

OPD-E Analytical Balance Maintenance Manual

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Chapter I: Count Value Adjustment

I. Disassembly of Balance Shell:

1. Disassembly of rear cover: Remove three M4 inner hexagon screws under the rear label of the balance and then disassemble the rear cover.
2. Disassembly of lower cover plate: erect the balance, remove 6 pieces of M3 cross-head screws and then disassemble the stainless steel rear cover of the balance.
3. Disassembly of upper cover plate: remove two front M4 inner hexagon screws under the balance and then disassemble the upper cover plate.
4. Disassembly of baffle: remove two middle M4 screws under the balance and then loosen the baffle.
5. Disassembly of windshield: remove two M3 inner hexagon screws at the front in the balance and then loosen the front glass of the windshield. After that, press the left and right glass (note: adhesive strips for the left and right glass are pasted in the sheath) and then remove the entire windshield.

II. Adjust the Zero and Full Scale Count Value:

1. Adjust the balance, install the balance pan and the balance pan bracket, and then switch on the power supply.
2. Under the standby condition, only the decimal point flickers or “PEFIL” is displayed or only the ON sign is displayed on the LCD.
3. Press CAL and then 1 is displayed on the LCD; press TARE and then 2 is displayed on the LCD; after that, press CAL again, 3 is displayed....
4. Press CAL and TARE alternately until 8 is displayed on the LCD.
5. Press ON/OFF, and then the balance displays 8888888.
6. Press TARE to display the balance type. Then press TARE again to display set values of internal parameters.
7. Press CAL to display the zero point count value.
8. By increasing or decreasing the balance weight, the zero point count value of the balance is

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close to 400 as much as possible and the zero point count value is between 350 and 450: (increase or decrease the weight on 8 fixed screws of the bracket or M4 screw holes in front of the column, so as to achieve the standard between 350 and 450).

9. Full load count value: load a 200g standard weight on the balance pan to observe the full scale count value. The full load count value is between 15200 and 15550.

10. If the full load count value is excluded in the above scope, an electric resistance box shall be connected at R25 so as to ensure the full load count value in the said scope through the parallel connection of relevant resistance.

III. Check Counter Value:

The no-load counter value scope is from 350 to 450. After the 200k weight is loaded, the full load count value shall be between 15200 and 15550.

IV. Assembly:

Components of the balance shall be assembled well according to the sequence opposite the disassembly sequence after checking.

Chapter II: Balance Adjustment (4MM adjustment)

When the balance is under the condition A and B, observe the change of the balance value. (Condition A means the balance is at the horizontal position, condition B means that a gasket 4mm thick is placed at the front bottom of the balance to increase the front height of the balance by 4mm), and then compare readings of the balance under the two conditions.

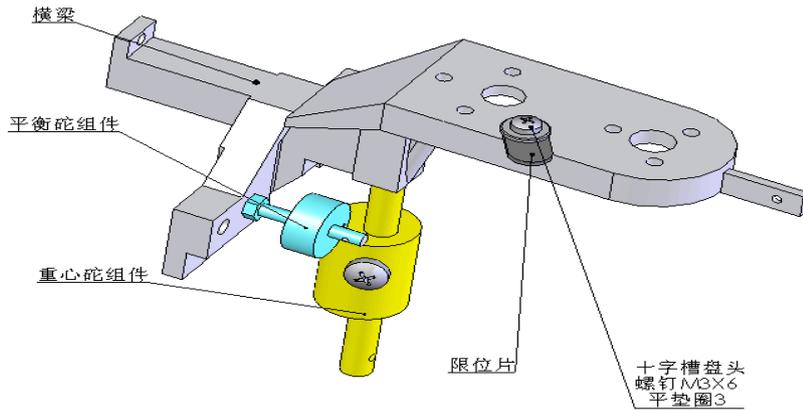
1. Roughly adjust the balance weight and keep the difference of values displayed under both condition A and B in the scope of ± 80 . If the value under the condition A is higher than the value under the condition B, the balance weight shall be decreased. On the contrary, the weight shall be increased.

