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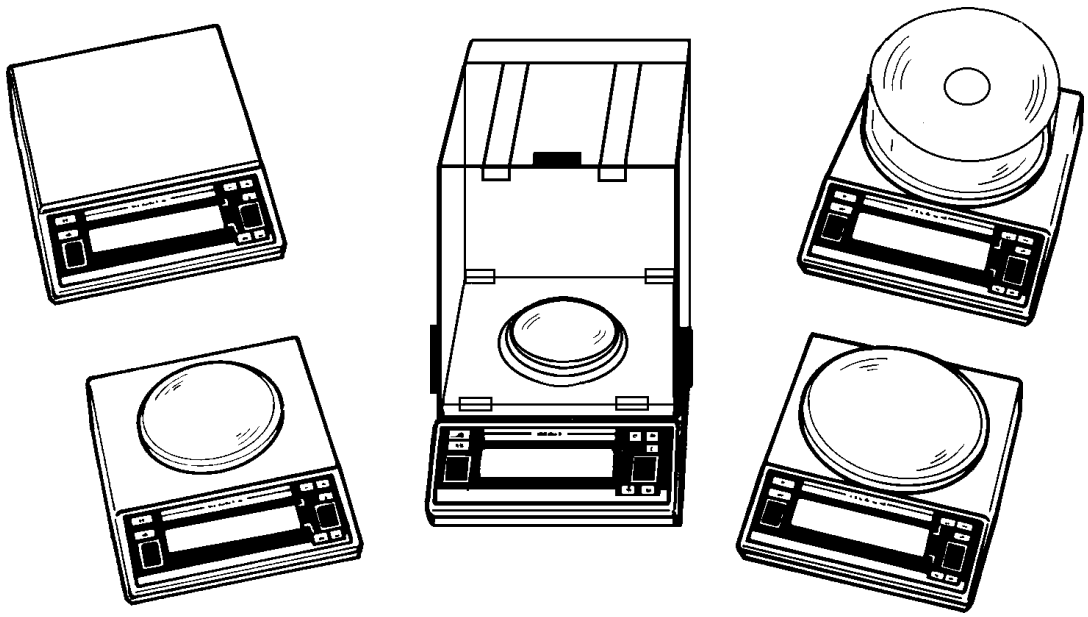
Sartorius LC / AC - Balances
Service Manual



Sartorius AG, Weighing Technology

Contents

General Information

The Sartorius LC- / AC-balances are available in different versions:

1. Standard version (1990 - 1993)

2. Modified version (1993 - 1994):

   - Model suffix ..... - 00V1
   - new analog PCB´s (no radio interference box)
     (please refer to Service Information Nr. 5/1993)

3. "Facelift" - version (ab 1994)

   - white housing
   - new keyboard layout and design
   - new analog PCB`s

Additionally the following versions are available:

– with IAC	(-00AC, -00AC1)
– Backweigher	(-00DC, -00DC1)
– approved	(-0D1, -0D2, -0CE...)
– Master Series	(-00MS)
– Master Series approved	(-0CEMS)

Accompaning Literature

Spare Parts Lists for Sartorius LC- and AC- Balances
Service Specifications Sheets for LC- and AC - Balances
Sartorius Tool List from 6/91
Sartorius MC1- Balance Operating Program
Sartorius MC1- Server - Generel Handling

Service Manuals for:

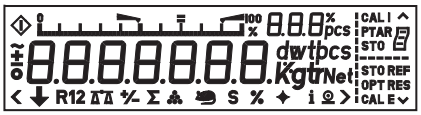
- Analytical-Brass-System (A 200S)
- Small Block-System
- Standard-Brass-System

Operation and Handling

Key Funktions

Standard	Facelift	
CF/	+/-	clears or interrupts functions of programs in progress
i/	→	two functions possible: briefly press: information and documentation of stored data long press: set reference for weighing in percent or counting
I/⏻/	→	ON/OFF key
⊙/	⊙	Print key
⚖/	⚖	Weighing range toggle key
T/	9	Tare key
F1/	SETUP	Function key to access the first program application
F2/	F2	Function key to access the second program application
0/ … 9/	0 … 9	Numeric keys including decimal point key

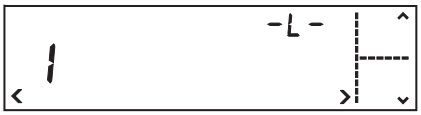
Accessing the Balance Operating Program and Changing Settings



– Turn your balance off and then back on again.

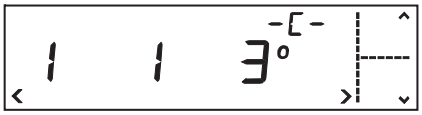
– While all segments are displayed, briefly press the [tare]–key.

– If » L « is displayed, change to the » C « mode using the menu access switch.



– Select the desired code number as follows:
  - o press [F1] to increase it or
  - o press [F2] to decrease it.

– Select the left, middle or right place as follows:
  - o press the [weighing range toggle] key to go toward the left
  - o press the [print]–key to go toward the right



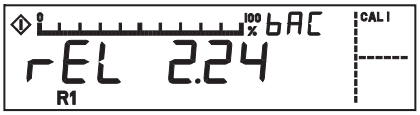
– Confirm your code selection by pressing the [tare]–key; now »°« appears after the code - e.g.: » 1-13° « adaptation to the ambient conditions (see the Balance Operating Menu).

or

» 99-1° « To adjust all parameters back to the basic factory settings.

– Slide the menu access switch back to its original position - readout: » L «.
– To store the code and leave the menu, press the [CF]–key.
– If you do not want to store this change to the menu code, press the [ON/OFF]–key to leave the menu.

Displaying the Hardware and Software Versions



- Switch balance off and turn it on again using the [ON/OFF]–key.
- While all display segments are lit, briefly press the [Info]–key.
- The hardware and software version is displayed and remains for about 3 seconds.
- The first two numbers show the hardware generation; the last two, the software version.

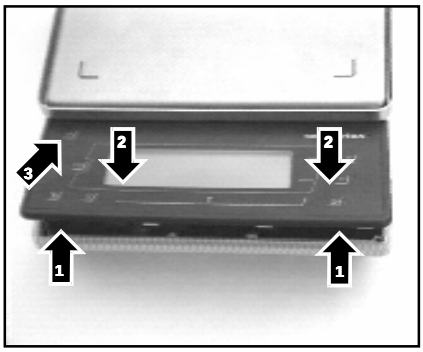
Note:

On balances which are equipped with the IAC, first the hard-/software version of the IAC is displayed then the version of the balance processor.

