5 4 digits

1 4 Weight unit for calibration weight**

- 1 4 1 o Grams
- 1 4 2 Kilograms **
- 1 4 3 Pounds

1 5 Calibration/adjustment

- 1 5 1 o Accessible
- 1 5 2 int. adjustment
- 1 5 3 Blocked

1 6 Auto Zero Function

- 1 6 1 o Auto Zero on
- 1 6 2 Auto Zero off

1 7 1st Weight Unit

- 1 7 1 Grams (Display: o)*
- 1 7 2 o Grams (Display: g)
- 1 7 3 Kilograms
- 1 7 4 Carats
- 1 7 5 Pounds
- 1 7 6 Ounces
- 1 7 7 Troy ounces
- 1 7 8 Hong Kong taels
- 1 7 9 Singapore taels
- 1 7 10 Taiwanese taels
- 1 7 11 Grains
- 1 7 12 Pennyweights
- 1 7 13 Milligrams
- 1 7 14 Parts per pound

* = only for GD-, GE-models

** = only for TE models

) = not for models with a readability of 0.1 mg

o) = Model-dependent factory setting

- 1 7 15 Chinese taels
- 1 7 16 Momme
- 1 7 17 Austrian carats
- 1 7 18 Tola
- 1 7 19 Baht
- 1 7 20 Mesghal

1 8 Display accuracy*

- 1 8 1 o Standard resolution*
- 1 8 4 Single scale interval*

2 1 Program selection

- 2 1 1 o Weighing as the basic function
- 2 1 2 Toggle weight units (mass unit conversion)
- 2 1 3 Net-Total Formulation/Second Tare Memory
- 2 1 4 Counting
- 2 1 5 Weighing in percent
- 2 1 12 Averaging

Menu 3 Application Parameters

3 1 2nd Weight Unit

- 3 1 1 Grams (Display: o)
- 3 1 2 o Grams (Display: g)
- 3 1 3 Kilograms**
- 3 1 4 Carats

- 3 1 5 Pounds
- 3 1 6 Ounces
- 3 1 7 Troy ounces
- 3 1 8 Hong Kong taels
- 3 1 9 Singapore taels
- 3 1 10 Taiwanese taels
- 3 1 11 Grains
- 3 1 12 Pennyweights
- 3 1 13 Milligrams
- 3 1 14 Parts per pound
- 3 1 15 Chinese taels
- 3 1 16 Mommies
- 3 1 17 Austrian carats
- 3 1 18 Tola
- 3 1 19 Baht
- 3 1 20 Mesghal

3 2 Rang 2 Display accuracy*

- 3 2 1 o Standard resolution*
- 3 2 4 Single scale interval*

* = only for GD-, GE-models

** = only for TE models

) = not for models with a readability of 0.1 mg

o) = Model-dependent factory setting

3 3 Reference sample quantity or %

- 3 3 1 5 pieces/ %
- 3 3 2 o 10 pieces/ %
- 3 3 3 20 pieces/ %
- 3 3 4 50 pieces/ %
- 3 3 5 100 pieces/ %

3 4 Display accuracy / Weighing in Percent

- 3 4 1 o Standard resolution
- 3 4 2 With 10 times higher resolution than standard

Menu 5 Data Interface

5 1 Baud rate

- 5 1 1 150 baud
- 5 1 2 300 baud
- 5 1 3 600 baud
- 5 1 4 o 1200 baud
- 5 1 5 2400 baud
- 5 1 6 4800 baud
- 5 1 7 9600 baud

5 2 Parity

- 5 2 1 Mark
- 5 2 2 Space
- 5 2 3 o Odd
- 5 2 4 Even

5 3 Number of Stop Bits

- 5 3 1 o 1 stop bit
- 5 3 2 2 stop bits

5 4 Handshake Mode

- 5 4 1 Software handshake
- 5 4 2 o Hardware handshake, 2 char. after CTS
- 5 4 3 Software handshake, 1 char. after CTS

5 5 Communication Mode

- 5 5 1 o SBI (ASCII)
- 5 5 2 GLP record

Menu 6 Utilities for Printouts/ Basic Function Weighing

6 1 Manual/Auto print

- 6 1 1 Manual without stability
- 6 1 2 o Manual at stability
- 6 1 3 Automatic without stability
- 6 1 4 Automate at stability

* = only for GD-, GE-models

** = only for TE models

!) = not for models with a readability of 0.1 mg

o) = Model-dependent factory setting

Menü 7 Print with Application Programs

7 1 Line format of printout

- 7 1 1 Without data ID Codes
- 7 1 2 o With data ID Codes

7 2 ISO/GLP-compliant printout

- 7 2 1 o Off
- 7 2 2 For calibration/adjustment only
- 7 2 3 Always on

7 3 Printout time






- 7 3 1 o 24-h format
- 7 3 2 12-h format

Menü 8 Extra Functions

8 1 Menu Access Function

- 8 1 1 o Parameter settings alterable
- 8 1 2 Parameter settings read only

8 2 Universal Switch for Remote Control

- 8 2 1 key 
- 8 2 4 key 
- 8 2 5 o key 
- 8 2 6 key 
- 8 2 8 key 

8 3 Power-on mode for balance/scale

- 8 3 1 Off/on (battery shuts off automatically after 3 min)
- 8 3 2 o Stand.by/on

Menu 9 Reset Menu to Factory Settings

- 9 - 1 Restore
- 9 - 2 o Do not restore
Also resets SBI mode

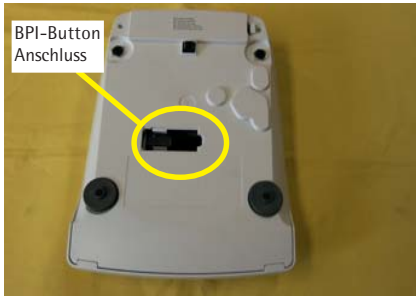
Caution: Before resetting the menu, note down the menu settings

* = only for GD-, GE-models

** = only for TE models

¹⁾ = not for models with a readability of 0.1 mg

o) = Model-dependent factory setting



Aut12420.jpg

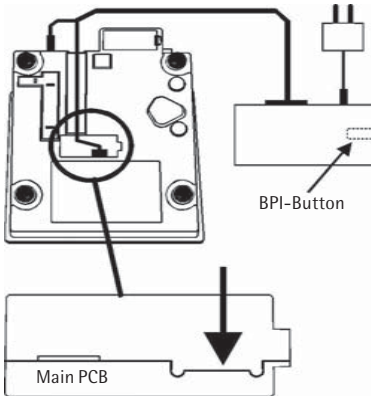
Activating the BPI Mode

Note:

The BPI mode must be activated in the balance/scale before you can work with the service software. You need to use this software, for example, to adjust the linearity and/or span after adjusting the zero-point offset value, or after replacing a PCB.

