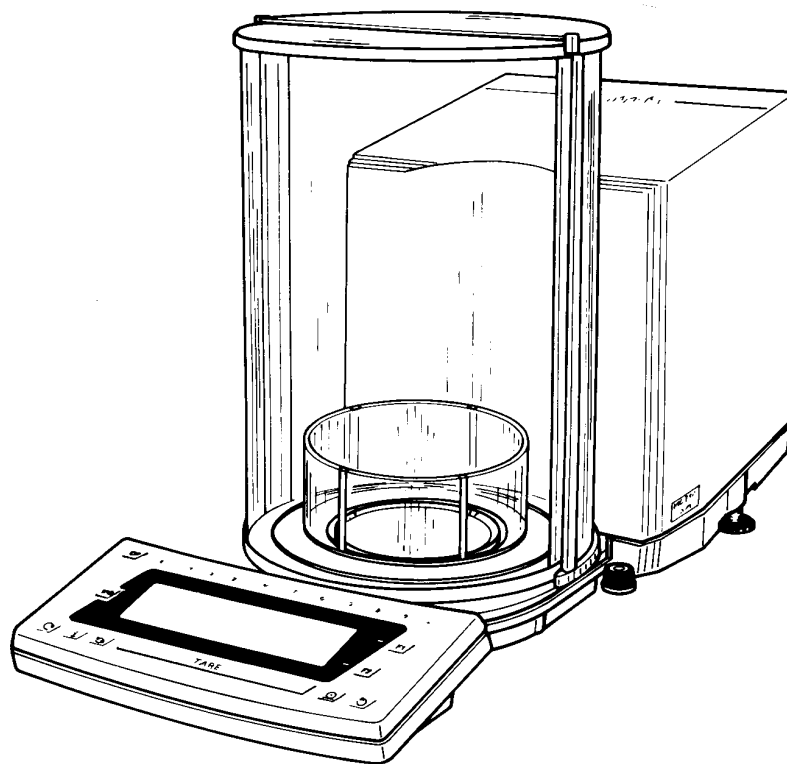


Sartorius

Micro, Research

Service Manual
MC - * and RC - Balances

* not MC 5



Sartorius AG, Weighing Technology

sartorius

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General Information

Service Prerequisites

Prerequisites for working on Sartorius high-resolution balances include considerable experience, completion of a Service Course at the main office in Göttingen, and the special tools and equipment described below. Please do not attempt or permit any unauthorized repair work!

Never perform any repairs on the weighing system. Defective units must be sent to your local SARTORIUS Repair Center or to the main factory in Goettingen, Germany.

If you remove the seals (warranty stickers), you will forfeit all warranty claims!

Work Area

Notes on the optimum work area:

Before you carry out any tests or adjustments, always make sure that the balance is set up under optimum ambient conditions, has been leveled with the level indicator and allowed to warm up.

The best conditions for high-resolution balances include:

- solid, level surface that is free of vibrations
- room with a constant temperature ($\pm 0.5K^*$) during weighing
- no direct heat exposure (sun, heaters etc.)
- no drafts (open windows, doors or vents)

Allow the balance to warm up for at least the recommended time of 6 hours. If the user needs the results of the balance test for evaluation, he or she must use the balance at the same location after it has warmed up. Always wait a while before carrying out any tests or adjustments whenever the balance has been transferred to a different place of installation or the balance housing has been opened.

Measuring and Test Equipment

Information on the measuring and test equipment that may be used:

The most important measuring and test equipment are weights.

Selection of the right measuring and test equipment is crucial for every test. The test equipment, i.e. the weights, must generally have a higher accuracy than that of balance to be checked.

Only calibrated weights with a calibration certificate may be used for testing and adjusting the (absolute) linearity or span. To protect the calibrated weights, non-calibrated weights should always be used for all other tests (reproducibility, off-center load test = eccentricity testing). The calibration certificates and documents state the nominal mass value of the weight as well as the error limits and uncertainty of measurement.

During every test, calibration or adjustment of a balance, it is important for you to be informed about the test equipment (the set of weights):

- Is the accuracy sufficient?
- Is the calibration certificate still valid?
- Is there evidence of any damage?

Warning

Never test or adjust the balance with unsuitable measuring and test equipment.

General View

RC 210S, RC 210 P, RC 210 D, RC 250 S
MC 210S, MC 210 P, MC 410 S

Service Tools and Equipment




















In addition to the appropriate tools, it is necessary to set up and operate your balance in a stable, clean work area that is free of vibrations and drafts. You will additionally need the following special tools for working on Sartorius Research Balances:

Qty.	Designation	Order No.
2	Off-center adjustment key	6740-15
1	PSION Server with Cas Version 4.4 or	
1	SARTOCAS Service Software for PC and Laptop	

Accompanying Literature

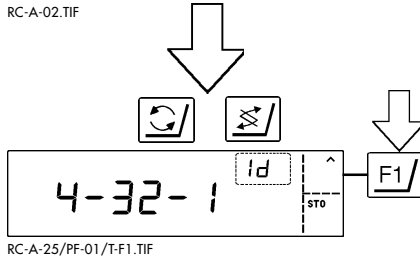
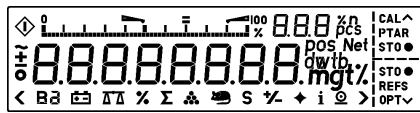
Spare Parts List, SARTORIUS RC/MC Series MC1
Service Specifications Sheet for RC/MC Balances
SARTORIUS Tools List

Key Functions

MC	RC	
		ON/OFF key
		Clears or interrupts functions of programs in progress and confirms that menu code settings are stored
		Press briefly: – displays information and prints/transfers stored data Press and hold: – selects the parameter mode to set the reference for weighing in percent and counting
		Tare control
		Toggle key for weighing range
		Print key
		F1 function key for activating the first program application
		F2 function key for activating the second program application
		Left draft shield function key
		Right draft shield function key
		Draft shield function key

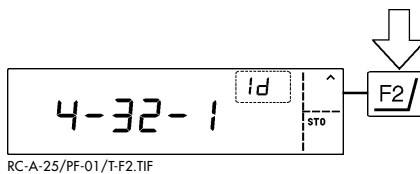
Brief Operation

Setting the ID Code /Time/Date



- Turn the balance off
- Turn the balance back on
- While all segments are displayed, press the key (MC) or the key (RC) briefly
- Toggle between ID code "id." time "t in." and date "dAt" by pressing the key (only MC)

ID Code for a GLP/GMP-compliant Record

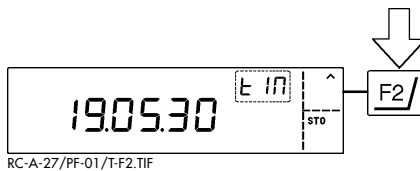


The maximum 8-digit ID code can comprise the numbers 0 to 9 and the "." symbol. Zeros at the beginning are not displayed.

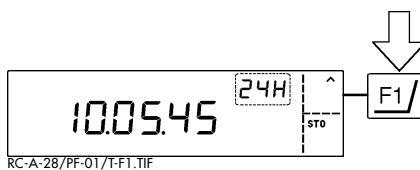
- Enter ID code, e.g. 4 - 32 - 1

- MC:**
- Enter code using the numeric keys
 - Confirm by pressing STO -
- RC:**
- Select decimals using or
 - Enter numbers (0 ... 9) or "." using or
 - Store setting with or change Date/Time with

Time



- MC:**
- Separate hours, minutes and seconds by pressing the "." key; e.g., 1 0 . 2 4 . 3 5
 - Set the time to be synchronous with the reference clock by pressing STO -
 - For times between 0 and 12, select the 12-hour display "A" (a.m.) or "P" (p.m.) with the key and confirm by pressing STO - or
 - Use the 24-hour display by simply pressing STO -
 - Exit by pressing



- RC:**
- Select between hours, minutes, seconds or 12-hour / 24-hour display with or
 - Enter hours and minutes using or
 - Reset the seconds to zero using
 - Select between 12 hour / 24 hour display with
 - Store setting with or change to Date/Time with



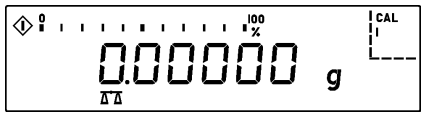
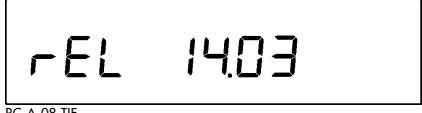
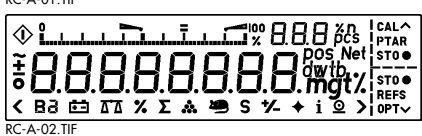
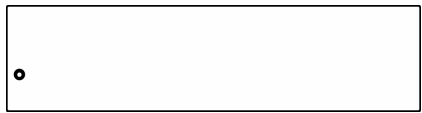
Date

- MC:** – Separate day, month and year by pressing the "." key;
 e.g., 1 0 . 0 9 . 9 3
 – Confirm by pressing STO – **F2/**
- RC:** – Select between day, month and year using **≡/** or **⊙/**
 – Change setting with **F1/** or **F2/**
 – Store setting with **CF/** or change to Ident.No. with **I/**

Displaying the Hardware and Software Version

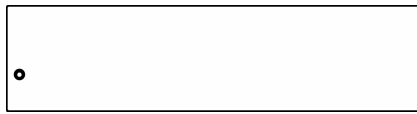
Important note:

It may be helpful to know the processor version in case you need to communicate with the Service Center.

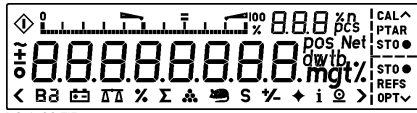


- Turn the balance off and back on again by pressing the **⏻/** key.
- While all segments are displayed, briefly press the **I/** key (MC) or the **I/** key.
- The display shown here on the left appears for about 3 sec.
- The first two digits indicate the hardware generation and the last two the software version.
- Afterwards, the balance switches back to the normal weight display.

Accessing the Balance Operating Menu and Setting a Menu Code



RC-A-01.TIF



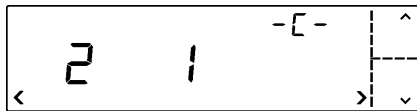
RC-A-02.TIF



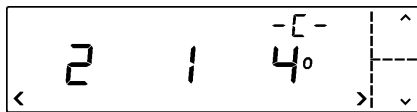
RC-A-03.TIF



RC-A-04.TIF



RC-A-05.TIF



RC-A-06.TIF



RC-A-07.TIF

- Turn the balance off and back on again by pressing the key.
- While all segments are displayed, briefly press the key (MC) or the key (RC).
- If "-L-" is displayed, change to the "-[-]" mode using the menu access switch.
- Select the desired code numbers as follows:
 - press the key to increase it or
 - press the key to decrease it
- Select the left, middle or right digit as follows:
 - press the key (MC) or the key (RC) to go toward to the left or
 - press the key to go toward to the right
- Confirm your code selection, indicated by "°" after the code, by pressing the key (MC) or the key (RC);
e.g., "2-1-4°" using the key (please refer to the Balance Operating Menu).
To undo all menu code changes and obtain the factory-set menu code, select code "9--1°".
- Slide the menu access switch back to the factory setting, "-L-" appears on the display.
- Press the key to store the menu code setting and exit the menu.
- If you do not want to store the changes, exit the menu by pressing the key.

Checking the Metrological Specifications

Prerequisites to Be Met before Checking the Metrological Specifications

Place of Installation

- room with a constant ambient temperature ($\pm 0.5K^*$)
- solid, level surface that is free of vibrations
- no direct heat exposure (sun, heater etc.)
- no drafts

Getting Started:

- Level the balance using the level indicator
- Turn the balance on and allow it to warm up for at least 6 hours.

Test Weights

The span of the balance may be tested only with calibrated weights for which a calibration certificate has been issued. Always make sure that the individual weights are traceable to a national standard.

The calibration and verification certificate must show the nominal mass value, the deviation from the nominal mass value, as well as the uncertainty of measurement for each weight. The nominal mass value and deviation from this value can be added to obtain the exact weight value (conventional mass) of each weight.

Testing

Testing must be carried out according to the following Standard Operating Procedure for Testing and in the order given. The test results must be written on the **Balance Test Record** designed for this purpose.

(Please make a copy, see page 43)

Standard Operating Procedure for Testing

Checking the Reproducibility (Standard Deviation)

Test Weights: (E2 - individual weights , nominal mass values)

Model	Test weight
RC210S	100g
RC210P	50g
RC210D	50g
RC250S	100g
MC210S	100g
MC210P	50g
MC410S	200g

Test Procedure (Weighing)

- 1) Unload and zero the balance.
- 2) Center the test weight on the weighing pan.
- 3) Write down the weight displayed on the Balance Test Record.
- 4) Repeat steps 1) to 3) five times.