2. During the adjustment, pay attention to adjusting properly and do not damage the force spring and pivot spring. When you tighten screws of the balance weight, hold the beam by hands and avoid moving the beam.

3. Adjust the balance weight slightly and keep the difference of values displayed under both condition A and B in the scope of ± 30 .

4. Check the count value again and make a fine adjustment after the balance adjustment is finished.

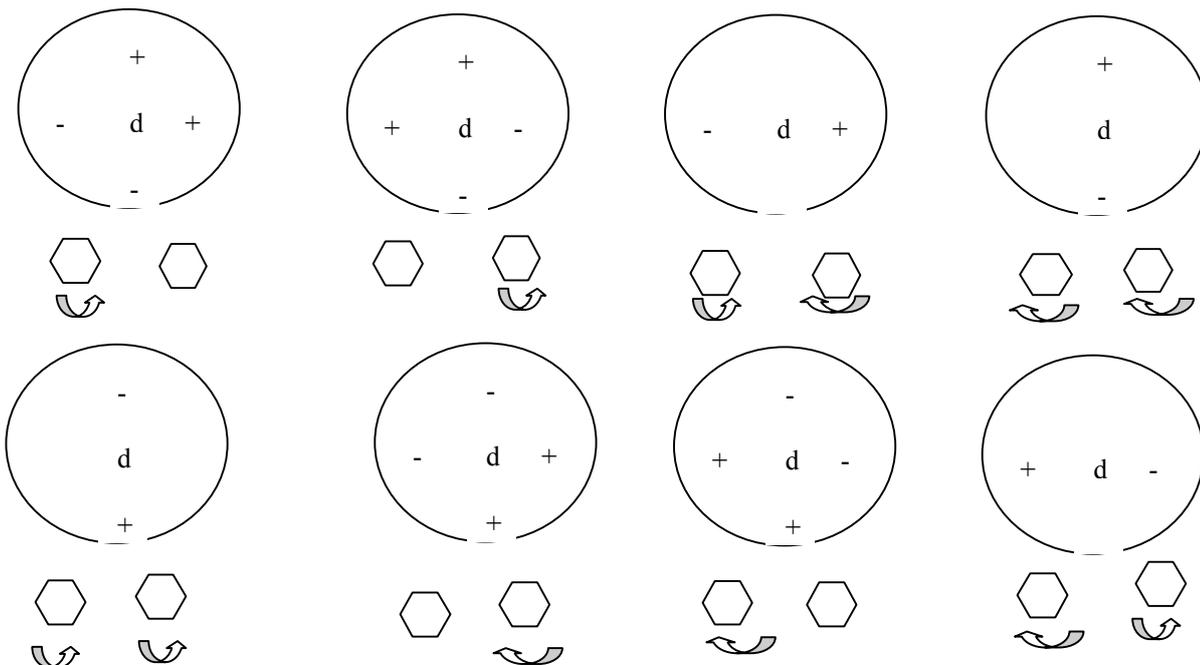
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Beam	Balance weight assembly
Gravity weight assembly	Stopper
Cross recess head screw M3x6	Flat washer 3

Chapter III: Position Error Adjustment

1. Use a 100g weight to adjust the position error after the balance is preheated for 40min. Check the value displayed at five positions of the balance, i.e. up, down, left, right and middle. Then, make a contrast with the value displayed in the middle. When the error is more than 0.2mg, make an adjustment with the following method:



2. On the basis of displayed position data and differences with data at the middle position, adjust position adjustment screws in the direction indicated by arrows in the picture above, until they meet the scope requirement.