The BPI adapter (part no. 6740-71) must be connected to the balance/scale before the BPI mode can be activated. The procedure for connecting the adapter is as follows:

- Turn off the balance/scale and disconnect it from the power supply
- Remove the weighing pan/load plate
- Remove the protective cap (A) from the bottom of the balance/scale.
- The main PCB is now accessible through an opening in the balance/scale housing.
- Connect the white plug on the cable of BPI adapter to the corresponding position on the main PCB.
- Connect the plug on the power cable of the BPI adapter to the power jack on the balance/scale.
- Plug the balance/scale AC adapter into the power jack on the BPI adapter.



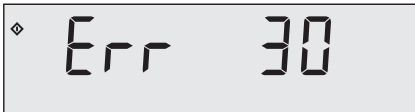
BPI02.jpg

The equipment is now connected as follows:


- The balance/scale has a 25-pin RS-232 interface for the service software
- There is a power supply to the balance/scale (beside the battery, if one is installed) so that the BPI mode can be activated.
- Replace the weighing pan/load plate and turn on the balance/scale.
- When 0.0 is displayed, use a suitable tool to press and hold the button on the BPI adapter (accessible through an opening in the housing).
- The balance/scale now performs its self-test (display segment check) repeatedly.
- Wait until the segment check has lit up at least 3 times; then press the button again.
- The balance/scale electronics are now in the BPI mode and you can use the balance/scale with the service software.



Anz-888F.eps



Anz-019F.eps

Caution! After working in the BPI mode, make sure to set the write-protect again (using the „Close“ function in the service software program) so that the balance/scale returns to the SBI mode (SBI = serial balance interface; the standard data transfer protocol). Otherwise one will not be able to operate peripheral devices with the balance/scale; when  is pressed, the error code „E 30“ is displayed.

Balances/Scales with Strain Gauge Systems

Preparations:

Place the balance/scale on a solid, level surface that is free of vibration, e.g. a stone table. Level the balance/scale using the level indicator. Turn the balance/scale and allow it to warm up for about 30-60 minutes, depending on the model.

Calibrate/adjust the balance/scale on this place.

Note:

Testing must be carried out according to the following Sartorius Standard Operating Procedure for Testing WKD-037-02 and WKD-038-02. They are also equivalent to the given adjustment data as described in this service manual.

You will need to check and, if necessary, adjust the following:

1. Overload stop
2. Zero point offset adjustment
3. Repeatability
4. Off-center loading error
5. Span adjustment
6. External linearity

Checking and Adjustment Sequence

Checking the Overload Stop

Note: Overload stops must be checked only following replacement of the strain-gauge system.

The overload stop must be reset after the strain-gauge load receptor has been damaged or replaced. Weight readouts greater than the balance/scale's maximum capacity must be read off. The service software is required for this procedure.

- Activate the BPI mode (see page 26)
- Service software: Select the „Diagnostics“ program; then select the „High Resolution“ subprogram
- When adjusting the overload stop, read off the weight value shown on the Psion server or PC display (see page 30)
- After adjusting the overload stop, activate the „Close“ function in the service software to reset the balance/scale to the SBI mode.

Table of Weights for the Overload Stop

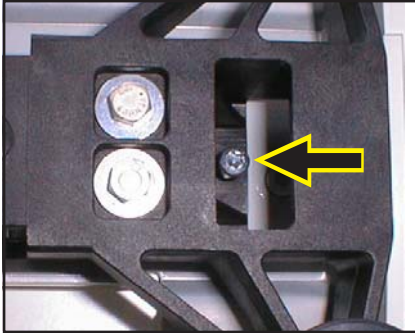
Test Weights	Test Weights ¹⁾
TE153S	400g ±10%
GE252	400g ±10%
TE212; TE212-L; GE212	900g ±10%
TE412; TE412-L; GE412	900g ±10%
TE612; TE612-L; GE812	900g ±10%
TE512-OCE; GE512-OCE	900g ±10%
TE1502S	1700g ±10%
GE1302	1700g ±10%
GE2102	2300g ±10%
TE601; TE601-L	2500g ±10%
GE811	2500g ±10%
TE2101; TE2101-L; GE2101	2500g ±10%
TE4101; TE4101-L; GE4101	8000g ±10%
TE6101; TE6101-L	8000g ±10%
GE7100	8000g ±10%
TE4100	12000g ±10%
TE6100; TE6100-L	12000g ±10%
TE12000; TE12000-L	12000g ±10%

¹⁾ Weight at which the overload stop must take effect

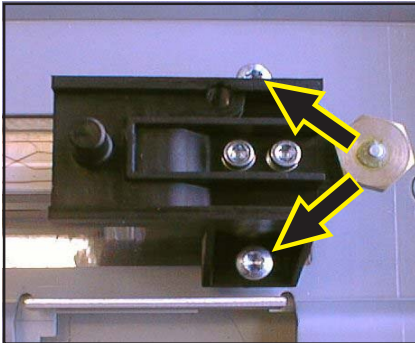
Checking the Overload Stop

Note:

Overload stops must be checked following replacement of the strain-gauge system.