Evaluation of the Test Results

Simplified Procedure for Evaluating the Reproducibility:

Calculate the following value from 6 weighing operations:

$$\frac{\text{Max. value displayed.} - \text{Min. value displayed}}{2}$$

and write down this average value on the Balance Test Record.

Evaluation:

The value calculated in this way must be within the permissible tolerances for the reproducibility (standard deviation) given on the Service Specifications Sheet. If this requirement is not met, calculate the standard deviation as described in the section entitled **“Calculating the Standard Deviation.”**

Calculating the Standard Deviation

Calculate the standard deviation using a suitable calculator or according to the following formula:

$$s = \sqrt{\frac{1}{n-1} * \sum_{i=1}^n (x_i - \bar{x})^2}$$

x_i = Individual weighed values
 \bar{x} = mean value of the Individual weighed values
 n = Number of weighings (6)

Evaluation:

The value calculated in this way must be within the permissible tolerances for reproducibility (standard deviation) given on the Service Specifications Sheet.

If the standard deviation calculated in this way is too high, carry out the following tests:

- Are the requirements listed under **“Place of Installation”** and **“Getting Started ”** met?
- Recheck the permissible off-center loading tolerances.
- Clean the weighing system and make sure that there is no friction between the movable parts. (Friction between movable parts causes unstable weighing results.)

Recheck the reproducibility (standard deviation) as described in the section “Checking the Reproducibility.”

Checking the Off-center Loading Tolerances

Test Weights: (E2 - individual weights, nominal values)

Model	Test weight
RC210S/P/D	100g
RC250S	100g
MC210S/P	100g
MC410S	200g

Test Procedure (Weighing)

- 1) Center the test weight on the weighing pan and tare the balance.
- 2) In the order given in the Balance Test Record, place the test weight in each of the off-center positions indicated and write down the weight on the Balance Test Record.
- 3) Repeat steps 1) and 2) for all off-center loading positions.

Evaluating the Test Results:

The value obtained for each off-center loading position must be within the off-center loading tolerances given in the Service Specifications Sheet.

If the off-center loading error is too large, adjust the balance so that the off-center loading error is within the tolerances specified.

Checking the Internal Span Adjustment

Test Weights: (E2 - individual weights, calibrated)

Model	Test weight
RC210S/P/D	200g
RC250S	200g
MC210S/P	200g
MC410S	2 x 200g

Test Procedure

Write down the permissible tolerance of the span on the Balance Test Record.
(Please refer to the Service Specifications Sheet)

On the Balance Test Record, write down in the the nominal mass value, the deviation from the nominal mass value and the uncertainty of the test weight you are using. If you are using several weights, write down the sum. (Please refer to the calibration certificate of your weight set)

Calculate the conventional mass **M** of the test weight:

M = nominal mass value **P** + deviation **D** of the test weight. (Be sure to write down the plus or minus sign!)

Write down the conventional mass **M** on the Balance Test Record.

Calculate the sum **SU**.

SU = permissible tolerance **T** of the span + uncertainty **U** of the test weight.
Write down the sum **SU** on the Balance Test Record.

Test Procedure (Weighing)

- 1) Unload and zero the balance.
- 2) Perform internal span adjustment (press the **F1** key).
- 3) Center the test weight on the weighing pan.
- 4) Write down the displayed value on the Balance Test Record.
- 5) Repeat steps 1) to 4) twice.

Evaluating the Test Results:

Calculate **Xi** for all of the three displayed values you wrote down

Xi = displayed value **Gi** - conventional mass **M**

Write down the calculated values in the Balance Test Record.

Calculate the value **X4** for all of the three displayed values you wrote down

$$X4 = \frac{\text{Max. displayed value} - \text{min. displayed value}}{2}$$

Write down the value **X4** on the Balance Test Record.

Evaluation

The following conditions must be met:

- 1) At least two of the calculated values X_1 to X_3 must be less than or equal to the sum SU .
- 2) X_4 must be within the permissible tolerance of the span.

If these conditions are not met, you must proceed as follows:

Condition 1) is not met:

Adjust the internal linearity (hold down the tare key to select the menu item "L") and repeat the test as described in the section "Checking the Internal Span Adjustment."

After doing so, if the deviation is still more than SU , overwrite the internal calibration/adjustment weight.

Condition 2) is not met:

Use a fine brush to clean the internal calibration/adjustment weight and the areas on which the weights rest; but do not use any liquid.

Checking the Linearity

Check the linearity in increments.

The advantage of this test procedure is that the test and tare weights do not have to be calibrated.

However, always make sure that you do not get the test weights mixed up with the tare weights.

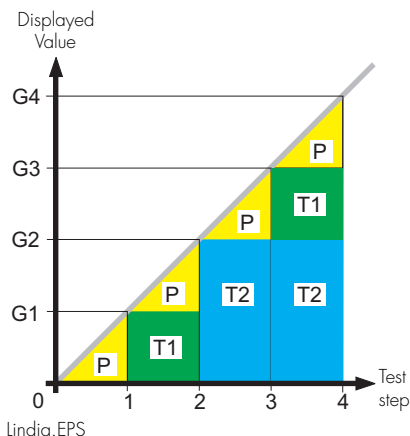
Test weights: (E2 - individual weights, nominal mass values)

Tare weights: (E2 - individual weights, nominal mass values)

Model	Test weight P	Tare weight T1	Tare weight T2
RC210S/P/D	50g	50g	100g
MC210S/P	50g	50g	100g
MC410S	100g	100g	200g

Test Procedure:

- 1) Unload and zero the balance.
- 2) Adjust the internal linearity (hold down the tare key to select the menu item "L")
- 3) Zero the balance.
- 4) Center the test weight **P** on the weighing pan and write down the displayed value **G1**.
- 5) Unload the balance.
- 6) Place the tare weight **T1** on the edge of the weighing pan and tare the balance.
- 7) Place the test weight **P** next to the tare weight **T1** in the center of the weighing pan and write down the displayed value **G2**.
- 8) Unload the balance.
- 9) Place the tare weight **T2** on the edge of the weighing pan and tare the balance.



- 10) Place the test weight **P** next to the tare weight **T2** in the center of the weighing pan and write down the displayed value **G3**.
- 11) Remove test weight **P** from the pan, and place the tare weight **T1** next to tare weight **T2** on the edge of the weighing pan and tare the balance.
- 12) Place test weight **P** next to the tare weights **T1** and **T2** in the center of the weighing pan and write down the displayed value **G4**.

Evaluating the Test Results:

Calculate the linearity errors as follows:

$$L2 = (G1 + G2 - G3 - G4) / 2$$

$$L1 = (G1 - G2 + L2) / 2$$

$$L3 = (G3 - G4 + L2) / 2$$

Evaluation:

The values L1, L2, L3 calculated in this way represent the linearity errors at approx. 25%, 50% and 75% of the maximum capacity and must be within permissible tolerances for the linearity given on the Service Specifications Sheet.

Adjustment

Adjustment Sequence

- check reproducibility - if within tolerance:
- Adjust the off-center load (eccentricity testing)
- Linearity (in the BPI mode)
- Span adjustment (in the BPI mode)

Preparing the Balance for Adjustment

Please refer to the section “Service Prerequisites” on page 3.

For adjusting the linearity and span with the CAS server (PSION), set the balance to the BPI Mode (BPI = Binary processor interface).

- Turn off the auto zero function in the balance operating menu (Code 162).
- Turn off the filling code (Code 121).

Important note:

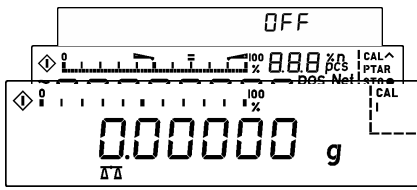
Perform adjustments only if a CAS server (PSION) or SARTOCAS service program is installed!

After completing these adjustments, select the “Close” function. **Otherwise, you will not be able to use any of the peripherals.**

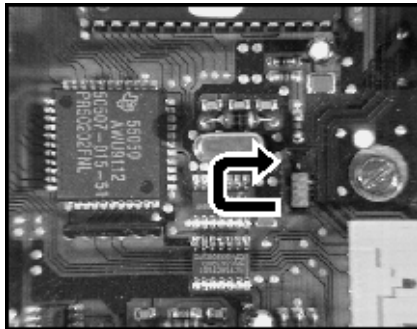
This is how you test to see which mode the balance is in:

Press the  print key:

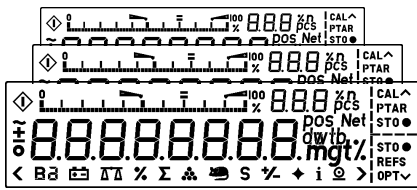
- An acoustic signal means that the balance is in the SBI mode.
- If “Err 30” is displayed, this means that the balance is in the BPI mode.



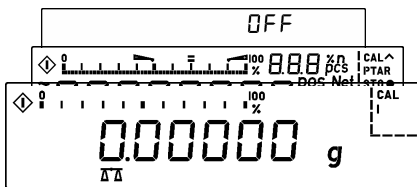
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RC-F-02.TIF




RC-A-02/02/02.TIF




RC-A-10/02/09.TIF

BPI Mode (RC Models):

- Open the balance housing (see page 23).
- Connect the balance to AC power, turn on the balance by pressing the  key and wait for the balance self-test to finish; 0.0000 g will be displayed (depending on the type of balance) at the end of the test.

- Afterwards remove the jumper (located on the digital PCB (204) close to the AOC (IC107)) and plug it into the next position.
- This bridges the 12 V and the MC1 processor, thereby disabling the write function of the EEPROM.

- The full-segment check readout now flashes in periodical sequence.
- Wait for at least 3 cycles until the balance is in the BPI mode.
- Now plug the jumper back into its original position and the balance will automatically return to the weighing display.
- Disconnect the balance from AC power.
- Close the balance housing (see page 24).
- Connect the balance to AC power and turn the balance back on by pressing the  key.
- Now the balance is ready to work in the BPI mode with the MC1 SERVER or the SARTOCAS program for PCs.

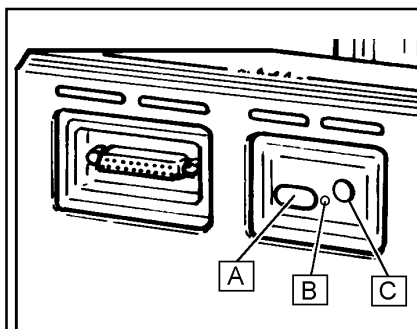
Important note:

Before you start to adjust, the balance has to warm up again (refer to the warm up time).

BPI Mode (MC Models)

On the rear panel of the balance, between the AC jack (C) and the menu access switch (A) there is a small hole (B). Use a suitable object, such as a match, and press it down on the switch inside the hole.

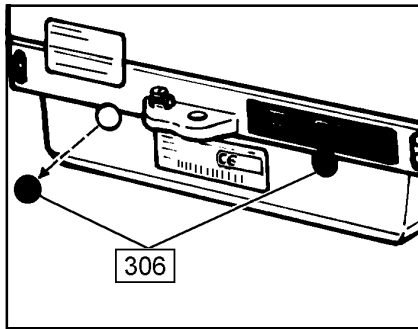
- The full-segment check readout now flashes in periodical sequence.
- Wait for at least 3 cycles until the balance is in the BPI mode.



RC-B-03.TIF

Adjusting the Off-Center Load

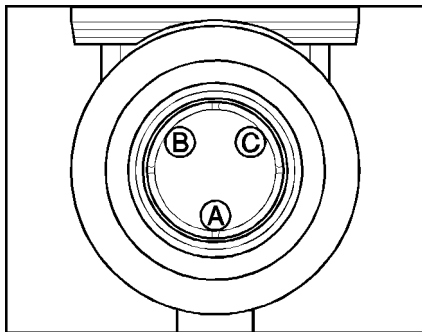
For this adjustment you will need:



RC-B-03.TIF

- The off-center adjustment key order number 6740-15.
- The following weights: 200g for all models (not calibrated!)
- Remove the two plastic caps (306) from the rear panel of the balance.

3-Point Adjustment (Coarse)

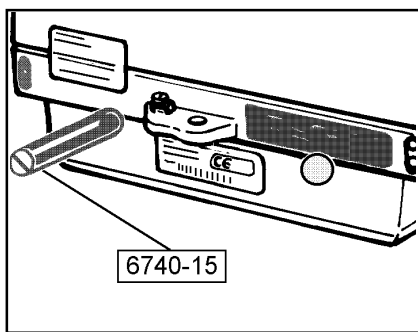


RC-G-02.TIF

- Place the off-center load test weight in position A on the weighing pan, close the draft shield and tare the balance by pressing the **TARE** key (MC) or the **T/** key (RC).
- Place the test weight in each of the positions B - C (in sequence), close the draft shield and write down the values displayed with the plus/minus sign when the readout is stable.