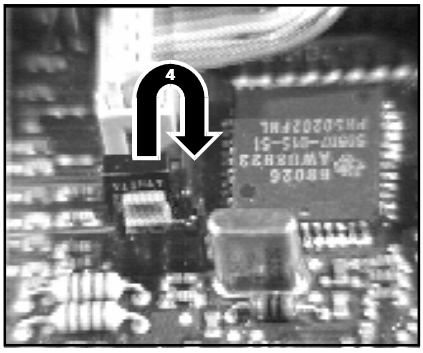
Important Note!

The a.m. application is possible on the processor version rel 2.24 or on the processor version rel 2.20 if the balance is additionally equipped with an IAC.

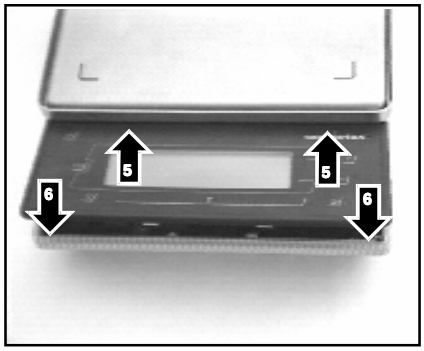
How to Activate the BPI Mode



- Disconnect the balance from line power.
- Carefully remove the keypad **(1, 2)** and place it on the right **(3)** next to the balance.
- Reconnect the balance to line power and turn on the unit with the [ON/OFF]–key.
- The poweron routine starts and ends with the readout » 0.00 g « (depending on the balance you are using).



- Unplug the jumper (located on the main PCB near the AOC) from its normal position **(4)** and plug it into the subsequent position.
- This establishes a 12V bridge between this position and the MC1 processor. This disables the write-protect function, allowing data stored in the EEPROM to be overwritten.
- At this point, a full-segment display test is run periodically on standard balances (all segments light up in the display). On IAC Balances, the error message » Err 98 « is displayed.
- Allow at least 3 cycles of the full-segment display test or the error message readout to be completed.
- Now plug the jumper back into its original position.
- Standard balances will now automatically return to the normal weight display.
- Before IAC Balances can return to the normal weight display, you must first turn them off and then on again using the [ON/OFF]–key.

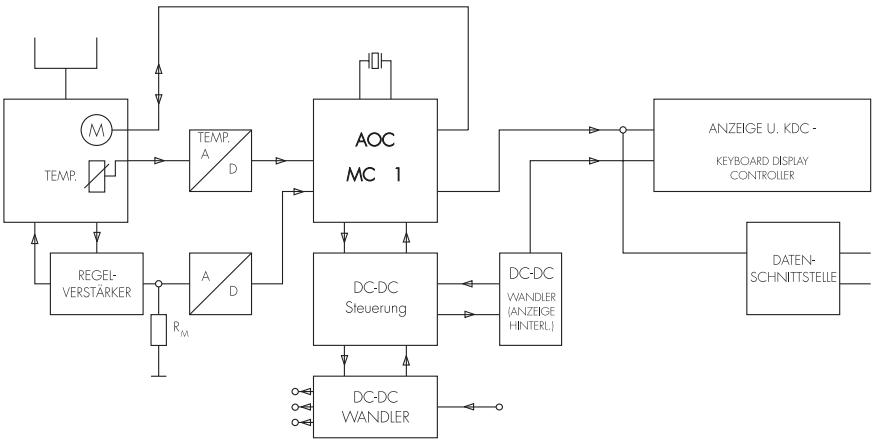


- Now reconnect the balance to line power and turn it on by pressing the [ON/OFF]–key.
- The balance can now communicate with the MC1 SERVER in the BPI mode.

- After working in the BPI mode, make sure to set the write-protection again (with the CAS Program for the PSION server), so that the balance returns to the standard data record output mode (SBI = **S**artorius **B**alance **I**nterface).

Description of the Electronic Circuitry

Block Diagram



Weighing Principle

Electromagnetic force compensation provides for high resolution (up to 20 million digits) along with a high loading capacity of the weighing system. The weighing pan is guided by a parallelogram, and the force generated by the weight on the weighing system is transferred by a linkage element to a rotatable lever. The force generated by the weight moves the coil within a permanent magnet located on the lever. The optoelectronic zero point detector recognizes each change in the position of the coil and transmits any change to the control amplifier. Then the coil current generated by the control amplifier causes the coil to move back to its original position (stability position). The necessary coil current (compensating current) is proportionate to the weight of the sample on the weighing pan and generates the analog voltage at the precision resistor.
Due to the high degree of leverage, even the smallest compensating currents can compensate for large weights. Therefore, all MC1 Balances and Scales can be operated with a battery.

Electronic Circuitry in LC- / AC- Balances

- All PCB's are mounted with **SMD** (**S**urface **M**ounted **D**evices) technology.
- The IC's have a higher degree of integration. For example, the gatearray, processor and parameter EEPROM are combined in one component.
- The PCB's have been designed in such a way that identical PCB's can be installed in as many balance models as possible.

  e.g.: Interface - The same for all balance models
  Keypad PCB without IAC - The same for all AC- and LC-Balances
  Power supply PCB - The PCB installed depends on the type of housing. The same housings also feature the same PCB's.
- You can order programmed main PCB's directly from SARTORIUS in Goettingen, Germany, or from your nearest SARTORIUS Service Center. Just indicate the balance model and the serial number on your order form.

A/D Converter

A low-pass filter stabilizes the analog voltage after it is output by the precision resistor, and the A/D converter generates a digital weight result, which is then processed in the **AOC** (**A**pplication **O**riented **C**omputer) of the MC1 Balance.

Temperature Compensation

To ensure exact weighing results in spite of fluctuating temperatures, an extremely accurate temperature sensor constantly determines the temperature of the weighing system. An A/D converter digitizes the value, which is then processed in the AOC. In this way, display accuracy is always assured, no matter how often the ambient temperature changes.

AOC (Application Oriented Computer)

The AOC includes the digital control circuit of the A/D converter, the EEPROM which is specific for the particular balance and the processor with the mask-programmed balance operating menu. The AOC controls the weight display or, if you have an extended keypad program, the IAC.
Peripheral devices are connected to the balance via the bidirectional RS232 data interface with line drivers.

Power Supplies

The electronic circuitry of LC- / AC- Balances includes two switching power supplies which are supported by a controlling IC. These power supplies have a high efficiency factor for generating operating voltages of +12V, -12V and +5V, as well as providing the backlighting of the display.
The voltage range for powering LC- / AC- Balances is quite extensive (12V to 30V DC). Therefore, they can be operated with a 12V rechargeable battery („emergency" power supply) besides by an AC adapter.