Anschl01.jpg



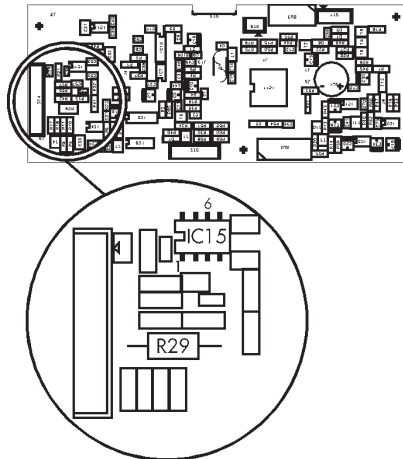
Anschl02.JPG

- Open the balance/scale (see page 48) and connect the balance/scale to power.
- Balances/scales with rectangular weighing pan/load plate: see illustration on the left (model TE6101 shown in this example).
- Center the required test weight plus approx. 6500 g additional weight (equal to the weight of the weighing pan/load plate plus shock absorber) on the weighing pan/load plate.
- Wait until the service software display shows a stable weight readout
- Adjust the stop screw (arrow) outward until the overload limit is just reached
- The weight readout is no longer stable
- Adjust the stop screw 1/2 turn inward
- The overload stop is now correctly adjusted.
- Balances/scales with a round weighing pan/load plate have two stop screws (arrows). Adjust both screws equally.

Zero-point Offset Value

The zero-point offset value adjustment is necessary for adapting the bridge voltage of the strain-gauge load receptor to the operating range of the balance/scale electronics. This may be necessary:

- after replacing the strain-gauge system
- after replacing the main PCB
- if the span cannot be adjusted (even with the service software) and the error code „E 02“ is displayed
- when the zero-point offset voltage has changed and is outside the tolerance limit (e.g., due to the strain gauge load receptor being „bent“)



offset1.eps

Adjusting the Zero-point Offset Value

- Open the balance/scale (see page 48)
- Connect the cable from the digital voltmeter (DVM) to IC15, pin 6 and ground
- Place the shock absorber and the weighing pan/load plate on the balance/scale and reconnect the power supply
- Use the DVM to test the preload voltage with no load on the balance/scale

Target (mV)	A/D converter output (%)
-------------	--------------------------

- 0.25 to - 0.49	4.3% to 8.3%
------------------	--------------

- If the zero-point offset voltage is outside the tolerance range listed above, balancing resistor R29 must be adjusted in accordance with the table below.

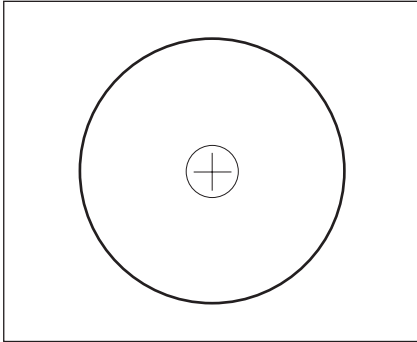
Table of Adjustment Resistors

Zero-point offset voltage (V)	R29 resistance value (ohms)
2,475 - 2,310	10
2,310 - 2,144	1800
2,144 - 1,979	3600
1,979 - 1,813	6200
1,813 - 1,648	9100
1,648 - 1,482	12000
1,482 - 1,317	15000
1,317 - 1,151	20000
1,151 - 0,968	27000
0,968 - 0,820	33000
0,820 - 0,655	43000
0,655 - 0,489	51000
0,489 - 0,324	68000
0,342 - 0,158	100000
0,158 - - 0,007	150000

The balancing resistor must have the following specifications:
Metal film, 0.6 W, 1%, TK50

Repeatability (Standard Deviation)

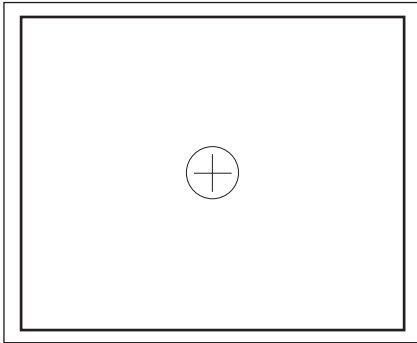
Checking the Repeatability (Standard deviation „S“)



Eckru01.eps

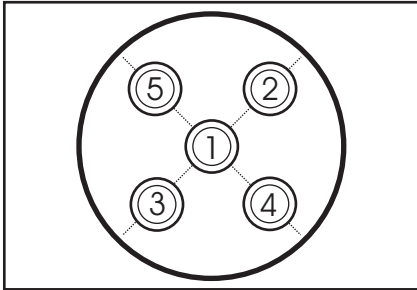
- Refer to the service specifications (see pages 53-54) for the required test weight.
- Unload the weighing pan/load plate and press t to zero the balance/scale.
- Center the test weight on the weighing pan/load plate.
- Write down the displayed value.
- Repeat this procedure five times.
- Calculate the repeatability of results from these 6 values as follows:

$$S = (\text{Max. value displayed} - \text{Min. value displayed}) / 3$$

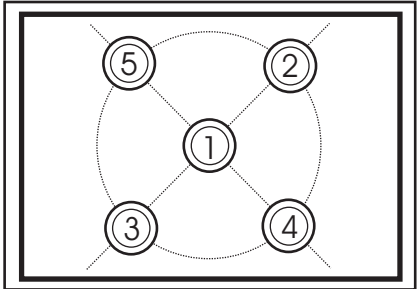


Eckre01.eps

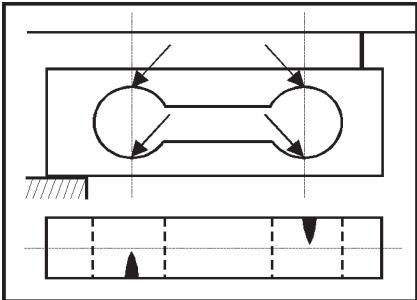
- Compare the calculated value with the tolerances listed in the service specifications.
- If the result exceeds the tolerance limits, this may be due to one of the following circumstances:
 - The weighing system needs to be cleaned
 - A mechanical part (e.g., lever) is touching the weighing system
 - The place of installation is subject to excessive vibration



eck_ru_03.eps



eck_re_03.eps



eckl-01d.eps

Off-center Error

Checking the Off-center Error

- Center the test weight (see „Service Specifications,“ page 53-54) on the weighing pan/load plate (Pos. 1) and zero the balance/scale by pressing **TARE**. The readout shows 0.0g (depending on model and settings).
- Place the test weight in Positions 2, 3, 4 and 5 in turn.
- The absolute value displayed for each position must lie within the tolerance limits listed in the service specifications.
- If the off-center loading error in one of these positions is greater than the value given in the service specifications, adjust the off-center loading error to the greatest positive deviation (see „Adjusting the Off-center Loading Error“ below).