Example (RC 210 P):

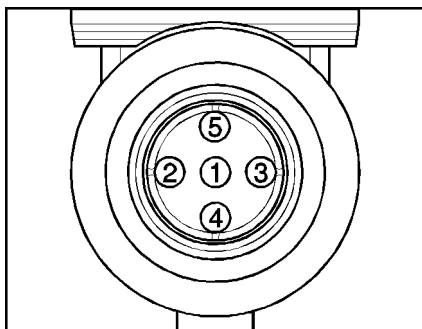
Pos. A	T/	0.00000 g
Pos. B		+ 0.00025 g
Pos. C		- 0.00035 g



RC-B-05.TIF

- Please adjust only the side with the largest error. In our example it is position C; consequently, you have to adjust the left off-center load screw.
- Please adjust the screws in small steps. After each change, check the off-center loading positions A, B and C and, if necessary, readjust one of the off-center load screws.

5-Point Adjustment (Fine)



RC-G-03.TIF

- Place the off-center load test weight in position 1 on the weighing pan, close the draft shield, and tare the balance by pressing the **TARE** key (MC) or the **T/** key (RC).
- Place the test weight in each of the positions 2 - 3 (in sequence). Close the draft shield and write down the values displayed with plus/minus sign when the readout is stable.

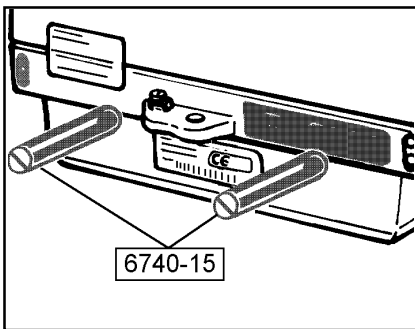
Example (RC 210 P):

Pos. 1	T/	0.00000 g
Pos. 2		+ 0.00025 g
Pos. 3		- 0.00035 g

- Please adjust only the side with the largest error. In our example it is position 3, consequently you have to adjust the left off-center load screw.
- Please adjust the screws in small steps. After each change, check the off-center loading positions 1, 2 and 3 and, if necessary, readjust one of the off-center load screws.
- When the off-center load at the sides (positions 2 and 3) is in tolerance, adjust the off-center load tolerances at the front and back (positions 4 and 5).
- Place the off-center load test weight in position 1 on the weighing pan, close the draft shield, and tare the balance by pressing the **TARE** key (MC) or the **T/** key (RC).
- Place the test weight in each of the positions 4 - 5 (in sequence). Close the draft shield and write down the values displayed with plus/minus sign when the readout is stable.

Example (RC 210 P):

Pos. 1	T/	0.00000 g
Pos. 4		+ 0.00040 g
Pos. 5		- 0.00035 g



RC-B-06.TIF

- Adjust both sides uniformly. In other words, change the adjustment of both off-load screws in the equal steps by turning them in the same direction.
- Change the screw adjustment in small steps. Check the off-center load positions 1, 4 and 5 and, if necessary, change the adjustment of the off-center load screws.
- If the indicated tolerance is reached, please recheck the off-center load in position 5.
- After finishing the off-center load adjustment, place the caps (306) back over the holes on the rear panel of the balance.
- Turn on the auto-zero function in the balance operating menu (**Code 16 !**).
- If required, set the filling menu code (**Code 12 2**).

Linearity

Checking the Linearity:

Important note:

Check the linearity as described in the section "Checking the Linearity" on page 12).

External Linearity Adjustment

The RC-/MC-balance can be linearized in different ways:

1. the way explained in this service manual;
2. using the PSION server; or
3. using the SARTOCAS program for personal computers and laptops.

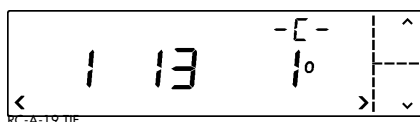
Only use the PSION server or the SARTOCAS program to adjust the linearity of this balance (Linearity adjustment with "UNKNOWN WEIGHTS").

Minor linearity deviations (no "S"-linearity) can be adjusted using the internal linearity program of the balance.

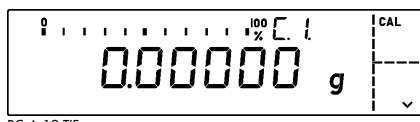
Only in exceptional cases (e.g. no service software available) the MC-balances may be linearized using the internal linearization program.

The RC-balances should not be linearized with the internal linearization program!

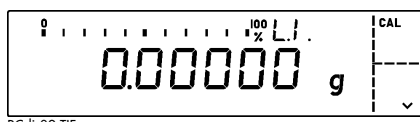
Internal Linearity Adjustment



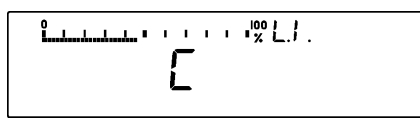
- Make sure the balance operating menu is set to code " 1 13 1 " - internal linearization accessible - .



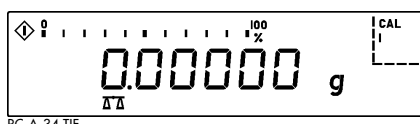
- At 0.00000 g display press the **TARE** key (MC) or the **T** key (RC) and keep it pressed (for at least 3 sec.) until the readout on the left is displayed.



- Press the **F2** key until " L . ! . " is displayed.



- Tare the balance by pressing the **TARE** key (MC) or the **T** key (RC) and press the **F1** key to start the linearization routine.
- The build-in weights are internally applied by servomotor and removed at the end of linearization.

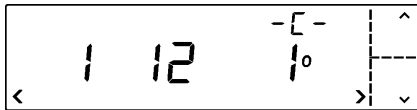


- After finishing the linearization routine the linearity has to be checked externally again (see page 12 "Checking the Linearity").

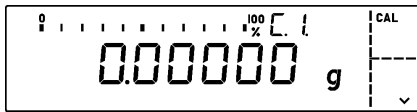
External Linearity Adjustment (only MC-Balances)

Important Note!

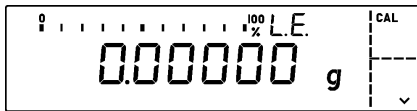
This adjustment should only be performed in exceptional cases and only on MC-balances (only on MC-balances you have the possibility to enter the exact weight values of the necessary linearity weights using the numeric keys).



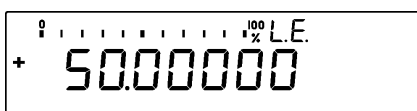
RC-A-11.TIF



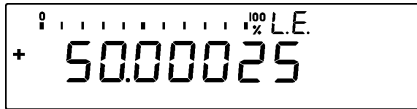
RC-A-12.TIF



RC-A-13.TIF



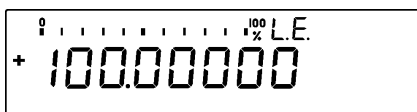
RC-A-14.TIF



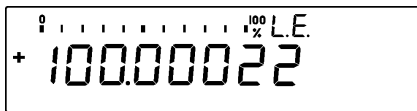
RC-A-30.TIF

Warning!

The balance accepts only a weight that is within a tolerance of approx. 2% of the factory-programmed linearity. You can set the balance for greater linearity tolerances only using the PSION server or the SARTOCAS program.



RC-A-31.TIF



RC-A-33.TIF

- Make sure the balance operating menu is set to code " 1 12 1 " - external linearization accessible - .
- At 0.000000 g display press the **TARE** key and keep it pressed (for at least 3 sec.) until the readout on the left is displayed.
- Press the **F2** key until " L.E. " is displayed.
- Tare the balance by pressing the **TARE** key and press the **F1** key to start the linearization routine.
- The first linearity weight value is displayed.
- Alternatively, enter the exact weight 50.000xx (see calibration certificate) using the numeric keys on the balance.

- Open the draft shield.
- Center the required test weight on the weighing pan and close the draft shield.
- Once the weight value is stored, the next linearity value will be displayed.
- Center the required weight on the weighing pan once again and close the draft shield.
- Alternatively, enter the exact weight 100.000xx (see calibration certificate) using the numeric keys on the balance.
- The linearization weights to be loaded are displayed on the balance one after the other and the values are stored.
- Finally, you are prompted to unload the balance.
- After the zero point has been stored, the program will return to the weighing mode.
- Afterwards, recheck the linearity.
- After adjusting the linearity, please set the balance operating menu back to code " 1 12 2 "

Important Note!

After the external linearization the internal linearization weights have to be overwritten (see page 20)!

External Span Adjustment

Important:

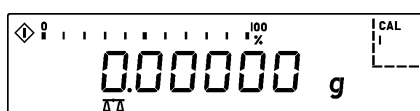
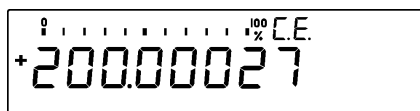
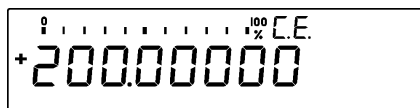
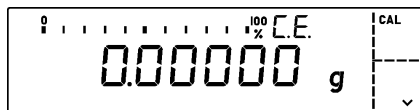
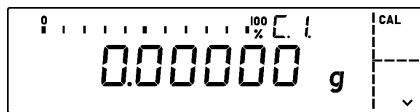
Usually the span adjustment should be performed using the internal adjustment weight.
Only in special cases the RC-/MC-balances may be adjusted externally (e.g. if the span accuracy of the internal adjustment weight is out of tolerance).

The RC-/MC-balance can be externally calibrated in different ways:

1. the way explained in this service manual;
2. using the PSION server; or
3. using the SARTOCAS program for personal computers and laptops.

Warning!

The balance accepts only a weight that is within a tolerance of approx. 2% of the factory-programmed adjustment value. You can set the balance for greater adjustment tolerances only using the PSION server or the SARTOCAS program for personal computers and laptops.



- Unload the weighing pan and press the **[TARE]** key (MC) or the **[T]** key (RC).
- At 0.00000 g is display press the **[TARE]** key (MC) or the **[T]** key (RC) and keep it pressed (for at least 3 sec.) until the readout on the left is displayed.
- When "C.E." is displayed, press the **[F2]** key until "C.E." appears.
- Tare the balance by pressing the **[TARE]** key (MC) or the **[T]** key (RC), and press the **[F1]** key to start calibration/adjustment.
- The calibration/adjustment weight is displayed.
- **Only MC-balances:** Enter the exact weight 200.000xx (see calibration certificate) using the numeric keys on the balance.
- Center the required weight (200 g) on the weighing pan once again and close the draft shield.
- After storing the calibration/adjustment weight, the program returns to the weighing mode.
- Lock the menu access switch.

Important Note!

After the external span adjustment the internal adjustment weight has to be overwritten (see page 21)!

Overwriting the Internal Linearity Weight

Important Note!

The internal linearity weights only should be overwritten if:

- balance was linearized externally
- external span adjustment was performed
- the linearity was tested externally with known weights (calculate a mean value out of 3 measurements)
- this mean value is two times larger than the standard deviation

The overwriting of the internal linearity weights can be performed different ways:

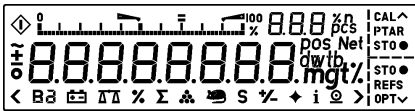
1. the way explained in this service manual;
2. using the PSION server; or
3. using the SARTOCAS program for personal computers and laptops.

Important Note!

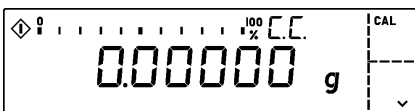
Usually the internal linearity weights should be overwritten using the PSION server or the SARTOCAS program for personal computers and laptops. Only in exceptional cases (e.g. no service software available) the overwriting routine can be performed using the overwriting program of the balance.



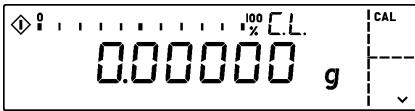
RC-A-01.TIF



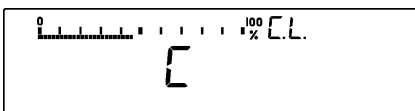
RC-A-02.TIF



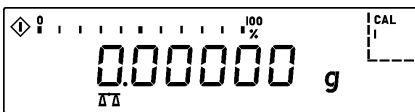
RC-A-20.TIF



RC-A-21.TIF



RC-A-22.TIF



RC-A-34.TIF

- Make sure that the balance operating menu is set to code " 1 13 1 " - internal linearization accessible -, and the menu access switch is open.
- Perform an external linearization (see page 17).
- Perform an external span adjustment (see page 19).

- Turn the balance off and back on again by pressing the key.
- While all segments appear (all 8's are displayed), briefly press the key.

- Now "C.C." or "C.L." appears above the weighing display.
 - "C.C." = overwriting the internal adjustment weight
 - "C.L." = overwriting the internal linearity weights

- Press the key until "C.L." is displayed.