Adjusting the LC- / AC - Balances

Adjustment Sequence

You will need to check and, if necessary, adjust the following factors, in the order given, any time the balance is moved to a new location and after servicing or repair work:

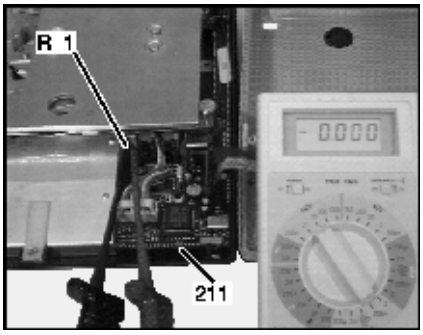
1. Preload
2. Off-center load
3. Linearity
4. Span adjustment

Preload

Checking the Preload

– For the data of preload test weight and preload voltage please refer to the "Service Specifications Sheets for LC- / AC - Balances".

Test procedure:



– Connect a digital voltmeter parallel to the measuring resistor R 1.
– Set the digital voltmeter to a measuring range of 20 V DC, place the pan and the supporting pan if fitted.

– Turn the balance on and place the required preload test weight on the pan.
– Compare the readout shown at the digital voltmeter display with the preload voltage indicated in the "Service Specifications Sheets for LC- / AC - Balances". If necessary adjust the voltmeter to a lower measuring range (e.g. 2 V DC or 200 mV DC).

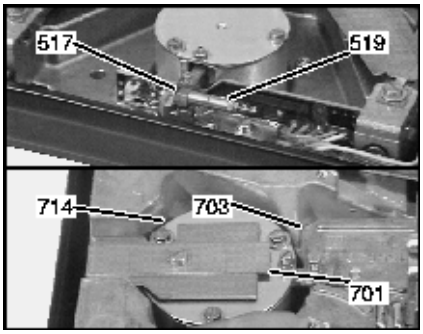
If there are deviations between the measured preload voltage and the voltage indicated in the "Service Specifications Sheets for LC-/AC Balances" adjust the preload.

– If the measured preload voltage is in the range of indicated voltage close the balance.
– Adjust the balance completely by: adjusting the off-center load, the linearity and the span.

How to Adjust the Preload

– The test procedure is similar to the preload check.

– Use one of the following procedures to change the preload:
– At LC-Balances with the standard brass system by fitting or removing the preload weights (I) from the end of lever (605).



– At AC-Balances with the analytical brass system by fitting or removing the preload weights (519) from the end of lever (517).

– At LC-Balances with the small block system by fitting or removing the preload weights (701) from the lever (703) which are located above the magnet (714).

– During this procedure keep the balance loaded with the preload weights.
– After each change please check the display of the digital voltmeter and compare the readout with the indicated preload voltage value.

– If the measured preload voltage in the range of the indicated voltage close the balance.
– Adjust the balance completely by: adjusting the off-center load, the linearity and the span.

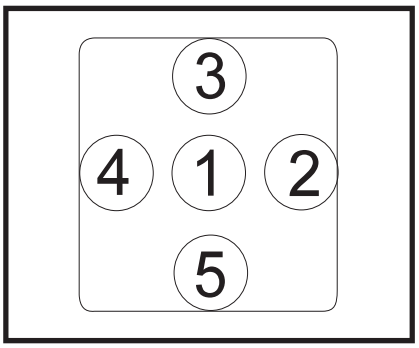
Off-Center Load Adjustment

How to Check the Off-Center Load

Hints:

The described procedure of off-center load control is accordingly to the SARTORIUS factory specs 1-150 point 1.5.1. "off–center Load Test on 5 Points". The data of the "Service Specifications Sheets for LC-/AC- Balances" are completely covered by the Sartorius factory specs.

- For the data of off-center load test weight, diameter, off-center load testing surface and tolerance please refer to the "Service Specifications Sheets for LC-/AC - Balances".
- Place the off-center load test weight on position **1**, if required close the draft shield, and tare the balance by pressing the [Tare]–key.
- Place the off-center load test weights on each on the positions **2, 3, 4** and **5** (in sequence), close the draft shield and write down the values displayed with plus/minus signs when readout is stable.



- The LC-/AC-Balances are equipped with crosswise built-in load cells. Transfer the values (outlined on the left) to LC-/AC-Balances Balances with a round pan.

Example (LC 6200 S):	Pos. 1	[Tare]	0.00 g
	Pos. 2		+ 0.12 g
	Pos. 3		+ 0.15 g
	Pos. 4		- 0.08 g
	Pos. 5		- 0.10 g

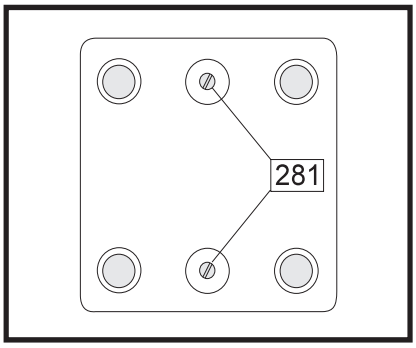
- Compare the measured off-center load errors with the tolerances indicated in the "Service Specifications Sheets for LC-/AC- Balances".
- If there are deviations such as in our example, adjust the off-center load.

How to Adjust the Off-Center Load

LC-Balances with the small block system:

To adjust the off-center load, you must have special knowledge about the small block system which cannot be explained in detail in this service manual. However, adjustment of the off-center load is covered in the corresponding service training course. For more information, please contact the SARTORIUS Training Center.

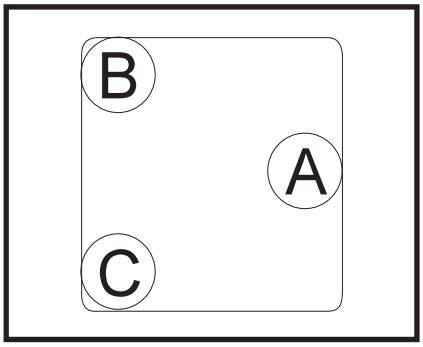
LC-Balances with the standard brass system and AC-Balances with the analytical brass system:



- Remove the 2 caps from the upper part of the housing.
  Through the holes in the housing the two off-center load adjustment screws (281) are accessible.

3 Point Adjustment (coarse)

- Place the off-center test weight on **position A** on the pan and close the draft shield if required, and tare the balance by pressing the [Tare] key.
- Place the test weights on each of the **positions B - C** and write down the values displayed with plus/minus signs when the draft shield is closed and readout is stable.



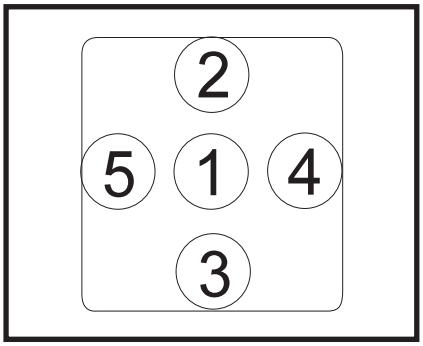
- Transfer the values (outlined on the left) to LC-/AC-Balances with a round pan.