Adjusting the Off-center Error

- Open the balance/scale (see page 48).
- Use a 7 mm open-ended wrench to remove the two fastening screws from the pan support and remove the pan support.
- The strain-gauge load receptor is now accessible.
- The off-center load error is adjusted by filing on a thin part. File the thin part that corresponds to the greatest error.

Note: Only minor deviations can be adjusted. If the strain-gauge load receptor is visibly bent, the error cannot be adjusted.

- Replace the pan support on the strain-gauge load receptor and replace the upper housing, shock absorber and weighing pan/load plate.
- Check the off-center loading error and perform adjustment again if necessary.

Span Adjustment

Note:

There are two methods for adjusting the span:

1. Using the service software
2. As described in the following:
 - Select menu item 1 5 1, „Calibration/adjustment: Accessible“ in the operating menu (factory setting). **Make sure the menu access switch is open** (see page 19).
 - If necessary, select the calibration weight unit in the operating menu (item 1 4 x; factory setting: 1 4 2*, „kg“).
 - Unload the balance/scale (in this example, model TE6101) and press **TARE** to zero it, if necessary.
 - Press and hold the **TARE** key (> 3 sec) to initiate the calibration routine.
 - The required calibration weight is displayed without a weight unit; e.g., „+ 5000.0“
 - Center the displayed weight* on the weighing pan/load plate (in this example, 5000.0 g).



Anz-151F.eps



Anz-00F.eps



Anz-500F.eps

Important:

The balance/scale will only accept a weight that is within a tolerance range of approximately 2% of the nominal weight. Greater deviations can be corrected only using the service software.



Anz-5000gF.eps

- After calibration, the readout shows the calibration weight* with weight unit (in this example, „+ 5000.0 g“).
- Remove the calibration weight.
- Check the span and perform adjustment again if necessary.

* depends on model

Adjusting Linearity

Checking the Linearity

Note:

The linearity must be checked according to the Standard Operating Procedure WKD-038.

- Check the linearity of the balance/scale for the entire weighing range in 4-g steps.
- Compare the values displayed with the tolerance ranges given in the „Table of Calibration/Adjustment Data“ on pages 53-54.
- If the errors exceed the permissible tolerance ranges, the linearity must be adjusted

Adjusting the Linearity

Use the service software to adjust linearity.

- Activate the BPI mode (see page 26).
- Connect the balance/scale to the PC and call the linearity program in the service software.
- Test the span and adjust if necessary (see page 36, „Span Adjustment“).
- After linearity and span has been adjusted, activate the „Close“ function in the service software to reset the balance/scale to the SBI mode.

Balances/Scales with Double Lever Systems

Checking and Adjustment Sequence

Preparations:

Place the balance/scale on a solid, level surface that is free of vibration, e.g. a stone table. Level the balance/scale using the level indicator. Turn the balance/scale and allow it to warm up for about 30-60 minutes, depending on the model. Calibrate/adjust the balance/scale on this place.

Note:

Testing must be carried out according to the following Sartorius Standard Operating Procedure for Testing WKD-037-02 and WKD-038-02. They are also the equivalent of the given adjustment data as described in this service manual.

You will need to check and, if necessary, adjust the following:

1. Overload stop
2. Repeatability
3. Off-center loading error
4. Span adjustment
5. External linear

Checking the Overload Stops

Note:

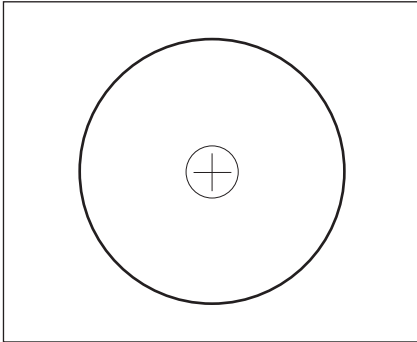
It is no longer necessary to test the overload stops in a double-lever weighing system.

Adjusting the Overload Stops

It is no longer necessary to set the overload stops, as they are set and adjusted at the factory.

Repeatability (Standard deviation)

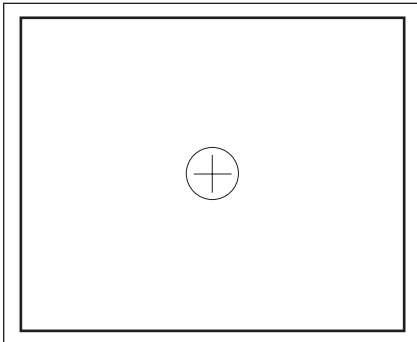
Checking the Repeatability (Standard deviation „S“)



Eckru01.eps

- Select the test weight from the „Adjustment Datasheet (see Page 53-54).
- Unload the weighing pan and zero the balance/scale using the **TARE** key.
- Center the test weight on the weighing pan.
- Write down the weight displayed.
- Repeat the procedure five times.
- The repeatability is calculated from the 6 weighing operations as follows:

$$S = (\text{Max. value displayed} - \text{Min. value displayed}) / 3$$



Eckre01.eps

- Compare the calculated value with the given tolerance.
- If the calculated value is not within the given tolerance, it may be due to one of the following reasons:
 - The weighing system needs to be cleaned
 - Mechanical parts are in the weighing system
 - Bent / defective bending element

Off-center Error

Caution:

Larger errors in the off-center loading error affect the repeatability of the weighing system!

The OIML Guideline R76-1 describes the tests for off-center loading tolerances for square, round and even triangular weighing pans. Therefore, the test weight should be placed on every 1/4 of the weighing pan surface. The positions for placing test weights in triangular weighing pans are indicated in the figures to the left.