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Chapter IV: Model Setting Procedures

1. Under the standby condition, only the decimal point flickers or “PEFIL” is displayed or only the ON sign is displayed on the LCD.
2. Press CAL and then 1 is displayed on the LCD; press TARE and then 2 is displayed on the LCD; after that, press CAL again, 3 is displayed....
3. Press CAL and TARE repeatedly until 9 is displayed on the LCD.
4. Switch ON/OFF, and then the balance displays 8888888.
 - a) Press TARE to display the relevant balance type.
 - b) Press CAL repeatedly to choose the balance type you need. When the balance type you need is displayed, press TARE. Then, setting is finished. The balance displays “-1 112111”.
 - c) Swith-ON

Remark:

There are 10 internal models for this type of balance: 200, 180, 120, 60, H200, H180, H120, H60, 600c and 150c.

Chapter V: Linearity Calibration

1. Switch on power and preheat it for 30min. and adjust the gradienter to the horizontal position.
2. Press ON/OFF and then the balance displays the switch-off sign.
3. Press CAL and then 1 is displayed on the LCD; press TARE and then 2 is displayed on the LCD.
4. Press CAL and TARE repeatedly until 8 is displayed on the LCD.
5. Switch ON/OFF, and then the balance displays 8888888.
 - 1) Press CAL to enter Lnr;
 - 2) 3s later, the balance will display Lnr in. 3s later, Lin... is displayed and the balance carries out the zero point calibration. About 3s later, the balance displays Lin50 and

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prompts to load a 50g standard weight on the scale pan. After that, press TARE and the balance displays Lin. and then Lin 100. Load a 100g standard weight, press TARE, and the balance displays Lin... and then Lin 150. Load a 150g weight, press TARE, and then the balance displays Lin... Several seconds later, the balance calibration is finished and the balance displays 0.0000g.

3) Take away the weight on the scale pan and press TARE for zeroing, and then the calibration is over.

4) Remark: Correct external weights once or for many times after the calibration is finished, until the reading on the balance is the same with the weight value. Refer to “Balance Calibration” for the specific calibration method.

Chapter VI: External Weight Calibration

The balance calibration can be classified into external weight calibration and internal weight calibration. Before the calibration, switch on the power and preheat for 30min and adjust the gradienter to the horizontal position.

1. External weight calibration (for external calibration balance): for external calibration balance, it is confirmed that the internal parameter is C1-1.

A. Press CAL and the balance displays “CAL IN” and then “CAL...” and calibrates the zero point.

B. 3s later, the balance displays “Cal dn” and prompts to load the 100g standard weight to the center of the scale pan.

C. The balance displays “CAL...” and calibrates the position of the 100g standard weight.

D. After the calibration, the balance displays “Cal up” and prompts to take away the weight on the scale pan.

E. After the weight is taken away, the balance displays “CAL...” and then “Cal end”. Then, the external weight calibration is over.

F. 2s later, the balance returns to the zero position automatically. When “0.0000” is displayed, the calibration is over.

G. After the balance calibration is finished, use the full scale weight (e.g. 100g or 200g standard weight) for testing, be sure that the indication on the balance is in consistent with the weight value and the error shall have no more than 3 bits. If the error has more than 3 bits, the balance shall be calibrated again.

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2. Internal weight calibration: for internal calibration balance only: the parameter shall be set as C1-0 before calibration.

A. Press CAL and then the balance displays “Cal in”. 2s later, the balance displays “Cal...” and calibrates the zero point.

B. After that, the balance displays “Cal in” and the motor loads the internal weight to the internal weighing bracket automatically. When the motor stops rotation, the balance displays “Cal...” and calibrates the internal weight automatically.

C. After the calibration is over, the balance displays “Cal up”, the motor moves away the weight automatically and the balance displays “Cal...”.

D. 2s later, the calibration is over, the balance returns to the position of zero point, and 0.0000g is displayed.

In the same way, after the balance calibration is over, use a full scale weight (e.g. 100g or 200g standard weight) for testing, be sure the indication on the balance is in consistent with the weight value and the error shall have no more than 3 bits. If the error has more than 3 bits, the balance shall be calibrated again.

Chapter VII: Correction of Internal Calibration Weight Value

Background reference: for an internal calibration balance, its built-in weight grade shall be lower than E2 or F1 and the error shall be higher than the permissible tolerance of the balance. In order to eliminate the D-value between internal and external weights, the parameter correction is specially set.