Example (LC 6200 S):	Pos. A	[Tare]	0.00 g
	Pos. B		+ 0.13 g
	Pos. C		- 0.09 g

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

5 Point Adjustment (fine)

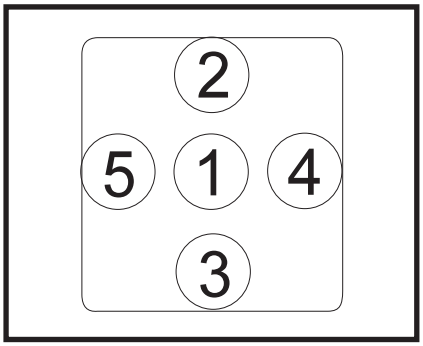
- Place the off-center load test weight on **position 1** on the pan, close the draft shield if required, and tare the balance by pressing the [Tare] key.
- Place the test weights on each on **positions 2 - 3**, close the draft shield and write down the values displayed with plus/minus signs when readout is stable.



- Transfer the values (outlined on the left) to LC-/AC-Balances with a round pan.

Example (LC 6200 S):	Pos. 1	[Tare]	0.00 g
	Pos. 2		+ 0.07 g
	Pos. 3		- 0.06 g

- Please adjust only the side with the largest deviation. In our example it is **position 2**, consequently you have to adjust the right off-center load screw.
- Please adjust the screws in small steps. After each change check the off-center load **positions 1, 2** and **3** and adjust if necessary one of the off-center load screws again.
- If the off-center load **(positions 2** and **3)** are lateral in tolerance, adjust now the off-center load of **position 4** and **5**.
- Place the off-center load test weight on **position 1** on the pan, close the draft shield if required and tare the balance by pressing the [Tare] key.
- Place the test weight on each on the **position 4 - 5**, close the draft shield and write down the values displayed with plus/minus signs when readout is stable.



– Transfer the values (outlined on the left) to LC-/AC-Balances with a round pan.

Example (LC 6200 S):	Pos. 1	[Tare]	0.00 g
	Pos. 4		+ 0.07 g
	Pos. 5		– 0.05 g

– Adjust both sides constantly. Change the adjustment of both off-center load screws in even steps toward the same direction.
– Change the screw adjustment in small steps. Check the off-center load on **positions 1, 4** and **5** and change if necessary the adjustment of the off-center load screws again.

- If the indicated tolerace is reached, please check again the 5 point adjustment.
- After finishing the off-center load adjustment place the 2 caps back on the holes in the upper part of housing.

Linearity

The linearity can only be adjusted with the CAS program for PC´s and Laptops or the MC1 - PSION Server.

After adjusting the linearity it has to be checked again.

Tools: MC1 Server or PC (e.g. Laptop) with software - tools (CAS - program) and adjustment weights (weight class refer to " Service specifications sheets for LC-/AC-Balances").

Span Adjustment

There are different procedures to adjust the span:

1. As described in this manual or
2. with the CAS - program for PC´s and Laptops or
3. with the MC1 PSION - Server.

External Span Adjustment

The balance accept only a weight value with a deviation of 2% from the target value. Therefore, use only weights of the accuracy class specified in the service specifications sheets for the balance (or of higher accuracy).

– Turn balance on and level it.

Important Note!

Before adjusting the span the balance needs to warm up (time - depending on balance type).

– Press the [tare] key for at least 3 seconds until » C – E « (external adjustment) or » C – I « (internal adjustment - for balances with an internal weight application) is displayed above the weight readout and » CAL « appears to the left next to the [F1]–key.

Note:

If you do not obtain these readouts, the adjustemnt functions are partially or completely blocked in the balance operating menu. In this case, unlock the menu access switch. Afterwards, press the [tare]–key again, and hold it down for a few seconds.

– To toggle from the readout » C – I « to the readout » C – E « press the [F2]–key.
– If the correct readout appears, tare the balance, then press the [F1]–key.
– Now the weight to load is displayed without the weight unit symbol, and » C – E « appears in the display.

Important Note!

The error message » Err02 « indicates a zero point error at the beginning of the adjustment routine. This error will result if the balance was not tared before adjusting, a weight is loaded on the weighing pan, or if the preload has been incorrectly adjusted.

– If you obtain the correct readout, place the required weight on the pan. After a short time, the balance will store the weight. Now » C – E « goes out in the display, and the unit symbol appears after the weight display.
– If necessary, readjust the menu code settings and slide the menu access switch back to its original position (locked).

Internal Span Adjustment

This function can only be accessed on balances with a internal weight application.

– Turn on the balance, and level it using the level indicator.
– Now allow the balance to warm up (time - depending on balance type).
– Press the [tare] key for at least 3 seconds until » C – I « (internal adjustment) is displayed above the weight and » CAL « appears to the left next to the [F1]–key.

Note:

If you do not obtain these readouts, the adjustment functions are partially or completely blocked in the balance operating program. In this case, set code „1-10-1" in the balance operating program. Afterwards, repeat the adjustment procedure.

– If the correct readout appears, tare the balance, then press the [F1]–key.
– Now » C « and the symbol » C – E « appear in the display.

Note:

The error message » Err02 « indicates a zero point error at the beginning of the adjustment routine. This error will result if the balance was not tared before adjustment, a weight is loaded on the pan, or if the preload has been incorrectly adjusted.

– The internal adjustment weight is applied automatically by servomotor and then removed. In the process, the weight value is stored.
– The weight readout (e.g., » 0.000 g «) indicates the end of the adjustment procedure.
– If necessary, readjust the menu code settings and slide the menu access switch back to its original position (locked).

How to Overwrite an Internal Adjustment Weight

During this procedure, the internal adjustment weight is adjusted so that it matches the external reference weight.

- Unlock the menu access switch.
- Perform an external span adjustment.
- Switch the balance to the STANDBY mode by pressing the [ON/OFF]–key.
- Turn the balance back on. During the full-segment display test (all segments light up), briefly press the [F2]–key.
- Now » C – 1 « is displayed above the weight, and » CAL « appears on the left next to the [F1]–key.

Important Note!

If you do not obtain this readout, the menu access switch is locked, or the routine was not performed correctly. (STANDBY / ON / F2).

- If the correct readout appears, tare the balance, and press the [F1]–key as soon as the weight (e.g., » 0.000 g «) is displayed.

- The internal adjustment weight is applied automatically by servomotor, and this weight value is then stored in the EEPROM inside the processor.

Important Note!

If you obtain the error message » Err 02 «, the balance was not tared before starting the adjustment routine (» 0.00 g « was not displayed). In this case, retare the balance or remove all weights from the pan, and press the [F1]–key.

- After you have correctly completed this procedure, slide the menu access switch back to its original position to lock the operating menu. Now the balance is ready to operate.