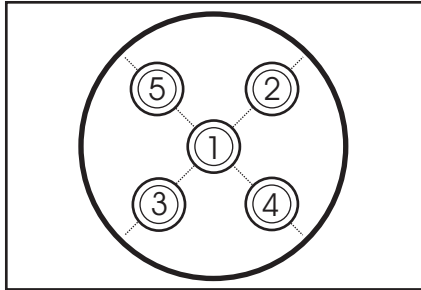
Please refer to the sketches to the left to establish the testing points for checking the off-center loading tolerances.

The markings should help you place the test weights in their proper positions.

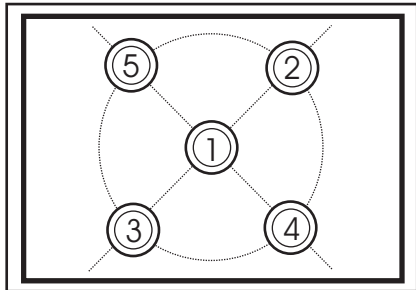
Checking the Off-Center Error

Note:

The data for the test weight and the tolerance are listed in the „Adjustment Datasheet (see Page 53-54).



eck_ru_03.eps



eck_re_03.eps

CP Balances/Scales with Draft Shields and Triangular Weighing Pans

Models: TE64; TE124S; TE214S; TE313S; TE313S-DS; GD103; GD603;

- Place the test weight on position 1 on the weighing pan and zero the balance/scale by pressing the **TARE** key.
- In the order given, place the test weight in the position 2, 3, 4 and 5 as indicated and write down the readout at stability, including the plus/minus signs.
- If the off-center loading error is too large, adjust the balance so that the off-center loading error is within the tolerances specified.

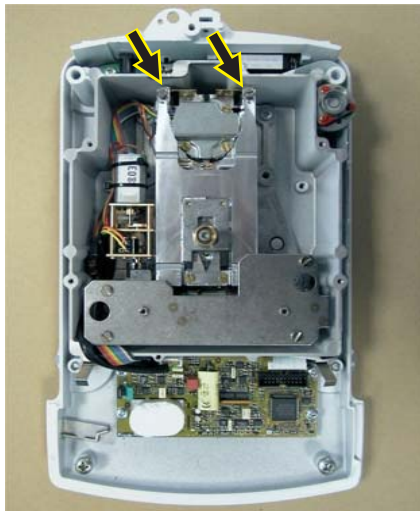
TE- Balances/Scales with Square Weighing Pan

Models: TE3102S

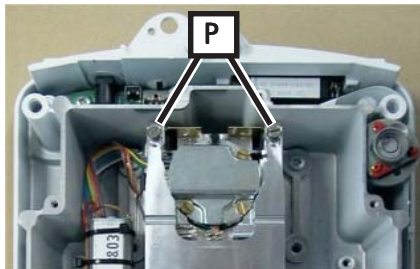
- Compare the off-center loading errors with the tolerances listed in the („Adjustment Datasheet“ see Page 53-54).
- If the off-center loading error is too large, adjust the balance so that the off-center loading error is within the tolerances specific

Adjusting the Off-Center Error

Note:



Aut13353a.jpg



Aut13353b.jpg

Following adjustment of the off-center loading error, the span and linearity must be tested and, if necessary, adjusted.

Procedure for Adjusting the Off-Center Loading Error (Double-Lever System with Adjustment Screws (P))

Use a 3-point measurement to determine the off-center loading error. The off-center loading error of the balance is indicated by the results of the 3-point measurement.

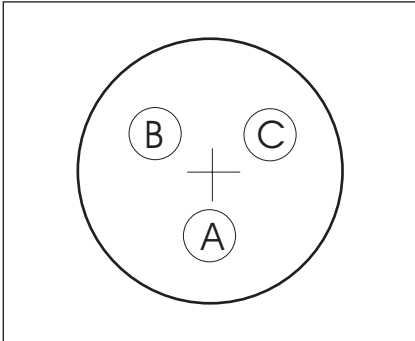
Note: The balance/scale must be opened to adjust the off-center loading error.

- Open the balance/scale (see page 48).
- Re-connect power, if disconnected.

Caution: From this point, you will be working on an opened balance/scale while the equipment is carrying voltage.

- The adjustment screws (see arrows) are now accessible.
- Adjust both screws to set the off-center loading error (see illustrations on the left).
- To test the adjustment of the off-center loading error, close the balance/scale and position the weighing pan/load plate on the balance/scale.
- Allow approximately 3 to 5 minutes for the balance/scale to warm up.
- Perform the 3-point adjustment as described on page 43.

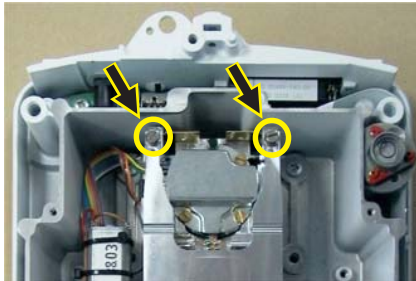
3-point Measurement





Eck_02.eps

- Place the off-center load test weight in Position A on the weighing pan/ load plate and press t to tare.
- Place the test weight in Positions B and C and record the value displayed at stability in each case.

- Example:	Pos. A	Press TARE	0.000 mg
	Pos. B		+ 0.005 mg
	Pos. C		- 0.004 mg

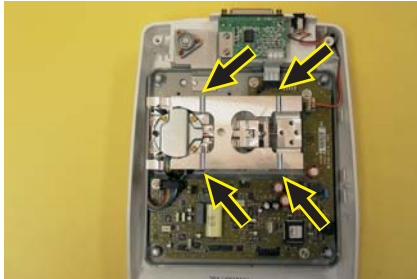


Aut13353b.jpg

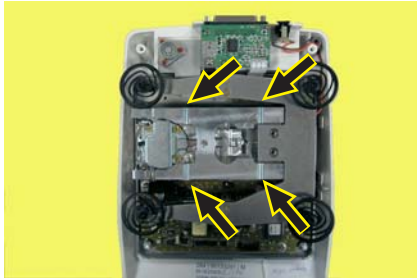
- Adjust only the side with the greatest deviation (absolute value) as follows:
 Negative deviations:
 Turn the adjustment screw inwards  (clockwise)
 Positive deviations
 Turn the adjustment screw outwards  (counterclockwise)
- Change the position of each screw in small increments and measure the off-center loading error in Positions A, B and C after each adjustment.
- Repeat this procedure until the off-center loading error is within the tolerance limits at all 3 positions.