- Tare the balance by pressing the key (MC) or the key (RC) and press the key to start the linearity overwriting routine. The display shows "C".

- The built-in linearization weight(s) is(are) internally applied one after the other by servomotor and removed at the end of linearization. The weight value is now read into the EEPROM. Then the balance returns to the weighing mode.

- After completing the linearization routine, set the balance operating menu back to code " 1 13 2 " and lock the menu access switch.

- After this the linearity has to be checked again externally.

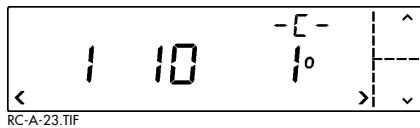
Overwriting the Internal Adjustment Weight

Important Note!

Usually the internal adjustment weights should be overwritten using the PSION server or the SARTOCAS program for personal computers and laptops. Only in exceptional cases (e.g. no service software available) the overwriting routine can be performed using the overwriting program of the balance.

Caution:

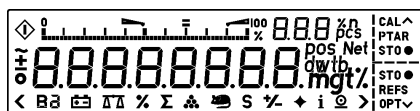
Before overwriting the internal adjustment weight a correct external adjustment has to be performed.




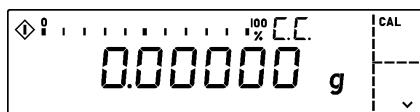
- Make sure that the balance operating menu is set to code " 1 10 1 " - internal adjustment accessible -.
- Unlock the menu access switch. You can access the menu access switch through an opening on the rear panel of the balance next to the AC jack.



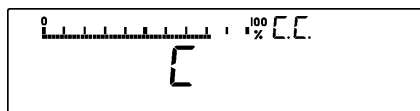
- Turn the balance off and back on again by pressing the  key.




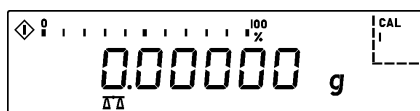
- While all segments appear (all 8's are displayed), briefly press the  key.






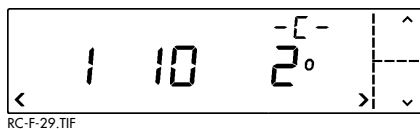
- Now "E.E." or "E.L." appears above the weighing display.
 - "E.E." = overwriting the internal adjustment weight
 - "E.L." = overwriting the internal linearity weights



- Press the  key until "E.E." is displayed.



- Tare the balance by pressing the  key (MC) or the  key (RC) and press the  key to start adjustment.
- The built-in calibration/adjustment weight(s) is(are) internally applied one after the other by servomotor and removed at the end of adjustment. The weight value is now read into the EEPROM. Then balance returns to the weighing mode.



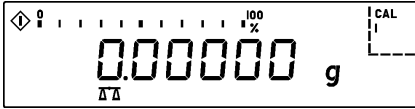
- After completing the adjustment routine, please set the balance operating menu back to code " 1 10 2 " and lock the menu access switch.

Internal Adjustment



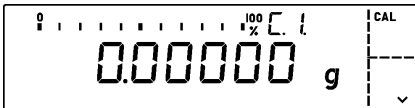
RC-A-23.TIF

- Make sure that the balance operating menu is set to code " 1 10 1 " - internal calibration/adjustment accessible -.



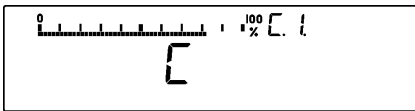
RC-A-34.TIF

- Press the **TARE** key (MC) or the **T** key (RC) for at least 3 seconds when a stable readout is displayed.



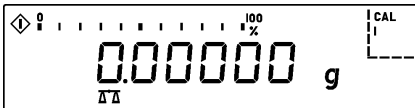
RC-A-12.TIF

- The readout shown on the left will appear.



RC-A-37.TIF

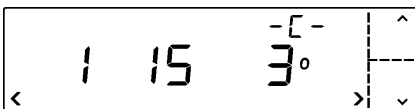
- Press the **F1** key, and the internal adjustment weight will be applied by servomotor and removed at the end of adjustment. The weight value is stored.



RC-A-34.TIF

- Then the balance returns to the weighing mode (see the Figure on the left).
- After the internal adjustment routine the span adjustment has to be tested externally again.

Automatic Internal Adjustment

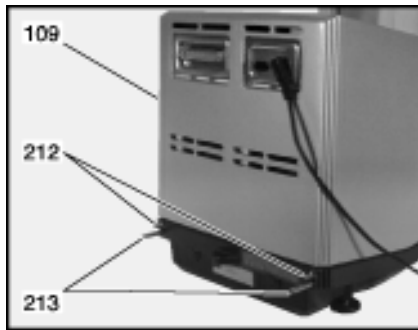


RC-A-38.TIF

- Set the balance operating menu to code " 1 15 3 " to activate the self-calibrating and automatic adjustment function (isoCAL).
- When isoCAL is activated, the scale symbol will flash in the display and the balance will automatically perform internal calibration and adjustment.
- The adjustment parameter are:
 - Temperatur changes > 1.5K
 - and every 4 hours
- If a printer is connected, a GLP/GMP-compliant record will be printed out.

Preparatory Steps for Cleaning and Repair

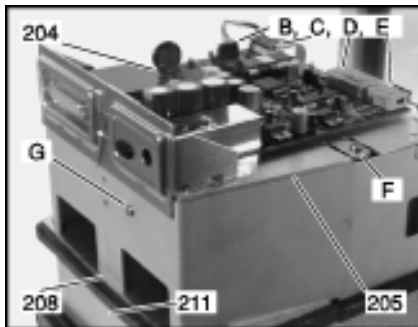
Opening the Balance Housing



RC-F-23.TIF

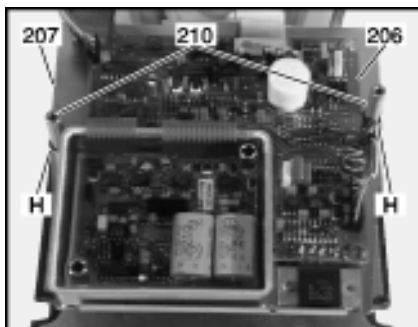
- Disconnect the balance from AC power.
- Remove the 4 threaded fasteners (212/213) from below the rear panel of the balance by turning them a few times.
- Carefully lift and remove the balance housing (109).

Removing PCBs and Enclosure



RC-F-24.TIF

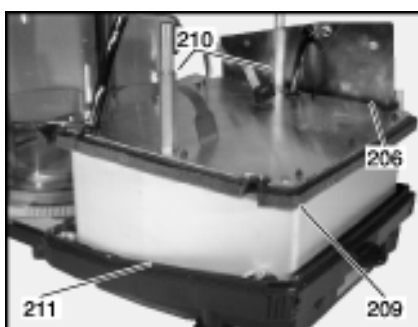
- Unplug the connectors (B, C, D and E) from the digital PCB (204) and remove the cables from the retainers on the enclosure frame.
- Remove the fastening screws (F) and the digital PCB (204).
- Now remove the screw (G) from the rear panel of the balance and lift off the upper part of the enclosure frame (208).



RC-F-25.TIF

- Remove the retainer rings (H) from the PCB holders (210) and the connecting cables from the openings in the spacer plate (207) sideways.
- Now lift off the analog PCB (206) along with the spacer plate (207) and set them aside.

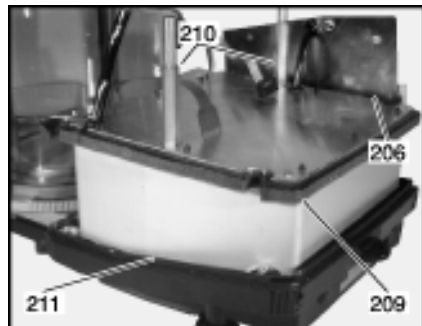
Please be extremely careful when removing the system's enclosure. Otherwise, you might damage the balance!



RC-F-26.TIF

- Remove the connecting cables from the openings in the insulation plate (209) and lift off the plate (209).
- Lift the lower part of the frame (211) over the PCB holders (210) and the analog PCB (206).

Warning!

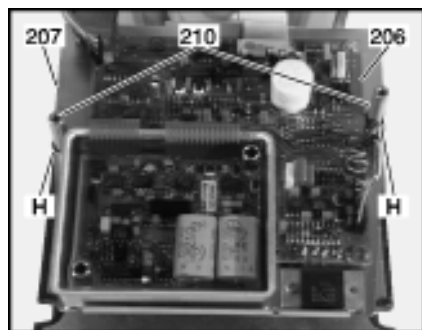


RC-F-26.TIF

Installing PCBs and Enclosure

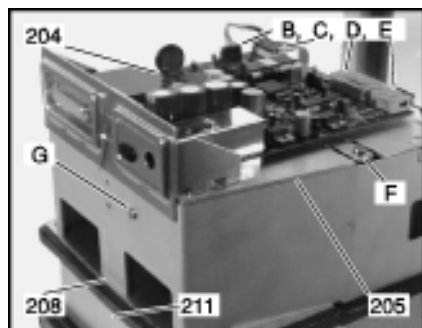
The following steps are necessary only if you have cleaned the weighing system or exchanged the PCBs.

- Install the lower part of the enclosure frame (211) along with the analog PCB (206), PCB holders (210) and weighing system on the base plate.
- Attach the insulation plate (209) and route the connecting cables through the cable openings.



RC-F-25.TIF

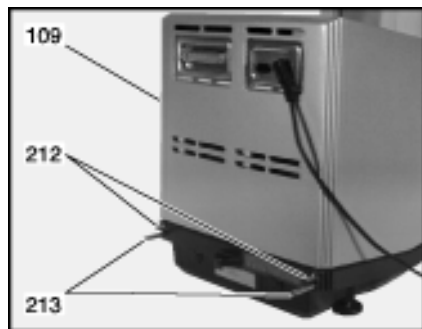
- Place the analog PCB (206) along with the spacer plate (207) on the PCB holders (210) and fasten them using the retainer rings (H).
- Route the connecting cables through the cable openings in the analog PCB (206).



RC-F-24.TIF

- Now reposition the upper part of the enclosure frame (208) and fasten screw (G).
- Place the digital PCB (204) along with the intermediate cover plate (205) on the PCB holders (210), route the connecting cables through the openings in the plate (205), and fasten the PCB (204) and the plate (205) to the PCB holders (210) using 2 screws (F) (10dNm).
- Now insert the connecting cables into the retainers of the upper part of the enclosure frame (208/211) and plug the connectors (B, C, D and E) back into the sockets on the digital PCB (204).

Closing the Balance Housing



RC-F-23.TIF

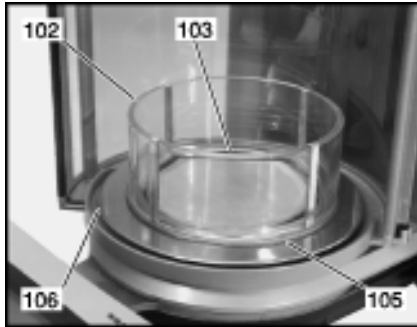
- Replace the top part of the balance housing (109) and secure it in place using the 4 threaded fasteners (212/213).
- Now the balance is ready to operate.

Caution:

Every time you open the housing, the balance has to warm up again afterwards – do not immediately start with adjustment!

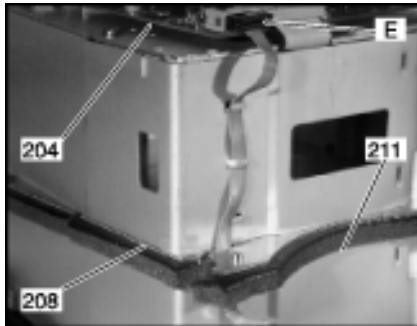
Exchanging the Draft Shield

Removing the Draft Shield



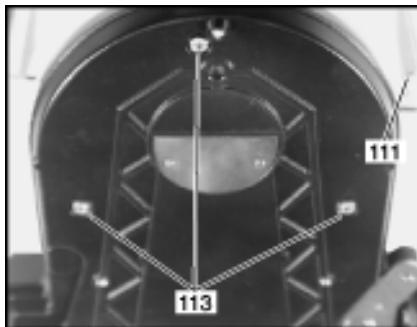
RC-F-29.TIF

- Disconnect the balance from AC power.
- Remove the draft shield cover(s) (101/104) from the draft shield (111) and set it (them) aside.
- Afterwards, remove the glass cylinder (102), along with the weighing pan (103), the shield ring (105) and the shield disk (106) from the weighing cell.
- Open the balance housing (see page 23).



RC-F-30.TIF

- Remove plug (E) for the draft shield drive from the digital PCB (204) and the cables from the retainers on the enclosure frame (208 / 211).