Repairing the Balance

Mechanical Load Cell

Which load cells are installed in the LC-/AC-Balances?

- LC-Balances feature the "small block system".

- The "standard brass system", taken from the MP8 Univesal series (e.g., U 6100 S), is also installed in the LC series.

- The same "analytical brass system" featured in erlier models of the Analytic series (e.g., A 200 S) is installed in the AC series.

Important Note!

To repair the Sartorius LC-/AC-Balances it is essential to have special knowledge and special tools. However repairing the load cells is covered in the corresponding service training course in the Sartorius Training Center in Göttingen.

The load cells must only be repaired by authorized Sartorius service technicians in Sartorius service centers, otherwise you will loose your warranty.

Electronics

Important Note!

Should there be any defects in the electronics of the LC-/AC-Balances, you should not attempt to repair individual components, but rather exchange the entire PCB.

Exchanging keypad PCB's, power supply PCB's or the interface PCB's

Exchanging these PCB's does not effect the balance data. Adjustment is not required. Some PCB's can be exchanged among various balance models (please refer to the corresponding "Spare Parts Lists").

Tools and equipment: standard service tools

Exchanging the main PCB

You can order pre-programmed PCB's by indicating the balance/scale model and serial number. Exchange PCB's, then adjust them (LINEAR, CALIBR) (please see "MC1 Server - General Operation and Usage" or "CAS using a Personal Computer or a Laptop").

Tools and equipment: MC1 Server or personal computer (or laptop) with software tools and standard service tools.

Error Codes

On LC- / AC- Balances, test routines are run during the startup procedure and during operation. These test routines allow operation and hardware errors to be detected.

If an error is detected, a corresponding code will appear in the weight display. However, operation and hardware errors differ in the way they are indicated. The following illustrates how different error codes are displayed:

Err xx - Indicates an operator or sequence error.
Err 1xx - Indicates a hardware error in the **K**eypad **D**isplay **C**ontroller (display processor) area.
Err 2xx - Indicates a hardware error in the **A**pplication **O**riented **C**ontroller (balance processor) area.
Err 3xx - Indicates a hardware error in the **I**ntegrated **A**pplication **C**ontroller (keypad processor) area.

List of Error Codes

Error code	Explanation	Remedial measures
level 0x	general balance errors in 1st block	
Err 01	Display format overflow	The weight to be output cannot be displayed, e.g., incorrect settings in the balance/scale operating menu.
Err 02	Zero point error at the beginning of the adjustment routine.	The balance was not tared before adjustment, the balance is loaded (a weight is on the weighing pan), the zero point is not within the tolerance limits (check the preload and adjust it, if necessary. Then calibrate with the MC1 Server or a personal computer (or laptop) to redetermine the zero point).
Err 03	Zero point error at the end of the adjustment routine	The balance drifts too much. Make sure to allow the unit to warm up as necessary, and readjustment.
Err 04	Control error during multiadjustment	The values deviate excessively from one another. This might be caused by the high drift if the balance has not been allowed to warm up as required.
level 1x	Tare 1 / Tare 2 operator errors	
Err 10	Tare 1 blocked when a value is stored in the 2nd tare memory	The tare functions are disabled with respect to each other: first clear the 2nd tare memory to enable tare 1.
Err 11	Tare 2 activated for a value not permitted	The readout was negative, for example. Check sample.
Err 12	Tare 2 is larger than the display range or range limit	
level 2x	operator errors in the aoc relating to the application	
Err 20	The (W)–key was pressed before an application was initialized	For example, you forgot to store a reference sample quantity for counting.
Err 21	Parameter change disabled in the parameter mode.	The code » 231 « for no change has been set in the balance operating menu. Change it to » 232 « or » 233 « .
Err 22	Initialization error in counting/weighing in percent.	The weight of the item is too light, or the item/sample is not on the weighing pan.
Err 23	Initialization error in the checkweighing mode	No item has been placed on the pan or the readout has a negative sign.
level 3x	operation errors relating to the printer	
Err 30	Printer is activated while in the BPI mode	The RS232 data interface is inactive in the BPI mode - change back to the SBI mode, e.g., use the close function on the MC1 Psion Server or PC!.

Error code	Explanation	Remedial measures
level 5x	general balance/scale errors in the 2nd Block	
Err 50	Overflow/underflow temperature compensation converter	Result determined by the temperature compensating (TC) circuit is out of tolerance. The TC sensor or the main PCB is defective (must be replaced).
Err 53	Failure temperature compensation converter	The AOC does not receive a value from the TC circuit. TC sensor or main PCB defective (must be replaced).
Err 54	Weight converter control too low/ underload	The balance is underloaded. Either the weighing pan is not in place, or there is a mechanical defect (linkage flexure roken).
Err 55	Weight converter control too high/ overload	The balance is overloaded.
level 6x	temporarily blocked keys/keys temporarily not allowed to be pressed	
Err 60	No access to data stored in the non-volatile memory when you press the [W]–key (and hold it down for a few seconds)	
Err 61	Not allowed to press the [F1]–key or [F2]–key (long press)	
Err 62	Not allowed to press the [F1]–key	
Err 63	Not allowed to press the [F2]–key	
Err 64	Not allowed to store a numeric entry	
Err 65	Print/transfer function not possible	
level 7x	incorrect entries or sequence errors	
Err..70	Incorrect entry	
Err 71	Incorrect data ID or unit during weight transfer/storage in the statistics or totaling function	Only data with the same unit, e.g. piece counts, weights or percentages can be stored.
level 8x	Arithmetic errors	
Err 80	Division by 0 or a negative root	
level 9x	Temporary internal errors	
Err 90	Clock chip not available or defective	
Err 91	No valid entry in the non-volatile memory (in case of power failure/outage)	
Err 96	Menu item too large for the IAC data range	
Err 97	Invalid key pressed or invalid internal error	
Err 98	CS or CM timeout on the BPI interface	