Note: This setting is limited to internal calibration balances only. When the internal weight calibration is used for internal calibration balance and the D-value is more than 1 in comparison with external standard weight, the internal weight value shall be adjusted.

1. Under the standby condition, only the decimal point flickers or “PEFIL” is displayed.
2. When “PFAIL” is displayed, press ON/OFF to keep the decimal point on.
3. Press CAL and the LCD displays 1; press TARE again and the LCD displays 2 again.
4. Repeatedly press CAL and TARE until the LCD displays 7.
5. Press ON/OFF and the balance displays the weight value L100.0012.

- 1) Press CAL and the value 100.0000 flickers;

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2) Press CAL and reduce the weight value. (After the internal weight calibration, use the external standard weight for checking and the indication value shall be higher than the standard value of the external weight).

3) Press SET and increase the weight value. (After the internal weight calibration, use the external standard weight for checking and the indication value shall be lower than the standard value of the external weight.)

4) Press TARE, save the weight value and exit.

5) Press ON/OFF to return to the standby condition.

6) After setting, check the setting result. Firstly, calibrate the internal weight and use the external weight to verify the correctness.

Note: When linear calibration is carried out for the weight, be sure to return the set value of the internal weight to the system default 100.0000.

Chapter VIII: 200g Full Scale Correction

Note: After the linear calibration for the balance, check the value at each testing point. If the value is between 180g and 200g, the linear performance is poor and the value at the 200g point can be corrected. The corrected value equals to the D-value with the standard value after the 200g standard weight is loaded.

1. Switch on the balance.

2. When the balance is on normally and displays zero point, press SET to enter the set menu.

3. Press MODE to set the D-value parameter as “200.0000”.

4. Press TARE for correction and then “Add XXX” is displayed.

5. Press MODE to modify sign bits.

6. Press PRINT to modify data bits, ± 29 at most.

7. Press TARE to confirm to save.

8. Press ON/OFF to exit.

9. After correction, check the linear error at each point again and the error value shall be no more than 2D.

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If a 200g weight ordinarily weights 200.0028g, set “add -28” and then save it only.

If a 200g weight ordinarily weights 199.9991g, set “add +09” and then save it only.

Chapter IX: Temperature Compensation Method under high or low temperature

1. Switch on the balance, preheat it for half an hour and adjust it horizontally. Calibrate and test it at the room temperature. If the balance is qualified, switch it on in the lab at high and low temperature and also adjust it horizontally.

2. Enter the high and low temperature status: Press ON/OFF and then the balance displays “ . “. Press CAL and TARE and then the balance displays 8. Press ON/OFF and then 888888 is displayed. After TARE is pressed twice and then CAL is pressed, the balance displays the count value. After you press CAL again, the balance displays zero point value (temperature compensation value).

3. Procedures for setting the temperature of the low and high temperature lab: humidity: 60%, temperature: 10□ (2h) -----35□ (3h) -----10□ (3h). It takes 6h for every circulation to make the balance display the count value.

4. When the temperature rises, the display value goes up (i.e.: high temperature value – low temperature value = 0) and the polarity is anode.

5. Zero point adjustment: $\square_{tt} = \text{zero point high temperature count value} - \text{zero point low temperature count value}$

$$VR_{tt} \text{ correction} = \square_{tt} * 10 / \text{temperature difference}$$

$$Vt \text{ adjustment} = VR_{tt} \text{ correction} / 6 \text{ (i.e. the number of adjusted potentiometer rings)}$$

Full scale adjustment: $\square_{st} = (\text{high temperature full scale count value} - \text{low temperature full scale count value}) - \square_{tt}$

$$VR_{st} \text{ correction} = \square_{st} * 7 / \text{temperature difference}$$

$$Vs \text{ adjustment} = VR_{st} \text{ correction} / 6 \text{ (i.e. the number of adjusted potentiometer rings)}$$