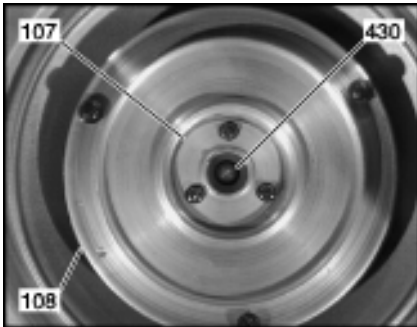
RC-F-31.TIF

- Remove the fastening screws (113) on the draft shield (111) from the base plate.
- Now lift off the old draft shield (111).

Caution!

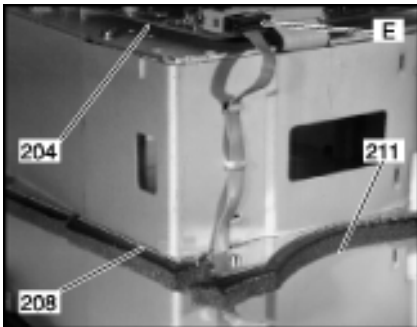
The display unit is now exposed and can tip over from the front!

Installing the Draft Shield



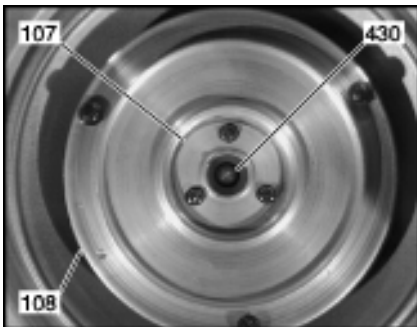
RC-F-32.TIF

- Remove the guide bushing (107) for the new draft shield (111) from the centering ring (108).
- Install the new draft shield (111) and adjust it.
- Fasten the new draft shield (111) in this position through the base plate using the screws (113).



RC-F-30.TIF

- Route the connecting cables (E) of the draft shield drive through the retainers on the enclosure frame (208/211) and insert the plug back into the socket of the digital PCB (204).

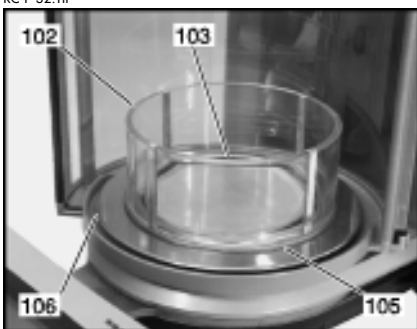


RC-F-32.TIF

- Install the guide bushing (107), align it according to the pan adapter (430) and tighten it on the centering ring (108).

Important Note:

Use the guide bushing (107) from the old draft shield when installing a new draft shield on balances of model series RC 250 S up to serial number 10602262. The reason: these types of balances have a thicker pan adapter (430).



RC-F-29.TIF

- Close the balance housing (see page 24).
- Now replace the shield disk (106), shield ring (105), weighing pan (103) and glass cylinder (102) of the weighing chamber draft shield).
- Finally, place the draft shield cover(s) (101 / 104) on the draft shield (111). Now the balance is ready to operate.

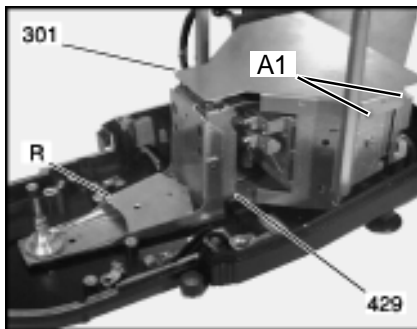
Cleaning

Cleaning the Weighing System

Important Note:

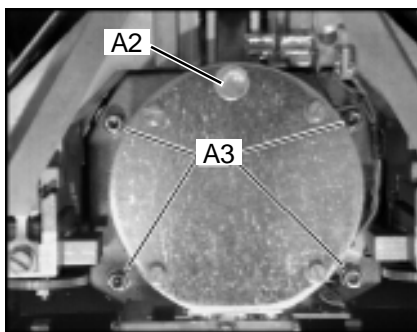
Cleaning is necessary only if the reproducibility of the weighing results is poor!

Opening the Weighing System



RC-F-40.TIF

- Remove the screws (A1) from the side of the shield cover (301) and carefully lift off the cover.



RC-F-42.TIF

- Carefully unscrew the small cover disk (A2).
- Remove the 4 screws (A3).
- Remove the magnet cover plate straight up without tilting it.

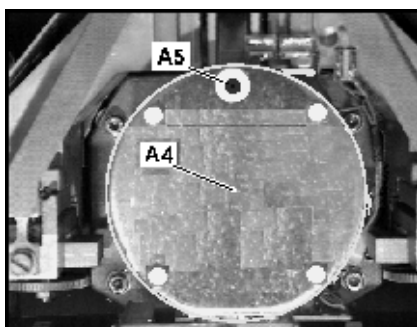
Warning!

Tilting can cause damage to the magnet cover plate.

Checking and Cleaning the Weighing System

- Carefully check to make sure that the gap around the coil is clean.
- Remove any small bits of debris or fuzz by carefully sliding adhesive tape through the gap.
- Check to make sure that the base plate is clean and carefully remove any dirt.

Closing the Weighing System



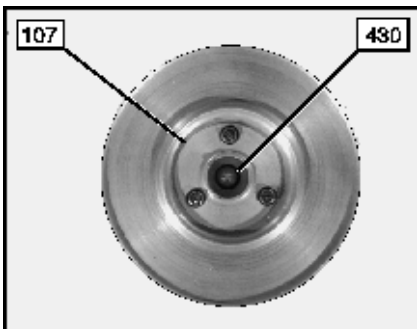
RC-F-54.TIF

- Carefully reposition the magnet cover plate (A4), aligning it with respect to the transport pin (A5) so that the clearance around the coil is uniform.
- Fasten the 4 screws (A3) back on; then cover the drill hole with a new cover disk (A2) (can also be ordered as an accessory).
- Replace the shield cover (301) by pressing down on it and securely fasten in place.
- Proceed as described in the section "Closing the Balance Housing".

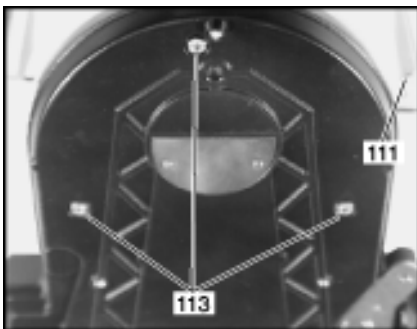
Cleaning the Calibration/Adjustment Weight Operating System

Exposing the Calibration Weight Operating System

- Disconnect the balance from AC power.
- Remove the draft shield cover(s) (101/104) from the draft shield (111) and set it (them) aside.
- Afterwards, remove the glass cylinder (102), along with the weighing pan (103), the shield ring (105) and the shield disk (106) from the weighing cell.
- Unscrew the guide bushing (107) and lift it off, ensuring that there is no contact with the pan adapter (430) due to tilting.



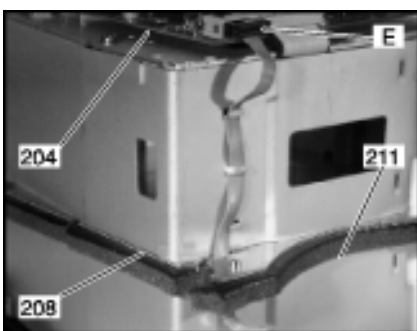
RC-F-55.TIF



RC-F-31.TIF

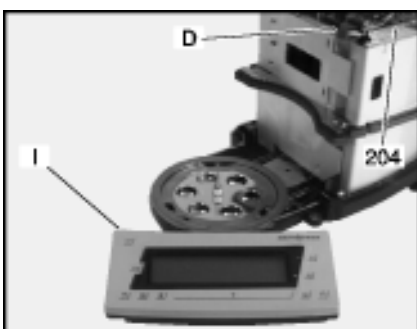
- Pull the balance over the edge of the table just until you can remove the fastening screws from underneath (113).

Caution!
The display unit (I) is now loose and could fall off!



RC-F-30.TIF

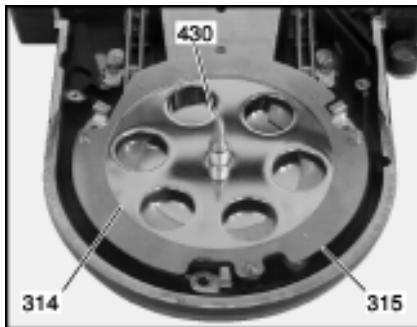
- Unplug the connecting cables for the draft shield drive (E) from the slot on the insulation plate (209).
- Carefully lift off the draft shield and set it aside.



RC-F-33.TIF

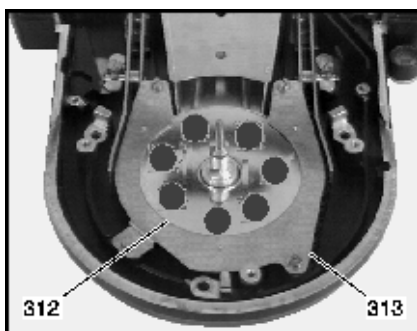
- Remove the complete display unit (I) and place it aside.

Checking the Weights for Dirt



RC-F-34.TIF

- Now check the weights for and remove any dirt.
- Unscrew the upper weight stop (315) for the upper weight (314).
- Do not touch the weight (314) with your fingers. Remove the weight (314) from the pan adapter (430) using a piece of cloth or leather.

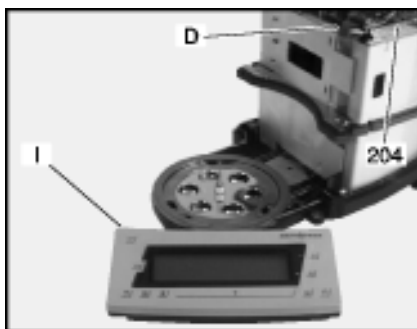


RC-F-56.TIF

- Remove the lower weight stop (313) and the lower weight (312) in the same manner.
- Check the two weights and their surroundings for any dirt.

Make sure to remove dirt or other debris from between each weight and the weight stop!

Replacing the Weights after Cleaning:

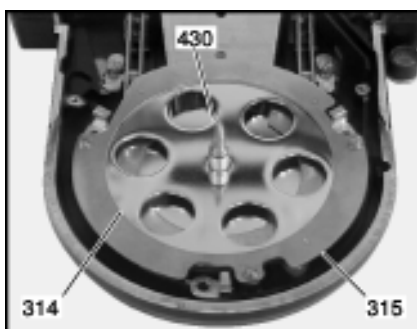


RC-F-33.TIF

- Replace the weights in the opposite order in which they were installed. When adjusting the weight stops (313 / 315), especially make sure that they are perfectly centered with respect to the pan adapter (430).
- Place the connecting cable (D) in the base plate in the groove provided and reinstall the display unit.
- Move the display unit back and forth a few times to check that it moves smoothly and replace the complete draft shield.

Important Note:

Make sure that the gap seals on the base plate are located in their original position!



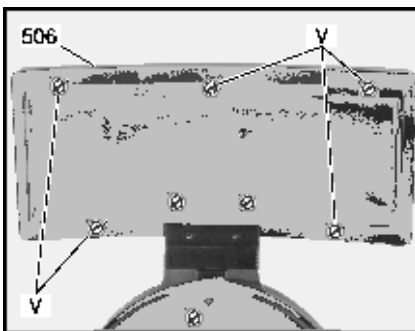
RC-F-34.TIF

- Pull the balance over the edge of the table just until you can refasten the screws from underneath (113).
- Install the guide bushing (107) so that an even gap is left around the pan adapter (430) when the pan adapter (430) is refastened.
- When re-assembling the balance, proceed as described under "Closing the Balance Housing."

Repairing the Electronics

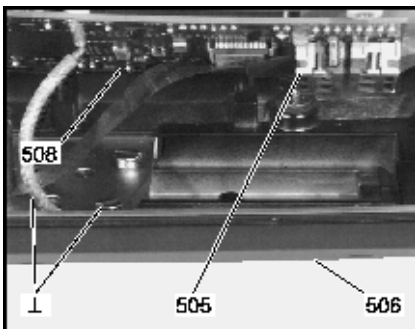
When repairing RC-/MC-balances, we recommend that you exchange complete component groups if a defect is located, because the two PCBs form an integral unit. The temperature coefficient of both the analog PCB (206) and the digital PCB (204) has been adjusted at the factory. These PCB-specific data are stored in the analog EEPROM (IC220 / analog PCB) and in the AOC (IC107/ digital PCB). Any repair work will distort these data.