Error code	Explanation	Remedial measures
Err 99	IAC version number does not correspond to the entry in the EEPROM	
level 1xx	Hardware errors in the KDC area	
Err 101	Keypad short circuit, column 1	Either a key is pressed, or the display PCB or keypad overlay is defective (display unit must be exchanged).
Err 102	Keypad short circuit, column 2	Either a key is pressed, or the display PCB or keypad overlay is defective (display unit must be exchanged).
Err 103	Keypad short circuit, column 3	Either a key is pressed, or the display PCB or keypad overlay is defective (display unit must be exchanged).
Err 104	Keypad short circuit, column 4	Either a key is pressed, or the display PCB or keypad overlay is defective (display unit must be exchanged).
Err 110	Defective interface KDC - AOC	Connectors either defective or unplugged, main PCB or display PCB is defective (exchange PCB).
Err 120	ROM checksum test	Erroneous data in the ROM area of the display PCB. PCB must be replaced.
Err 130	RAM read-write test	Erroneous data in the RAM area of the display PCB. PCB must be replaced.
level 2xxHardware errors in the AOC area		
Err 210	Defective interface KDC (IAC) - AOC	Connectors either defective or unplugged, main PCB or display PCB or keypad PCB is defective (exchange PCB).
Err 220	ROM checksum test	Erroneous data in the ROM area of the main PCB. PCB must be replaced.
Err 230	RAM read-write test	Erroneous data in the RAM area of the main PCB. PCB must be replaced.
Err 237	Incorrect EEPROM checksum test in the range	The balance has not yet been linearized or stored linearity data are erroneous - internal or external linearization is required.
Err 239	Incorrect EEPROM checksum test for the linearity weights	No weights have been assigned for the internal linearization weights or stored data are erroneous - overwrite the internal linearity weights.
Err 241	EEPROM checksum test in the permanent area	Erroneous data in the permanent area of the EEPROM in the AOC. Main PCB must be exchanged.
Err 243	EEPROM checksum test menu area	Erroneous data in the menu area of the EEPROM in the AOC. Readjust the setting.
Err 247	EEPROM checksum test adjustment range	The balance has not yet been adjustment, or the stored data are erroneous. Perform an external or internal adjustment procedure.

Error code	Explanation	Remedial measures
Err 249	EEPROM checksum test adjustment weight	No weight has been stored for the internal adjustment weight, or the data are erroneous. Overwrite the internal adjustment weight.
Err 251	Supply voltage for explosion-proof balances is too high	The permissible tolerance level for the supply voltage has been exceeded. The explosion-proof power supply must be exchanged.
level 3xxHardware errors in the IAC area		
Err 310	Defective interface IAC - AOC	Defective or unplugged connectors. The main or keypad PCB is defective (PCB must be replaced).
Err 320	ROM checksum test	Erroneous data in the ROM area of the keypad PCB. PCB must be exchanged
Err 330	RAM read-write test	Erroneous data in the RAM area of the keypad PCB. PCB must be exchanged.
Err 343	EEPROM checksum test menu area	Erroneous data in the menu area of the EEPROM inside the AOC - settings must be readjusted.
Err 399	IAC software is not compatible with the Only AOC version	This means the software being used is not appropriate. approved software may be used with the balance.

Other Error Codes

L	The balance is underloaded.	Either the weighing pan is not in place, or there is a echanical defect in the balance (e.g., linkage flexure is broken).
H	The balance/scale is overloaded.	
Two acoustic signals	A key is blocked by the menu or the operating level.	

List of Tolerances for Testing Metrological Specifications Supplement

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Model	Weighing capacity	Readability	Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS	iso CAL
			Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K	K
AC120S	120 g	0,1 mg	100 g	0,1 mg	100 g	0,3 mg	E2	intern	100 g	0,2 mg	30/60/100 g	20 g	0,2 mg	1,2	n
AC121S	120 g	0,1 mg	100 g	0,1 mg	100 g	0,3 mg	E2	intern	100 g	0,2 mg	30/60/100 g	20 g	0,2 mg	1,2	n
AC210P	60 120 g 210	0,1 0,2 mg 0,5	50 g	0,1 mg	100 g	0,4 mg	E2	intern	200 g	0,5 mg	50 100 g 150	50 g	0,2 mg	1,2	n
AC210S	210 g	0,1 mg	200 g	0,1 mg	100 g	0,3 mg	E2	intern	200 g	0,4 mg	50/100/150 g	50 g	0,2 mg	1,2	n
AC211P	60 120 g 210	0,1 0,2 mg 0,5	50 g	0,1 mg	100 g	0,4 mg	E2	intern	200 g	0,5 mg	50 100 g 150	50 g	0,2 mg	1,2	n
AC211S	210 g	0,1 mg	200 g	0,1 mg	100 g	0,3 mg	E2	intern	200 g	0,4 mg	50/100/150 g	50 g	0,2 mg	1,2	n

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Model	Weighing capacity	Readability	Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS	iso CAL
			Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K	K
LC34-00MS	34 kg	1 g	10000 g	1 g	10000 g	2 g	F2	intern	30000 g	1 g	--- *(10000)* g	7000/15000/ 22000/30000 g	1 g	2	4
LC34	34 kg	1 g	10000 g	1 g	10000 g	2 g	F2	10000 g	30000 g	1 g	--- *(10000)* g	7000/15000/ 22000/30000 g	1 g	2	n
LC220S	220 g	0,001 g	200 g	0,001 g	200 g	0,005 g	E2	200 g	200 g	0,002 g	--- *(100)* g	50/100/150/200 g	0,002 g	1,8	n
LC220S-00MS	220 g	0,001 g	200 g	0,001 g	200 g	0,005 g	E2	intern	200 g	0,003 g	--- *(100)* g	50/100/150/200 g	0,002 g	1,8	4
LC221S	220 g	0,001 g	200 g	0,001 g	200 g	0,005 g	E2	200 g	200 g	0,002 g	--- *(100)* g	50/100/150/200 g	0,002 g	1,8	n
LC221S-00MS	220 g	0,001 g	200 g	0,001 g	200 g	0,005 g	E2	intern	200 g	0,003 g	--- *(100)* g	50/100/150/200 g	0,002 g	1,8	4
LC420-00MS	420 g	0,01 g	200 g	0,01 g	200 g	0,03 g	F2	intern	400 g	0,03 g	--- *(200)* g	100/200/300/400 g	0,01 g	2	4
LC420	420 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	2	n
LC421-00MS	420 g	0,01 g	200 g	0,01 g	200 g	0,03 g	F2	intern	400 g	0,03 g	--- *(200)* g	100/200/300/400 g	0,01 g	2	4
LC421	420 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	2	n
LC620D	60 620 g	0,001 0,01 g	50 g	0,001 g	500 g	0,04 g	F1	500 g	500 g	0,01 g	--- *(20)* g *(200)* g	15/25/40/55 300/600 *DKD 150/300/400/600* g	0,002 0,01 g	1,8	n
LC620D-00MS	60 620 g	0,001 0,01 g	50 g	0,001 g	500 g	0,04 g	F1	intern	500 g	0,01 g	--- *(20)* g *(200)* g	15/25/40/55 300/600 *DKD 150/300/400/600* g	0,002 0,01 g	1,8	2
LC620P	120 240 620 g	0,001 0,002 0,005 g	100 g	0,001 g	200 g	0,003 g	F1	500 g	500 g	0,005 g	100 300 500 g	100 g	0,002 g	1,8	n
LC620P-00MS	120 240 620 g	0,001 0,002 0,005 g	100 g	0,001 g	200 g	0,003 g	F1	intern	500 g	0,005 g	100 300 500 g	100 g	0,002 g	1,8	2
LC620S	620 g	0,001 g	500 g	0,001 g	200 g	0,003 g	E2	500 g	500 g	0,002 g	--- *(200)* g	150/300/400/600 g	0,002 g	1,8	n
LC620S-00MS	620 g	0,001 g	500 g	0,001 g	200 g	0,003 g	E2	intern	500 g	0,004 g	--- *(200)* g	150/300/400/600 g	0,002 g	1,8	2
LC621P	120 240 620 g	0,001 0,002 0,005 g	100 g	0,001 g	200 g	0,003 g	F1	500 g	500 g	0,005 g	100 300 500 g	100 g	0,002 g	1,8	n
LC621P-00MS	120 240 620 g	0,001 0,002 0,005 g	100 g	0,001 g	200 g	0,003 g	F1	intern	500 g	0,005 g	100 300 500 g	100 g	0,002 g	1,8	2
LC621S	620 g	0,001 g	500 g	0,001 g	500 g	0,005 g	E2	500 g	500 g	0,002 g	--- *(200)* g	150/300/400/600 g	0,002 g	1,8	n
LC621S-00MS	620 g	0,001 g	500 g	0,001 g	500 g	0,005 g	E2	intern	500 g	0,004 g	--- *(200)* g	150/300/400/600 g	0,002 g	1,8	2
LC820-00MS	820 g	0,01 g	500 g	0,01 g	500 g	0,05 g	F1	intern	800 g	0,03 g	--- *(200)* g	200/400/600/800 g	0,02 g	2	4