Note: After adjusting the off-center loading error, the linearity and span must be checked and, if necessary, adjusted.

Procedure for Adjusting the Off-Center Error (Double Lever System)



Aut12954b.jpg



Aut12960b.jpg

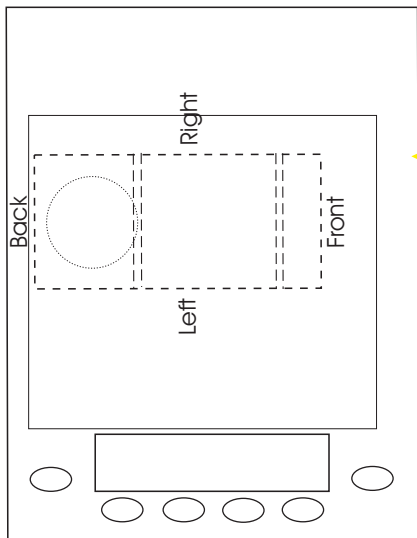
After calibration/adjustment of the off-center loading error, you must check the span and linearity and adjust as required.

On models TE64;TE124S;TE214S;TE313S;TE313S-DS; GD103;GD603; (see upper illustration on the left) TE3102S (see lower illustration on the left) the off-center loading error should be adjusted by careful filing at appropriately thin places on the upper guide. To avoid distorting the adjustment, wait a few seconds after filing so that the thin sites can „cool down“.

Caution! After carefully removing the housing, adjust the off-center loading error only at the thin sites in the back using an angled file.
Check the off-center loading error and adjust the largest error first by carefully filing at these points (see illustrations on page 45).

The errors measured (see the section „Off-Center Loading Error“) refer to the position of the systems in the balance/scale.

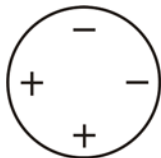
Position of the Systems in the Balance/Scale



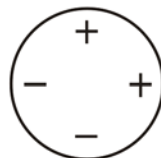
TE_Eck1e.eps

← Front View

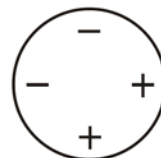
OFF-center loading error



Filing positions:
Back-Left-Top

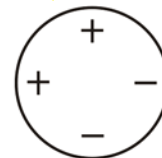


Filing positions:
Back-Left-Bottom



Filing positions:
Back-Right-Bottom

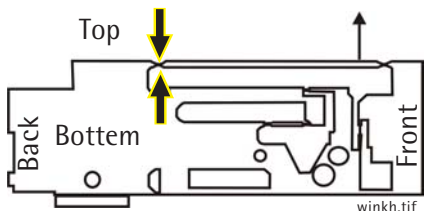
← Front View



Filing positions:
Back-Right-Top

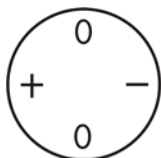
CP_eckj1.tif

Side view of the system

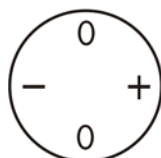


winkh.tif

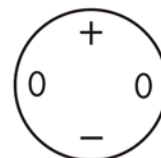
OFF-center loading error



Filing positions:
Back-Right-
and
Left-Top

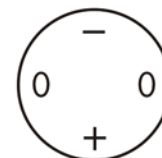


Filing positions:
Back-Right
and
Left-Bottom



Filing positions:
Back-Right-Top
or
Back-Left-Bottom

← Front View



Filing positions:
Back-Right-Bottom
or
Back-Left-Top

CP_eckj2.tif

Span Adjustment

Note:



Anz-151F.eps



Anz0000F.eps



Anz-100F.eps

There are two methods for adjusting the span:

1. Using the service software
2. As described in the following:
 - Select menu item 1 5 1, „Calibration/adjustment: Accessible“ in the operating menu (factory setting). **Make sure the menu access switch is open** (see page 19).
 - If necessary, select the calibration weight unit in the operating menu (item 1 4 x; factory setting: 1 4 1*, „g“).
 - Unload the balance/scale (in this example, model TE124S) and press **TARE** to zero it, if necessary.
 - Press and hold the **TARE** key (> 3 sec) to initiate the calibration routine.
 - The required calibration weight is displayed without a weight unit; e.g., „+ 100.0000“
 - Center the displayed weight* on the weighing pan/load plate (in this example, 100 g)

Important:

The balance/scale will only accept a weight that is within a tolerance range of approximately 2% of the nominal weight. Greater deviations can be corrected only using the service software.



Anz-100gF.eps

- After calibration, the readout shows the calibration weight* with weight unit (in this example, „+ 100.0000 g“)
- Remove the calibration weight.
- Check the span and perform adjustment again if necessary.

* depends on model

Adjusting Linearity

Checking the Linearity

Note: The linearity must be checked according to the Standard Operating Procedure WKD-038.

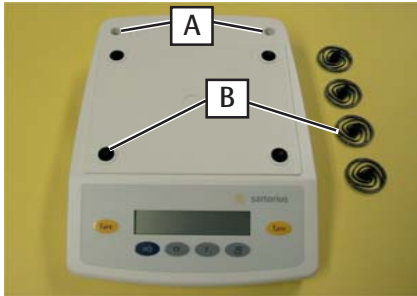
- Check the linearity of the balance/scale for the entire weighing range in 4-g steps.
- Compare the values displayed with the tolerance ranges given in the „Table of Adjustment Data“ Page 53-54.
- If the errors exceed the permissible tolerance ranges, the linearity must be adjusted.

Adjusting the Linearity

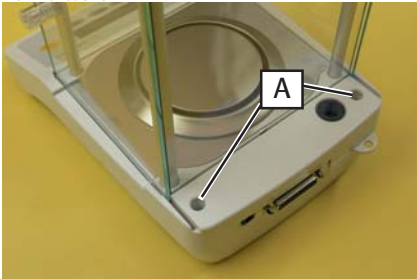
Use the service software to adjust linearity.