Exchanging the Display PCB



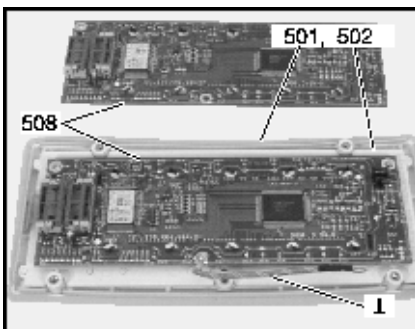
RC-F-57.TIF

- Disconnect the balance from AC power
- Now remove the 5 screws (V) from the lower part of the display housing (506).



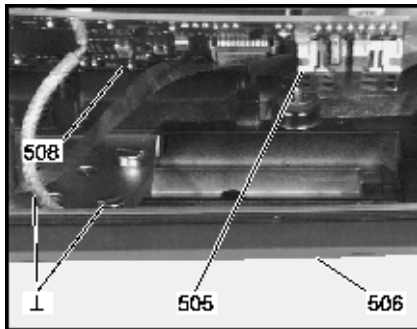
RC-F-48.TIF

- Slightly lift the display module (501 / 502) from the display housing (506).
- Unplug the connecting cable (505) from the display PCB (508) and disconnect the grounding cable (L) from the display housing (506).
- Now remove the complete display module (501 / 502) along with the display PCB (508).



RC-F-49.TIF

- Unplug the keypad (502) from the display PCB (508).
- Then detach the old PCB (508) from the display module (501 / 502).
- Transfer the grounding cable (L) from the old to the new display PCB (508).
- Now place the new display PCB (508) in the display module (501 / 502), plug the keypad (502) back into the socket and fasten the PCB (508) to the display module (501 / 502).



RC-F-48.TIF

- Place the complete display module (501 / 502) in front of the display housing (506), re-attach the grounding cable (^) in the housing (506), and plug the connecting cable (505) back into the display PCB (508).
- Place the display module (501 / 502) into the display housing (506) and fasten it in place; see Figure RC-F-57.TIF on page 30).
- Now the balance is ready to operate.

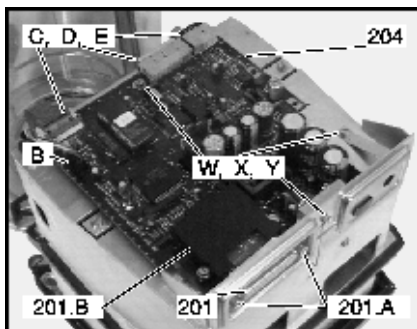
Exchanging the Digital PCB

To be able to exchange the PCB, you will need the following:

- the PSION server (CAS version 4.4) or
- the SARTOCAS program for personal computers

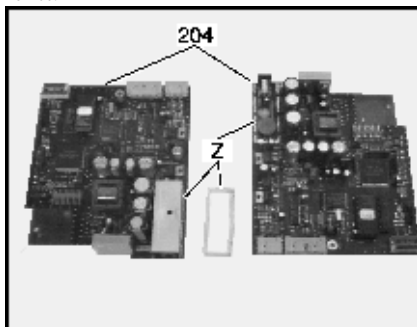
Important Note:

Before starting, you should first try to transfer the data from the old digital PCB and store them. If this is not possible, the data record can be retrieved from the International Technical Support in Goettingen using a PC.



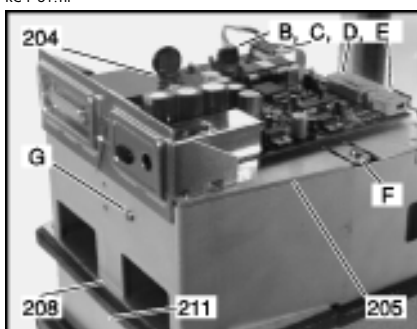
RC-F-50.TIF

- Open the balance housing (see page 23).
- Remove the connectors (B, C, D and E) from the digital PCB (204).
- Remove the locking screws (201.A) and the data interface (201).
- Unscrew and remove the slot (201.B) for the data interface (201).
- Remove the 3 screws (W, X and Y) from the brace (203) and the digital PCB (204).
- Take the old digital PCB (204) from the intermediate cover plate (205).



RC-F-51.TIF

- Transfer the shieldings (Z) located above the power socket on the component side and the soldered side from the old PCB to the new PCB (204).



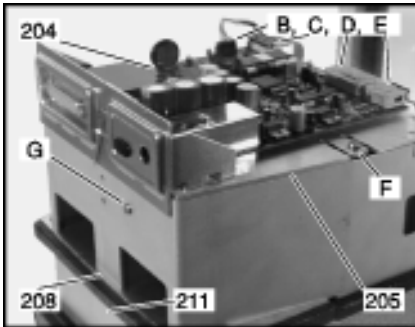
RC-F-24.TIF

- Place the new PCB (204) on the intermediate cover plate (205), align and fasten it back on using the 3 screws (W, X and Y).
- Replace the slot (201.B) for the data interface (201), fasten it and plug in the data interface (201).
- Now insert the connectors (B, C, D and E) back into the sockets on the digital PCB (204).
- Close the balance housing (see page 24).

Important Note:

You must now use the SARTOCAS program for personal computers or the MC1 server to transfer the data record to the balance. Please refer to the program description for the proper procedure.

Exchanging the Analog PCB

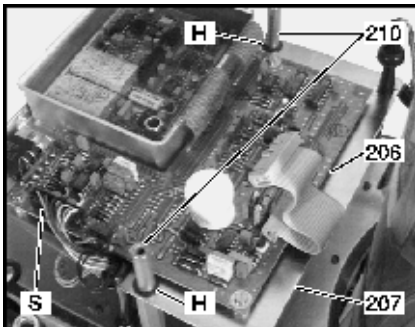


RC-F-24.TIF

- Open the balance (see page 23).
- Remove the connectors (B, C, D and E) from the digital PCB (204) and unplug the cables from the mountings of the upper frame (208 / 211).
- Remove the fastening screws (F) and digital PCB (204) along with the intermediate cover plate (205) and set them aside.
- Now remove the screw (G) from the rear panel of the balance and lift off the upper enclosure frame (208).
- Remove the system interface connector (S) from the analog PCB (206) and unsolder cables of the temperature sensors.

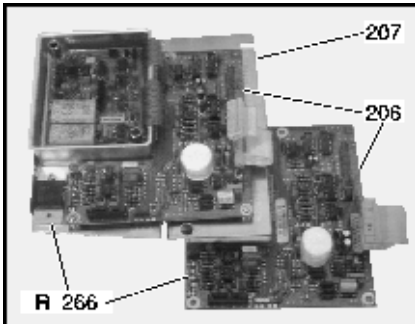
Important Note:

Please write down the way the cables of the temperature sensors are soldered.



RC-F-52.TIF

- Remove the retainer rings (H) from the PCB holders (210) and the connecting cables from the openings in the analog PCB (206).
- Remove the analog PCB (206) along with the spacer plate (207) from the PCB holders (210).
- Unscrew the analog PCB (206) from the spacer plate (207).
- Now transfer the precision resistor from the old analog PCB (206) (R 266) to the new PCB (206).
- Attach the new PCB (206) onto the spacer plate (207).



RC-F-53.TIF

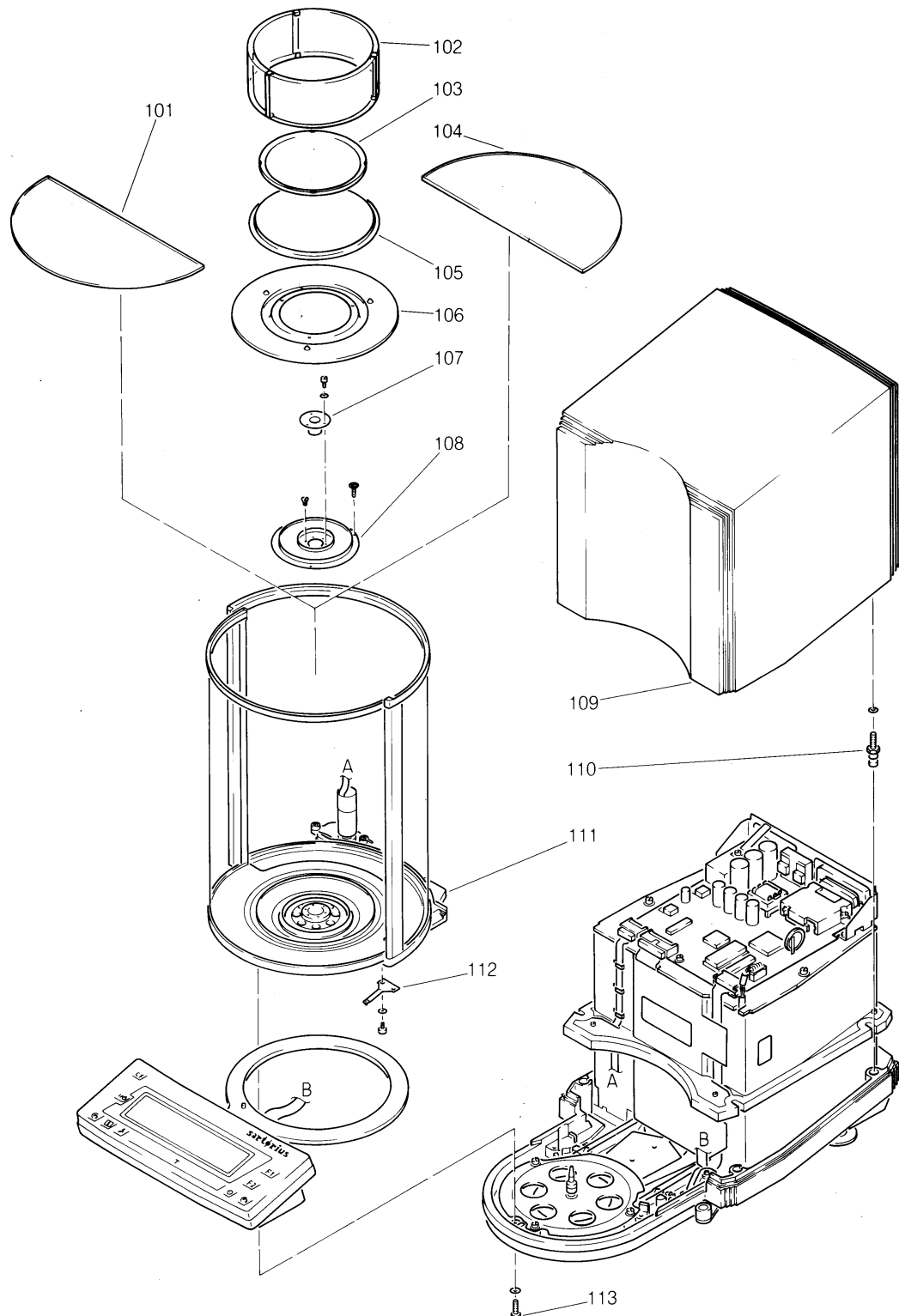
- Place the analog PCB (206) along with the spacer plate (207) on the PCB holders (210) and fasten it with the retainer rings (H).
- Route the connecting cables through the openings in the analog PCB (206).
- Plug the system interface cable (S) into the socket of the analog PCB (206) and solder the cables of the temperature sensors as marked.
- Reposition the upper enclosure frame (208) and refasten the screw (G).
- Place the digital PCB (204) along with the intermediate cover plate (205) back onto the PCB holders (209), route the connecting cables through the openings in the intermediate cover plate (205), and fasten the PCB (204) and intermediate cover plate (205) with 2 screws (F) (10dNm) onto the holders (210).
- Now insert the connecting cables into the retainers on the enclosure frame parts (208 / 211) and the connectors (B, C, D and E) into the sockets on the digital PCB (204).
- Close the balance housing (see page 24).

Important Note:

The specific data of the new analog PCB must be transferred to the EEPROM of the processor on the digital PCB. To do so, use the SARTOCAS program for the PSION server. Please refer to the program description for the proper procedure. Once this is done, you can finish your work.

Afterwards, the balance needs to be adjusted (Linearity, Span Adjustment).