List of Tolerances for Testing Metrological Specifications Supplement

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Model	Weighing capacity	Readability	Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS	iso CAL
			Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K	K
LC820	820 g	0,01 g	500 g	0,01 g	500 g	0,05 g	F1	500 g	800 g	0,03 g	--- *(200)* g	200/400/600/800 g	0,02 g	2	n
LC821-00MS	820 g	0,01 g	500 g	0,01 g	500 g	0,05 g	F1	intern	800 g	0,03 g	--- *(200)* g	200/400/600/800 g	0,02 g	2	4
LC821	820 g	0,01 g	500 g	0,01 g	500 g	0,05 g	F1	500 g	800 g	0,03 g	--- *(200)* g	200/400/600/800 g	0,02 g	2	n
LC1200S	1200 g	0,001 g	1000 g	0,001 g	1000 g	0,005 g	E2	intern	1000 g	0,003 g	200/500/1000 g	200 g	0,002 g	1,8	n
LC1201S	1200 g	0,001 g	1000 g	0,001 g	1000 g	0,005 g	E2	intern	1000 g	0,003 g	200/500/1000 g	200 g	0,002 g	1,8	n
LC2200-00MS	2200 g	0,1 g	2000 g	0,05 g	2000 g	0,2 g	F2	intern	2000 g	0,1 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,1 g	2	4
LC2200P	400 800 g 2200	0,01 0,02 g 0,05	200 g	0,01 g	1000 g	0,04 g	F2	2000 g	2000 g	0,05 g	500 1000 1500 g	300 g	0,01 g	2	n
LC2200P-00MS	400 800 g 2200	0,01 0,02 g 0,05	200 g	0,01 g	1000 g	0,04 g	F2	intern	2000 g	0,05 g	500 1000 1500 g	300 g	0,01 g	2	4
LC2200S	2200 g	0,01 g	2000 g	0,01 g	1000 g	0,03 g	E2	2000 g	2000 g	0,02 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,02 g	2	n
LC2200S-00MS	2200 g	0,01 g	2000 g	0,01 g	1000 g	0,03 g	E2	intern	2000 g	0,04 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,02 g	2	4
LC2200	2200 g	0,1 g	2000 g	0,05 g	2000 g	0,2 g	F2	2000 g	2000 g	0,1 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,1 g	2	n
LC2201P	400 800 g 2200	0,01 0,02 g 0,05	200 g	0,01 g	1000 g	0,04 g	F2	2000 g	2000 g	0,05 g	500 1000 1500 g	300 g	0,01 g	2	n
LC2201P-00MS	400 800 g 2200	0,01 0,02 g 0,05	200 g	0,01 g	1000 g	0,04 g	F2	intern	2000 g	0,05 g	500 1000 1500 g	300 g	0,01 g	2	4
LC2201S	2200 g	0,01 g	2000 g	0,01 g	1000 g	0,03 g	E2	2000 g	2000 g	0,02 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,02 g	2	n
LC2201S-00MS	2200 g	0,01 g	2000 g	0,01 g	1000 g	0,03 g	E2	intern	2000 g	0,04 g	--- *(1000)* g	500/1000/ 1500/2000 g	0,02 g	2	4
LC3200D	1000 3200 g	0,001 0,01 g	1000 g	0,001 g	1000 g	0,005 g	E2	intern	1000 g	0,003 g	--- *(500)* g *(1000)* g	200/500/700/1000 2000/3000 *DKD 700/1500/ 2200/3000* g	0,002 0,01 g	1,8	n
LC3200P-00VAA	600 1200 2400 3200 g	0,001 0,002 0,005 0,01 g	500 g	0,001 g	2000 g	0,03 g	E2	intern	3000 g	0,01 g	500 1500 2500 g	500 g	0,002 g	1,8	n
LC3201D	1000 3200 g	0,001 0,01 g	1000 g	0,001 g	1000 g	0,005 g	E2	intern	1000 g	0,003 g	--- *(500)* g *(1000)* g	200/500/700/1000 2000/3000 *DKD 700/1500/ 2200/3000* g	0,002 0,01 g	1,8	n
LC3201D-00MS	1000 3200 g	0,001 0,01 g	1000 g	0,001 g	1000 g	0,005 g	E2	intern	1000 g	0,003 g	--- *(500)* g *(1000)* g	200/500/700/1000 2000/3000 *DKD 700/1500/ 2200/3000* g	0,002 0,01 g	1,8	1,5