- Activate the BPI mode (see page 26).
- Connect the balance/scale to the PC and call the linearity program in the service software.
- Test the span and adjust if necessary (see page 46, „Span Adjustment“).
- After linearity has been adjusted, activate the „Close“ function in the service software to reset the balance/scale to the SBI mode.

Opening and Closing the Balance/Scale



Aut12618a.JPG



Aut12759.jpg



Aut12626.jpg

Opening the Balance/Scale

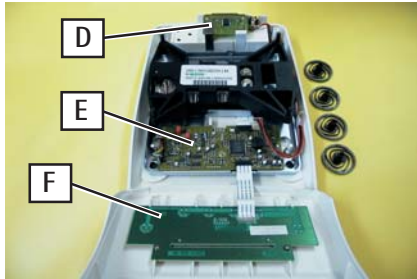
- Disconnect the balance/scale from power (remove the battery, if one is installed).
- Remove the weighing pan/load plate, as well as any shock absorbers and/or pan support (B), and place to one side.
- Remove the protective caps (A) and remove the Phillips screws.
- Remove the upper part of the housing by carefully pulling it towards the front. Make sure that you do not damage the ribbon cable that connects the display PCB to the main PCB.
- The display PCB, main PCB and strain-gauge load receptor are now accessible.

Closing the Balance/Scale

- Connect any internal lines that were unplugged.
- Slide the upper part of the housing into position and tighten the Phillips screws.
- Place the weighing pan/load plate, as well as any shock absorber and/or pan support (B), on the balance/scale.
- Connect the equipment to power.
- Check all balance/scale functions.
- Replace the protective caps over the Phillips screws when all other steps have been completed.

Important: After repairing and testing the balance/scale, make sure to attach your company seal (C).

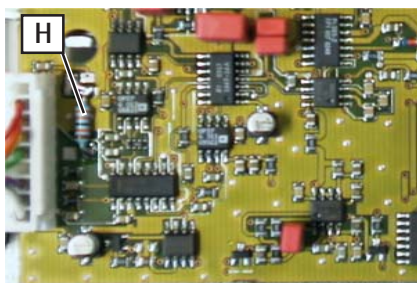
Replacing the PCB



Aut12628.jpg



AUT12423.JPG



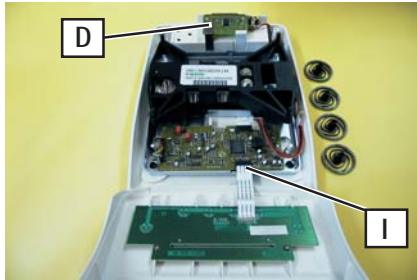
AUT12754a.JPG

In the case of defects, do not attempt to make any repairs at the component level, but replace the entire subassembly.

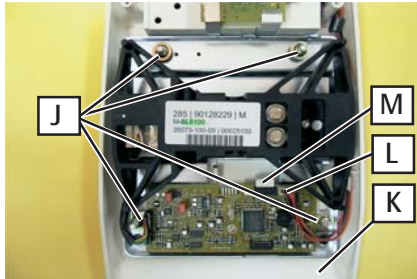
Note: Before replacing the main PCB, use the service software to read out and store the balance/scale's data record, if possible. If this is not possible, order a pre-programmed PCB, indicating the balance/scale model and serial number.

- Open the balance/scale (see page 48).
- Disconnect all cables.
- Remove the fastening screws (G) from the main PCB.
- Remove the old PCB
- Take the zero-point offset resistor from the old PCB and place it on the new PCB
- Follow the above instructions in reverse order to install the new main PCB
- The balance/scale must now be programmed with the required data record (unless you have installed a pre-programmed PCB)
- The following values must be checked and, if necessary, adjusted:
 - Zero-point offset
 - Linearity
 - Span

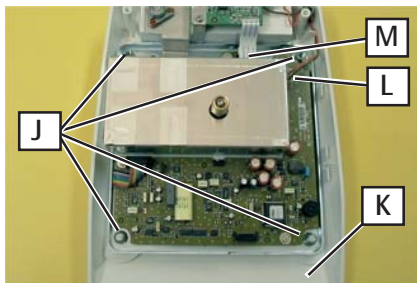
Replacing the Data Output Port



Aut12628.jpg



AUT12751a.JPG



Aut12761b.JPG

In the case of defects, do not attempt to make any repairs at the component level, but replace the entire data output port (D) with the pan support (K).

- Open the balance/scale (see page 48)
- Disconnect the ribbon cable (I) that leads to the display PCB.
- Lay the upper part of the housing to one side.
- Remove the four nuts (J).
- Disconnect the plugs from the output port (M) and power socket (L).
- Remove the base plate from the pan support.
- Replace the pan support with the data output port.
- Once replacement is completed, close the balance/scale.
- Then check the data output port for correct functioning. If possible, test the port with the following devices:
 - Sartorius printer, e.g., model YDP03-OCE
 - Service software (such as „SBI-Test“)
 - Data capture software for PCs and laptops, such as „Balance Reader“

Error Codes

Display	Cause	Solution
H	The load exceeds the balance/ scale capacity	Unload the balance/scale
L	The weighing pan/load plate is not in place Something is touching the weighing pan/load plate	Place the weighing pan/load plate on the balance/scale Move the object that is touching the weighing pan/load plate
E 01	Display overload: The value to be output cannot be displayed	Check the weight unit (operating menu setting)
E 02	Calibration parameter not met; e.g.: - balance/scale not zeroed - balance/scale is loaded	Calibrate only when zero is displayed Press the „Tare“ key to zero Unload the balance/scale
E 10	Function key blocked when there is data in the second tare memory	Press the „CF“ key to clear the tare and release the function key
E 11	The value input is not allowed for second tare memory	Press the „Tare“ key