Exploded-View Diagram 1



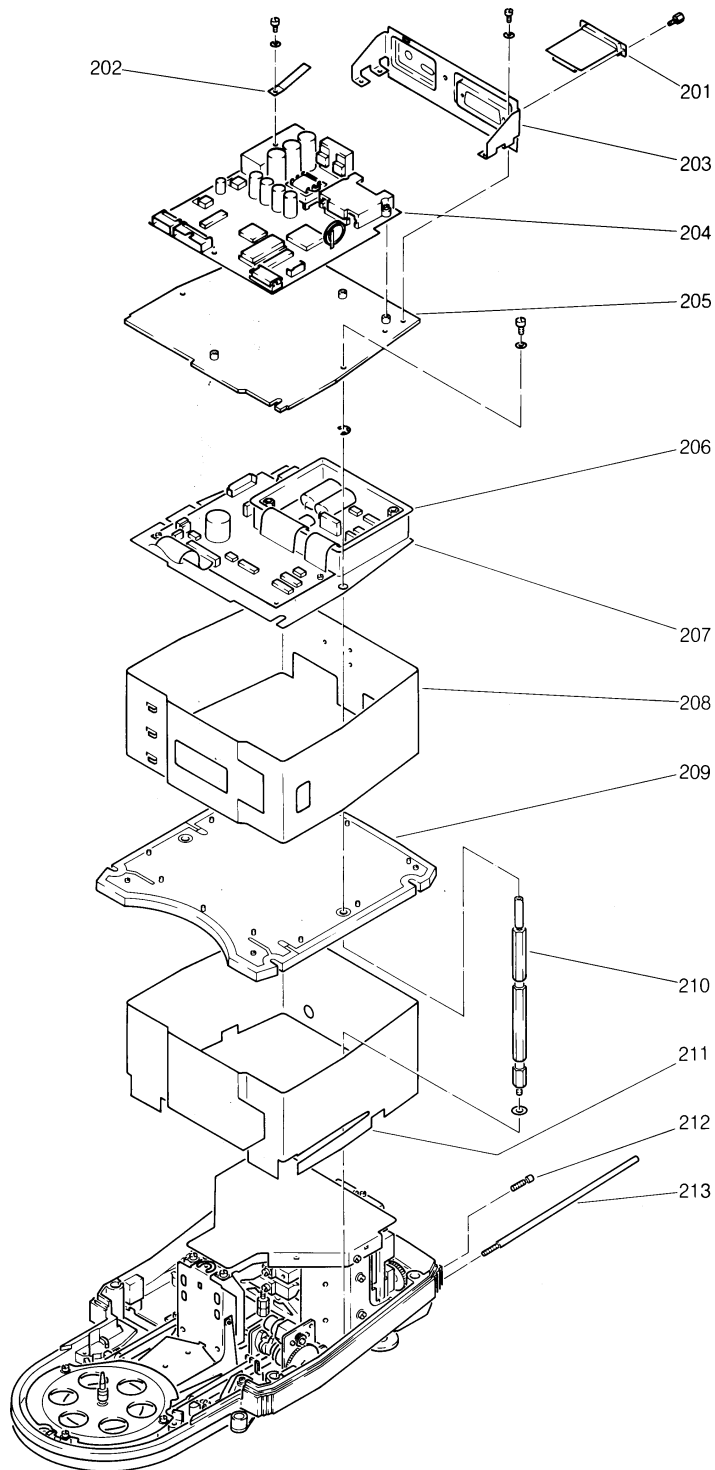
Index Designation

- 101 Draft shield cover plate, interior
- 102 Glass cylinder of the draft shield
- 103 Weighing pan
- 104 Glass shield cover plate, exterior
- 105 Shield ring
- 106 Shield disk
- 107 Guide bushing

Index Designation

- 108 Centering ring
- 109 Top part of the housing
- 110 Fastening bolt (for housing)
- 111 Draft shield (complete)
- 112 Leaf spring (display unit)
- 113 Fastening screw (for draft shield)

Exploded-View Diagram 2



Index Designation

- 201 Flexure (for grounding cable)
- 202 Data interface
- 203 Brace for interface port
- 204 Digital PCB
- 205 Intermediate cover plate
- 206 Analog PCB
- 207 Spacer plate

Index Designation

- 208 Enclosure frame (upper part) for PCB
- 209 Insulation plate
- 210 PCB holder
- 211 Enclosure frame (lower part) for weighing system
- 212 Fastener, short (for housing)
- 213 Fastener, long (for housing)

Troubleshooting Guide

Error codes are displayed by a numeric code.

All codes for operating sequence errors and operating errors have two digits

The codes for hardware errors have three digits.

These error codes enable you to identify the type of operating error.

Software errors

Readout	Meaning	Reason/Solution
Err 01	Display format overflow	Calculated result for application too large
Err 02	Zero point error at the start of the CAL routine	Display was not tared at the beginning of the adjustment routine, pan was not unloaded. Tare the balance again; check the system
Err 03	Zero point error at the end of the CAL routine	Balance drifted during the adjustment procedure, check weight application
Err 04	Control error during multiple-calibration/adjustment mode	Check system for stability. Make sure that the ambient conditions are stable before you calibrate/adjust.
Err 06	Internal calibration/adjustment weight defective or not available	Check calibration/adjustment weight operating system or return the balance to the factory in Goettingen
Err 07	Function and/or option is not allowed when the balance is used in legal metrology	Only when air buoyancy correction and print without header (menu code 7 2 1) are activated; set to print with header (7 2 2)
Err 10	1st tare memory disabled when a value is stored in 2nd tare memory	The tare functions are interlocked. Clear the application tare memory (press CF/) to enable the tare key.
Err 11	By pressing TARE/ or T/ - F1/ , you tried to store an invalid number in the tare memory.	For example, the readout was negative; check the sample on the pan
Err 12	The value you tried to store in tare memory 2 exceeds the weighing capacity or range limit of the balance.	Check the sample or container; entry 2 too large; tare 2 must be corrected.
Err 20	The ☒/ or ☑/ key was pressed before an application program was started.	Application not yet initialized; for example, you forgot to store a reference percentage for weighing in percent
Err 21	The menu code for the reference percentage or the reference sample quantity is blocked or this application has no parameter mode	Code 2 3 1 is selected in the balance operating menu; change it to 2 3 2 or 2 3 3
Err 22	Error during storage of the reference for weighing in percent or counting	The weight is too light or there is no sample on the pan
Err 23	Error during storage in any application program	There is no sample on the weighing pan or the readout is negative
Err 30	The print key was pressed in the BPL mode	a) If pin 6 is connected to the ground, disconnect the grounding cable b) The data record is wrong; use PSION server to correct
Err 50	Converter error (TC range).	Check temperature circuit, or temperature sensores

Err 53	Temperature sensor circuit failure	Check temperature-compensating sensors; exchange PCB or return balance to the factory in Goettingen
Err 54	Balance converter value below minimum limit	Check system; the balance is underloaded
Err 55	Balance converter value above maximum limit	Check system; the balance is overloaded
Err 62	Pressing [F1] is momentarily not allowed	Follow correct operating procedure
Err 63	Pressing [F2] is momentarily not allowed	Follow correct operating procedure
Err 64	A numeric entry is not allowed	Follow correct operating procedure
Err 70	Incorrect numeric entry	Make a new entry using the numeric keypad

Hardware Errors

Hardware error codes are displayed as long as the error persists. During this time, the error code is output via the data interface port.

Readout	Meaning	Reason/Solution
Err 110 / 210	Defective interface AOC – KDC	It is necessary to exchange the PCB (display module or digital PCB)
Err 220	EEPROM checksum error	Turn the balance ON / OFF and back ON again. It may be necessary to exchange the PCB.
Err 225	EEPROM data/ROM version incompatible	Adjust data record after ROM exchange.
Err 230	RAM writing/reading error	Turn the balance ON /OFF and back ON again. It may be necessary to exchange the PCB.
Err 234	Checksum error in the battery-backed RAM.	Leave the balance connected to AC current for approx. 12 h to recharge the battery.
Err 237	EEPROM checksum error, linearity range	Activate "external linearization"
Err 239	EEPROM checksum error, linearity weight	Determine the internal linearity weight
Err 241	EEPROM checksum error, hardware	Incorrect software programming
Err 243	EEPROM checksum error, menu area	Turn the balance OFF and back ON. Unlock menu access switch and access menu. Change code and exit from the menu by pressing the [CF] key.
Err 245	EEPROM checksum error, zero point reference for calibration/adjustment	Perform calibration/adjustment by setting the menu code for adjustment
Err 247	EEPROM checksum error, calibration/adjustment memory area	
Err 249	EEPROM checksum error, calibration weight	Determine the internal calibration/adjustment weight
Err 253*)	EEPROM checksum error, air density	Run the air density determination program
Err 259*)	EEPROM checksum, adjustment range	Return balance to the factory in Goettingen
Err 263*)	EEPROM checksum error, conventional mass	Run air density determination program again

*) only MC

Quick-Reference Guide to the Balance Operating Menu

RC			MC														
bis Vers.3.06												Menü für Applikationen					
1			1						Wägebetrieb								
1	1		1	1					Aufstellort								
1	1	1	1	1	1				sehr ruhige Umgebung								
1	1	2	1	1	2				ruhige Umgebung								
1	1	3	1	1	3				unruhige Umgebung								
1	1	4	1	1	4				sehr unruhige Umgebung								
1	2		1	2					Normales Wägen / manuelles Dosieren								
1	2	1	1	2	1				normales Wägen								
1	2	2	1	2	2				manuelles Dosieren								
1	3		1	3					Stillstandsbreite								
1	3	1	1	3	1				0,25 Zifferschritt								
1	3	2	1	3	2				0,50 Zifferschritt								
1	3	3	1	3	3				1 Zifferschritt								
1	3	4	1	3	4				2 Zifferschritte								
1	3	5	1	3	5				4 Zifferschritte								
1	3	6	1	3	6				8 Zifferschritte								
1	4		1	4					Stillstandsverzögerung								
1	4	1	1	4	1				keine Verzögerung								
1	4	2	1	4	2				kurze Verzögerung								
1	4	3	1	4	3				lange Verzögerung								
1	4	4	1	4	4				extrem lange Verzögerung								
1	5		1	5					Tariierbedingung								
1	5	1	1	5	1				jederzeit								
1	5	2	1	5	2				erst nach Stillstand								
1	6		1	6					Auto-Zero								
1	6	1	1	6	1				ein								
1	6	2	1	6	2				aus								
1. Bereich			2. Bereich			3. Bereich											
1	7		3	1		3	3		1. Gewichtseinheit			Anzeige	Schnittstelle				
1	7	1	3	1	1	3	3	1	wahlfreie Einheit			o	o				
1	7	2	3	1	2	3	3	2	Gramm			g	g				
1	7	3	3	1	3	3	3	3	Kilogramm			o	kg				
1	7	4	3	1	4	3	3	4	Carat			ct	ct				
1	7	5	3	1	5	3	3	5	Pound			lb	lb				
1	7	6	3	1	6	3	3	6	Ounce			oz	oz				
1	7	7	3	1	7	3	3	7	Troy ounce			ozt	ozt				
1	7	8	3	1	8	3	3	8	Tael Hongkong			tl	tlh				
1	7	9	3	1	9	3	3	9	Tael Singapur			tl	tfs				
1	7	10	3	1	10	3	3	10	Tael Taiwan			tl	tlt				
1	7	11	3	1	11	3	3	11	Grain			gr	GN				
1	7	12	3	1	12	3	3	12	Pennyweight			dwt	dwt				
1	7	13	3	1	13	3	3	13	Milligramm			mg	mg				
1	7	14	3	1	14	3	3	14	Parts per Pound			o	/lb				
1	7	15	3	1	15	3	3	15	Tael China			tl	tlc				
1	7	16	3	1	16	3	3	16	Momme			m	mom				
1	7	17	3	1	17	3	3	17	Karat			o	K				

1	7	18	3	1	18	3	3	18		Tola		t	t
1	7	19	3	1	19	3	3	19		Baht		b	bat
1	7	20	3	1	20	3	3	20		Mesghal		m	MS
1. Bereich			2. Bereich			3. Bereich							
1	8		3	2		3	4			Anzeigeanpassung			
1	8	1	3	2	1	3	4	1		größtmögliche Genauigkeit			
1	8	2	3	2	2	3	4	2		letzte Stelle >>dunkel<< bei Laständerung			
1	8	3	3	2	3	3	4	3		Rundungsfaktor 2			
1	8	4	3	2	4	3	4	4		Rundungsfaktor 5			
1	8	5	3	2	5	3	4	5		Rundungsfaktor 10			
1	8	6	3	2	6	3	4	6		Genauigkeit 1,0%			
1	8	7	3	2	7	3	4	7		Genauigkeit 0,5%			
1	8	8	3	2	8	3	4	8		Genauigkeit 0,2%			
1	8	9	3	2	9	3	4	9		Genauigkeit 0,1%			
1	8	10	3	2	10	3	4	10		Genauigkeit 0,05%			
1	8	11	3	2	11	3	4	11		Genauigkeit 0,02%			
1	8	12	3	2	12	3	4	12		Genauigkeit 0,01%			
1	8	13	3	2	13	3	4	13		PolyRange-Funktion			
1	9		1	9						Externes Justieren			
1	9	1	1	9	1					frei			
1	9	2	1	9	2					gesperrt			
1	10		1	10						Internes Justieren			
1	10	1	1	10	1					frei			
1	10	2	1	10	2					gesperrt			
1	11		1	11						Kennwert-Test			
1	11	1	1	11	1					frei			
1	11	2	1	11	2					gesperrt			
1	12		1	12						Externes Linearisieren			
1	12	1	1	12	1					frei			
1	12	2	1	12	2					gesperrt			
1	13		1	13						Internes Linearisieren			
1	13	1	1	13	1					frei			
1	13	2	1	13	2					gesperrt			
1	14		1	14						Mehrfach-Justieren			
1	14	1	1	14	1					aus			
1	14	2	1	14	2					ein			
1	15		1	15						Vollautomatisches Justieren >>isoCAL<< und Lin.			
1	15	1	1	15	1					aus			
1	15	2	1	15	2					nur Justierhinweis in der Anzeige			
1	15	3	1	15	3					Vollautomatisches Justieren >>isoCAL<<			
1	15	4	1	15	4					Vollautomatisches Justieren >>isoCAL<< und Lin.			
			1	16						Luftdichtebestimmung			
			1	16	1					frei			
			1	16	2					gesperrt			
2			2							Wägen in drei Wägebereichen bei Standard-Waagen			
2	1		2	1						Anwahl der Bereiche			
2	1	1	2	1	1					E2/-Taste gesperrt			
2	1	2	2	1	2					zwei Wägebereiche			
2	1	3	2	1	3					drei Wägebereiche			
2	1	4	2	1	4					Zählen			