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Model	Weighing capacity	Readability	Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS	iso CAL
			Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K	K
LC4200-00MS	4200 g	0,1 g	2000 g	0,05 g	2000 g	0,2 g	F2	intern	4000 g	0,3 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,1 g	4	4
LC4200S	4200 g	0,01 g	2000 g	0,01 g	2000 g	0,04 g	E2	2000 g	4000 g	0,03 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,02 g	1,6	n
LC4200S-00MS	4200 g	0,01 g	2000 g	0,01 g	2000 g	0,04 g	E2	intern	4000 g	0,04 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,02 g	1,6	2
LC4200	4200 g	0,1 g	2000 g	0,05 g	2000 g	0,3 g	F2	2000 g	4000 g	0,3 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,1 g	4	n
LC4201-00MS	4200 g	0,1 g	2000 g	0,05 g	2000 g	0,3 g	F2	intern	4000 g	0,3 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,1 g	4	4
LC4201S	4200 g	0,01 g	2000 g	0,01 g	2000 g	0,04 g	E2	2000 g	4000 g	0,03 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,02 g	1,6	n
LC4201S-00MS	4200 g	0,01 g	2000 g	0,01 g	2000 g	0,04 g	E2	intern	4000 g	0,04 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,02 g	1,6	2
LC4201	4200 g	0,1 g	2000 g	0,05 g	2000 g	0,3 g	F2	2000 g	4000 g	0,3 g	--- *(2000)* g	1000/2000/ 3000/4000 g	0,1 g	4	n
LC4800P	800 1600 3000 4800 g	0,01 0,02 0,05 0,1 g	500 g	0,01 g	2000 g	0,06 g	F1	2000 g	4000 g	0,1 g	1000 2000 4000 g	700 g	0,01 g	4	n
LC4800P-00MS	800 1600 3000 4800 g	0,01 0,02 0,05 0,1 g	500 g	0,01 g	2000 g	0,06 g	F1	intern	4000 g	0,1 g	1000 2000 4000 g	700 g	0,01 g	4	2
LC4801P	800 1600 3000 4800 g	0,01 0,02 0,05 0,1 g	500 g	0,01 g	2000 g	0,06 g	F1	2000 g	4000 g	0,1 g	1000 2000 4000 g	700 g	0,01 g	4	n
LC4801P-00MS	800 1600 3000 4800 g	0,01 0,02 0,05 0,1 g	500 g	0,01 g	2000 g	0,06 g	F1	intern	4000 g	0,1 g	1000 2000 4000 g	700 g	0,01 g	4	2
LC5100S-00VAA	5100 g	0,001 g	5000 g	0,0015 g	5000 g	0,02 g	E2	5000 g	5000 g	0,01 g	1000/2500/ 4000 g	1000 g	0,02 g	2	n
LC6200-00MS	6200 g	0,1 g	5000 g	0,05 g	2000 g	0,3 g	F1	intern	5000 g	0,3 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,1 g	4	4
LC6200D	600 6200 g	0,01 0,1 g	500 g	0,01 g	2000 g	0,3 g	F1	5000 g	5000 g	0,1 g	--- *(200)* g *(2000)* g	150/250/400/550 3000/6000 *DKD 1500/3000/ 4000/6000* g	0,02 0,2 g	4	n
LC6200S	6200 g	0,01 g	5000 g	0,01 g	2000 g	0,03 g	E2	intern	5000 g	0,04 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,02 g	1,8	n
LC6200	6200 g	0,1 g	5000 g	0,05 g	2000 g	0,3 g	F1	5000 g	5000 g	0,1 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,1 g	4	n
LC6201-00MS	6200 g	0,1 g	5000 g	0,05 g	2000 g	0,3 g	F1	intern	5000 g	0,3 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,1 g	4	4
LC6201S	6200 g	0,01 g	5000 g	0,01 g	2000 g	0,03 g	E2	intern	5000 g	0,04 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,02 g	1,8	n
LC6201S-00MS	6200 g	0,01 g	5000 g	0,01 g	2000 g	0,03 g	E2	intern	5000 g	0,04 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,02 g	1,8	2

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Model	Weighing capacity	Readability	Reproducibility		Off-center load Eccentricity		Span				Linearity			TCS	iso CAL
			Test weight	Permissible tolerances	Test weight	Permissible tolerance (±)	Class	Adjustm. weight	Test weight	Permissible tolerance (±)	Tareweight	Testweight	Permissible tolerance (±)	ppm /K	K
LC6201	6200 g	0,1 g	5000 g	0,05 g	2000 g	0,3 g	F1	5000 g	5000 g	0,1 g	--- *(2000)* g	1500/3000/ 4000/6000 g	0,1 g	4	n
LC12000P	3000 6000 g 12000	0,1 0,2 g 0,5	2000 g	0,1 g	5000 g	0,4 g	F2	5000 g	10000 g	0,5 g	3000 5000 g 10000	2000 g	0,1 g	4	n
LC12000P-00MS	3000 6000 g 12000	0,1 0,2 g 0,5	2000 g	0,1 g	5000 g	0,4 g	F2	intern	10000 g	1,0 g	3000 5000 g 10000	2000 g	0,1 g	4	4
LC12000S	12000 g	0,1 g	10000 g	0,1 g	5000 g	0,3 g	F1	5000 g	10000 g	0,4 g	--- *(5000)* g	3000/6000/ 8000/12000 g	0,2 g	4	n
LC12000S-00MS	12000 g	0,1 g	10000 g	0,1 g	5000 g	0,3 g	F1	intern	10000 g	0,6 g	--- *(5000)* g	3000/6000/ 8000/12000 g	0,2 g	4	4
LC12001P	3000 6000 g 12000	0,1 0,2 g 0,5	2000 g	0,1 g	5000 g	0,4 g	F2	5000 g	10000 g	0,5 g	3000 5000 g 10000	2000 g	0,1 g	4	n
LC12001P-00MS	3000 6000 g 12000	0,1 0,2 g 0,5	2000 g	0,1 g	5000 g	0,4 g	F2	intern	10000 g	1,0 g	3000 5000 g 10000	2000 g	0,1 g	4	4
LC12001S	12000 g	0,1 g	10000 g	0,1 g	5000 g	0,3 g	F1	5000 g	10000 g	0,4 g	--- *(5000)* g	3000/6000/ 8000/12000 g	0,2 g	4	n
LC12001S-00MS	12000 g	0,1 g	10000 g	0,1 g	5000 g	0,3 g	F1	intern	10000 g	0,6 g	--- *(5000)* g	3000/6000/ 8000/12000 g	0,2 g	4	4
LC16000S	16 kg	0,1 g	10000 g	0,1 g	10000 g	1 g	F1	10000 g	15000 g	0,3 g	--- *(5000)* g	4000/8000/ 12000/16000 g	0,2 g	2	n
LC16000S-00MS	16 kg	0,1 g	10000 g	0,1 g	10000 g	1 g	F1	intern	15000 g	0,3 g	--- *(5000)* g	4000/8000/ 12000/16000 g	0,2 g	2	4
LC34000P	8 16 kg 34	0,1 0,2 g 0,5	5000 g	0,1 g	10000 g	1 g	F1	10000 g	30000 g	0,5 g	10000 15000 g 25000	7000 g	0,3 g	2	n
LC34000P-00MS	8 16 kg 34	0,1 0,2 g 0,5	5000 g	0,1 g	10000 g	1 g	F1	intern	30000 g	0,5 g	10000 15000 g 25000	7000 g	0,3 g	2	4

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