Error Codes

Display	Cause	Solution
E 22	Weight is too light or there is no sample on the balance/scale	Increase the weight on the balance/scale
E 30	„Print“ key pressed while balance/scale is in BPI mode	Activate SBI mode (e.g., using the „Close“ function in the service software)
E 50	Overload or underload in temperature compensation converter	Defect in TK sensor or main PCB (replace)
E 53	Temperature compensation converter not functioning. No measured value received in processor from TK switch	Defect in TK sensor or main PCB (replace)
E 54	A/D converter output is below the minimum level	Device is underloaded; no weighing pan/ load plate on balance/scale; mechanical defect; defective main PCB
E 55	A/D converter output is above the maximum level	Device is overloaded; mechanical defect; defective main PCB

Service Specification			Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS
Model	Weighing capacity	Readability	Test weight	Permissible tolerance s	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K
TE214S	210 g	0,1 mg	50 g	0,1 mg	100 g	0,5 mg	E2	200 g	200 g	0,2 mg	50/100/150 g	50 g	0,2 mg	2
TE124S	120 g	0,1 mg	50 g	0,1 mg	50 g	0,4 mg	E2	100 g	120 g	0,2 mg	20/50/100 g	20 g	0,2 mg	2
TE64	60 g	0,1 mg	50 g	0,1 mg	50 g	0,4 mg	E2	50 g	60 g	0,3 mg	--- (20) g	15/20/40/60 g	0,2 mg	2
TE313S TE313S-DS	310 g	0,001 g	200 g	0,001 g	200 g	0,004 g	E2	200 g	300 g	0,004 g	--- (100) g	70/150/220/300 g	0,002 g	2
GD103	185 37 ct g	0,001 0,2 ct mg	10 g	0,001 0,2 ct mg	20 g	0,4 mg	E2	20 g	30 g	0,2 mg	--- (10) g	7/15/22/30 g	0,002 0,4 ct mg	2
GD603	605 121 ct g	0,001 0,2 ct mg	50 g	0,001 0,2 ct mg	50 g	0,4 mg	E2	100 g	120 g	0,2 mg	--- (50) g	30/60/80/120 g	0,002 0,4 ct mg	2
TE153S TE153S-DS	150 g	0,001 g	100 g	0,001 g	100 g	0,004 g	F1	10 g	100 g	0,002 g	--- (50) g	30/70/110/150 g	0,003 g	3,3
GD252	255 51 ct g	0,005 ct	20 g	0,015 ct	20 g	0,02 ct	F1	50 g	50 g	0,015 ct	--- (20) g	12/25/40/50 g	0,015 ct	3,3
TE612 TE612-L	610 g	0,01 g	500 g	0,01 g	500 g	0,03 g	F2	500 g	500 g	0,01 g	--- (200) g	150/300/400/600 g	0,02 g	5
TE412 TE412-L GE412	410 g	0,01 g	200 g	0,01 g	200 g	0,03 g	F2	200 g	400 g	0,03 g	--- (200) g	100/200/300/400 g	0,01 g	5
TE212 TE212-L GE212	210 g	0,01 g	200 g	0,01 g	100 g	0,03 g	F2	100 g	200 g	0,03 g	--- (100) g	50/100/150/200 g	0,01 g	15
GE812	810 g	0,01 g	200 g	0,01 g	500 g	0,03 g	F1	500 g	700 g	0,01 g	--- (200) g	200/400/600/700 g	0,03 g	5

Service Specification				Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS		
Model	Weighing capacity	Readability		Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight		Testweight	Permissible tolerance (±)	ppm /K	
TE1502S	1500 g	0,01 g	g	1000 g	0,01 g	1000 g	0,04 g	F1	1000 g	1500 g	0,02 g	---	g	300/700/ 1100/1500	g	0,03 g	3,3
GE2102	2200 g	0,01 g	g	1000 g	0,015 g	1000 g	0,04 g	E2	2000 g	2000 g	0,01 g	---	g	500/1000/ 1500/2000	g	0,04 g	3,3
GE1302	1300 g	0,01 g	g	500 g	0,015 g	500 g	0,04 g	F1	1000 g	1000 g	0,01 g	---	g	300/600/ 800/1200	g	0,03 g	3,3
TE3102S	3100 g	0,01 g	g	2000 g	0,01 g	2000 g	0,03 g	E2	1000 g	3000 g	0,04 g	---	g	700/1500/ 2200/3000	g	0,02 g	10
TE6101 TE6101-L	6100 g	0,1 g	g	5000 g	0,1 g	5000 g	0,3 g	F1	5000 g	5000 g	0,1 g	---	g	1500/3000/ 4000/6000	g	0,2 g	5
TE4101 TE4101-L GE4101	4100 g	0,1 g	g	2000 g	0,1 g	2000 g	0,3 g	F2	2000 g	4000 g	0,3 g	---	g	1000/2000/ 3000/4000	g	0,1 g	4
GE7101	7100 g	0,1 g	g	5000 g	0,1 g	5000 g	0,3 g	F1	5000 g	7000 g	0,2 g	---	g	1500/3000/ 5000/7000	g	0,2 g	
TE2101 TE2101-L GE2101	2100 g	0,1 g	g	1000 g	0,1 g	1000 g	0,3 g	F2	1000 g	2000 g	0,3 g	---	g	500/1000/ 1500/2000	g	0,1 g	15
TE601 TE601-L	610 g	0,1 g	g	500 g	0,1 g	500 g	0,3 g	M1	500 g	500 g	0,2 g	---	g	150/300/ 400/600	g	0,1 g	50
GE811	810 g	0,1 g	g	200 g	0,1 g	500 g	0,3 g	M1	500 g	700 g	0,2 g	---	g	200/400/ 600/700	g	0,2 g	50
TE12000 TE12000-L	12000 g	1 g	g	10000 g	1 g	5000 g	3 g	M1	10000 g	10000 g	2 g	---	g	3000/6000/ 8000/12000	g	2 g	25
TE6100 TE6100-L	6100 g	1 g	g	5000 g	1 g	5000 g	3 g	M1	5000 g	5000 g	1 g	---	g	1500/3000/ 4000/6000	g	1 g	50
TE4100	4100 g	1 g	g	2000 g	1 g	2000 g	3 g	M1	2000 g	4000 g	1 g	---	g	1000/2000/ 3000/4000	g	1 g	50

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