2	1	5	2	1	5						Prozentwägen		
			2	1	6						Differenz- und Rückwägen		
			2	1	7						Dichte / Durchmesserbestimmung		
			2	1	8						Luftauftriebskorrektur		
2	2		2	2							Funktion der Taste $F1/$		
2	2	1	2	2	1						gesperrt		
2	2	2	2	2	2						Tara-Speicher		
2	2	3	2	2	3						Plus/Minus-Kontrolle (Nettogewicht)		
2	2	4	2	2	4						Plus/Minus-Kontrolle (Abweichung)		
2	2	5	2	2	5						Justieren intern <<CAL I<<		
2	2	6	2	2	6						Kalibrierfunktion <<CAL T<<		
2	3		2	3							Referenzprozentwert / Referenzstückzahl		
2	3	1	2	3	1						keine Verstellung		
2	3	2	2	3	2						umlaufend: 5, 10, 20, 50, 100, 5, 10, ...		
2	3	3	2	3	3						in Einerschritten		
2	4		2	4							Clear Funktion		
2	4	1	2	4	1						global auf alle Funktionen wirkend		
2	4	2	2	4	2						selektiv mit Löschreihenfolge $F1/ \rightarrow F2/$		
2	4	3	2	4	3						$F1/$ selektiv $F1/$ oder $F2/$		
2	5										Sonderanzeige		
2	5	1									>> -- << ohne Stillstand		
2	5	2									Normalanzeige		
			2	5							Zahlenblock		
			2	5	1						gesperrt		
			2	5	2						frei		
			2	6							Methode der Dichtebestimmung		
			2	6	1						Auftrieb		
			2	6	2						Pyknometer		
3			3								Parameter 1. Applikation		
3	5		3	5							Referenzübernahme		
3	5	1	3	5	1						meßwertgenau nach interner Auflösung		
3	5	2	3	5	2						anzeigegenau		
3	6		3	6							Prozentwertanzeige		
3	6	1	3	6	1						ohne Nachkommastelle		
3	6	2	3	6	2						mit einer Nachkommastelle		
3	6	3	3	6	3						mit zwei Nachkommastellen		
3	6	4	3	6	4						mit drei Nachkommastellen		
			3	7							Wägefolge		
			3	7	1						Einzelwägung		
			3	7	2						fortlaufende Einzelwägung		
			3	7	3						Gruppenwägung		
			3	8							Tarawägung		
			3	8	1						aus		
			3	8	2						ein		
			3	9							1. Verrechnungswert in der Anzeige (Wertberechnung)		
			3	9	1						Rückstand in Milligramm		
			3	9	2						Rückstand in Prozent		
			3	9	3						Differenz in Milligramm		
			3	9	4						Differenz in Prozent		
			3	10							2. Verrechnungswert in der Anzeige (Wertberechnung)		
			3	10	1						Rückstand in Milligramm		
			3	10	2						Rückstand in Prozent		

			3	10	3												Differenz in Milligramm	
			3	10	4												Differenz in Prozent	
4			4														Parameter 2. Applikation	
4	1		4	1													Toleranzgrenze	
4	1	1	4	1	1												Abweichung vom Sollwert $\pm 0.1\%$	
4	1	2	4	1	2												Abweichung vom Sollwert $\pm 0.2\%$	
4	1	3	4	1	3												Abweichung vom Sollwert $\pm 0.5\%$	
4	1	4	4	1	4												Abweichung vom Sollwert $\pm 1.0\%$	
4	1	5	4	1	5												Abweichung vom Sollwert $\pm 1.5\%$	
4	1	6	4	1	6												Abweichung vom Sollwert $\pm 2.0\%$	
4	1	7	4	1	7												Abweichung vom Sollwert $\pm 2.5\%$	
4	1	8	4	1	8												Abweichung vom Sollwert $\pm 3.0\%$	
4	1	9	4	1	9												Abweichung vom Sollwert $\pm 5.0\%$	
4	1	10	4	1	10												Abweichung vom Sollwert $\pm 10.0\%$	
4	2		4	2													Automatische Datenausgabe	
4	2	1	4	2	1												aus	
4	2	2	4	2	2												ein	
4	3		4	3													Ansteuerung der Steuerleitungen	
4	3	1	4	3	1												nur im Kontrollbereich	
4	3	2	4	3	2												immer	
4	3	3	4	3	3												nur bei Stillstand im Kontrollbereich	
4	3	4	4	3	4												nur bei Stillstand	
5			5														Datenschnittstelle	
5	1		5	1													Baurate	
5	1	1	5	1	1												150 Baud	
5	1	2	5	1	2												300 Baud	
5	1	3	5	1	3												600 Baud	
5	1	4	5	1	4												1200 Baud	
5	1	5	5	1	5												2400 Baud	
5	1	6	5	1	6												4800 Baud	
5	1	7	5	1	7												9600 Baud	
5	1	8	5	1	8												19200 Baud	
5	2		5	2													Parität	
5	2	1	5	2	1												Mark Parity	
5	2	2	5	2	2												Space Parity	
5	2	3	5	2	3												Odd Parity	
5	2	4	5	2	4												Even Parity	
5	3		5	3													Anzahl der Stopbits	
5	3	1	5	3	1												1 Stopbit	
5	3	2	5	3	2												2 Stopbits	
5	4		5	4													Handshake-Art	
5	4	1	5	4	1												Software-Handshake	
5	4	2	5	4	2												Hardware-Handshake 2 Zeichen nach CTS	
5	4	3	5	4	3												Hardware-Handshake 1 Zeichen nach CTS	
6			6														Dienstleistung	
6	1		6	1													Datenausgabebedienung	
6	1	1	6	1	1												Einzelprint ohne Stillstand	
6	1	2	6	1	2												Einzelprint nach Stillstand mit Funktionsspeicherung	
6	1	3	6	1	3												Einzelprint nach Stillstand ohne Funktionsspeicherung	
6	1	4	6	1	4												Autoprint ohne Stillstand	

6	1	5		6	1	5					Autoprint bei Stillstand		
6	2			6	2						Automatische Datenausgabe		
6	2	1		6	2	1					Autoprint über die Taste \ominus / abschaltbar		
6	2	2		6	2	2					Autoprint nicht abschaltbar		
6	3			6	3						Autoprintintervall		
6	3	1		6	3	1					1 Anzeigewechsel		
6	3	2		6	3	2					2 Anzeigewechseln		
6	3	3		6	3	3					5 Anzeigewechseln		
6	3	4		6	3	4					10 Anzeigewechseln		
6	3	5		6	3	5					20 Anzeigewechseln		
6	3	6		6	3	6					50 Anzeigewechseln		
6	3	7		6	3	7					100 Anzeigewechseln		
6	4			6	4						Automatisches Trieren bei Print		
6	4	1		6	4	1					Datenausgabe ohne automatisches trieren		
6	4	2		6	4	2					Datenausgabe mit automatischem trieren		
7				7							Softkey Applikation		
7	1			7	1						Autom. Ausgabe der Referenzdaten (Parameter)		
7	1	1		7	1	1					aus (MC: nur bei Code 8 10 3)		
7	1	2		7	1	2					automatische Datenausgabe		
											der Luftdichte und Dichte des Wägegutes		
											Ref.-wert und Ref.-gewicht (MC: nur bei Code 8 10 3)		
											nur Referenzgewicht		
7	1	3		7	1	3					nur Referenzgewicht (MC: nur bei Code 8 10 3)		
7	2			7	2						Kennzeichnung der Datenausgabe		
7	2	1		7	2	1					ohne Header		
7	2	2		7	2	2					mit Header		
7	3			7	3						Automatische Datenausgabe Taraspeicher		
7	3	1		7	3	1					Print Nettowert		
7	3	2		7	3	2					Print Taraspeicher		
				7	4						Ausgabe >>Date/Time<<		
				7	4	1					aus		
				7	4	2					nur Datum		
				7	4	3					nur Uhrzeit		
				7	4	4					Datum und Zeit		
				7	5						Ausgabe >>Tar/Net<<		
				7	5	1					aus		
				7	5	2					nur Taragewicht		
				7	5	3					nur Nettogewicht		
				7	5	4					Taragewicht und Nettogewicht		
				7	6						Ausgabe >>Res<<		
				7	6	1					aus		
				7	6	2					nur Rückstand in Milligramm		
				7	6	3					nur Rückstand in Prozent		
				7	6	4					Rückstand in Milligramm und Prozent		
				7	7						Ausgabe >>Diff<<		
				7	7	1					aus		
				7	7	2					nur Differenz in Milligramm		
				7	7	3					nur Differenz in Prozent		
				7	7	4					Differenz in Milligramm und Prozent		
8				8							Sonderfunktion		
8	1			8	1						Zugang zum Waagenbetriebsmenü		
8	1	1		8	1	1					frei		

Waagen-Prüfprotokoll MC210S/P, MC410S, RC210S/P/D, RC250S

Modell: _____

Kunde: _____

Serien-Nr.: _____

Aufstellort: _____

Grund für die Ausstellung des Waagenprotokolls

- Neuaufstellung Reparatur
 Wartung Prüfmittelüberwachung

Aufstellbedingungen

- ruhig unruhig
 klimatisiert Wägestein

Gewichtssatz

Nr.: _____ Klasse: _____
 gültig bis: _____

Reproduzierbarkeit / Standardabweichung

zul. Toleranz: **s** _____

Prüflast: _____

Vor jeder Belastung nullstellen !

Messung	Anzeige
1	
2	
3	
4	
5	
6	

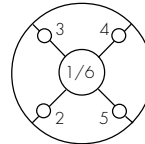
(Anzeige Max - Anzeige Min) / 2 _____

Standardabweichung: **s** _____

Ecklast:

zul. Toleranz: _____

Prüflast: _____



Pos.	Anzeige
1	
2	
3	
4	
5	
6	

Bewertung:

Der für jede Ecklastposition ermittelte Wert muß kleiner oder gleich der zul. Toleranz sein.

Kennwert:

zul. Toleranz: **T** _____

Prüflast: Nennwert: **P** _____

Abweichung: **D** _____

Unsicherheit: **U** _____

Konv. Wägewert: **W** _____

Summe: **SU = T + U** _____

Vor jeder Messung, int. Kennwertjustierung durchführen !

Anzeige	Abweichung $X_i = G_i - W$
G1:	X1:
G2:	X2:
G3:	X3:

$X_4 = (\text{Anz. Max} - \text{Anz. Min}) / 2$

$X_4 =$ _____

Bewertung:

Mindestens zwei der Werte X1 bis X3 müssen \leq SU sein.

X4 muß \leq der zul. Toleranz T sein.

Linearität:

zul. Toleranz: _____

Mehrbereichswaagen:

Meßbereich: _____

Linearitätsabweichungen:

Vor jeder Belastung nullstellen oder tarieren !

Taralast	Prüflast	Anzeige
_____	P	G1:
T1	P	G2:
T2	P	G3:
T3 (T1+T2)	P	G4:

$L_2 = (G_1 + G_2 - G_3 - G_4) / 2$ _____

$L_1 = (G_1 - G_2 + L_2) / 2$ _____

$L_3 = (G_3 - G_4 + L_2) / 2$ _____

Bewertung:

Die errechneten Werte L1, L2, L3 sind die Linearitätsabweichungen bei ca. 25%, 50%, und 75% der Höchstlast und müssen kleiner oder gleich der zul. Toleranz für die Linearität sein.

Abweichungen liegen innerhalb der zul. Toleranzen

Abweichungen liegen außerhalb der zul. Toleranzen

Bemerkungen: _____

Datum: _____

Unterschrift: _____

Stempel: _____

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