VR adjustment direction:

Zero point adjustment:

When R5 (R4, J4) is adjusted, rotate R5 to the right end and then rotate it leftward for 15 rings. Short-connect the needle 1 and 2 as well as 4 and 5 of J4. Then, make an adjustment according to the polarity. 1. If the polarity is negative, adjust R5 leftward (in the anticlockwise direction); if the polarity is positive, adjust R5 rightward. If the polarity is still negative when R5 is rotated to the leftward end, short-connect 2 and 3 as well as 5 and 6 respectively. Make an

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adjustment again: readjust it in the previously opposite direction. If the polarity is negative, adjust R5 to rightward (in the clockwise direction). If the polarity is positive, adjust it leftward. The number of adjusted rings shall be adjusted according to Vt. 2. On condition that needle 1 and 2, 4 and 5 of J4 are short-connected respectively, if the polarity is still positive when R5 rotates to the rightward end, the resistance of R4 shall be increased.

Full scale adjustment:

Adjust R14. At the beginning, rotate it to the rightward end and then leftward for 15 circles. Then, make an adjustment according to the polarity. Adjust it rightward if the polarity is positive. When it is impossible to adjust rightward anymore, reduce the resistance of R13. Adjust it leftward if the polarity is negative. When it is impossible to adjust leftward anymore, increase the resistance of R13.

Chapter X: Inspection

I. Corner Error Test:

Switch on the balance, preheat it for half an hour and adjust it horizontally. Use a 100g standard weight to perform the position error test for the balance. (Set the zero point track of the balance as C3-0 before the test. Refer to the manual for details about the setting method.

1. Tare the balance.
2. Put the 100g standard weight in the middle of the balance and record the reading of the balance.
3. Then, put the weight at the up, down, left and right positions gradually, check the reading of the balance and make a record.
4. It is required that the position error of the balance shall be within $\pm 2D$. If the error exceeds the scope, the four positions shall be adjusted.

II. Repeatability Test:

1. Tare the balance.
2. Put the half-scale and full-scale standard weight in the middle of the balance, perform the test for 6 times continuously and record the reading of the balance.
3. The repeated error of the balance shall be within $\pm 3D$.

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III. Linearity Error Test:

1. The indication error at each load point shall not exceed 3D.
2. During the test, the load shall start from zero and then be added gradually, until it achieves the maximum weight of the balance. Then, reduce the load gradually until the load becomes zero.
3. Test loads must include the following load points:
 - No load
 - Minimum capacity
 - Maximum capacity
 - Load at the conversion point of the maximum permissible error
4. For either loading or unloading, sufficient measuring points. For the firstly measured and tested balance, measuring points shall be no less than 10.

IV. Effectiveness Test:

After the balance is preheated for half an hour, calibrate it in the full range once. Perform a effectiveness test once every hour, check the full scale reading, perform the test for five times continuously, and the indication error shall be no more than 10D.

V. Full Range Floating Test:

Preheat the balance for half an hour under the room temperature, increase the full range load, put it aside for 5min. and the indication floating shall be no more than 5D.

VI. Appearance Inspection:

1. Power adapter inspection: Check if the power adapter conforms to the production notice and is configured according to a certain standard.
2. Serial number label: check if the label is correct.
3. The appearance shall be free of scratch, greasy dirt and damage, etc.
4. The panel shall not warp, deform or damage.
5. The instruction manual and testimonial shall be complete.
6. The certificate seal, signature and QC label shall be complete.
7. Glass components shall be firmly pasted and free of greasy dirt or finger prints, etc. and adhesive tapes shall not stretch out.

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8. Check if the balance meets requirements on the production notice and particular production requirements.
9. Check if components on the packing list are complete and if their types correspond with their serial numbers one by one.

Chapter XI: Failure and Maintenance

1. Problem: When the balance is switched on, "P FAIL" is displayed.
Failure analysis: mis-operation, failing to switch off the machine normally or pull out power supply directly.
Solution: Press POWER to switch on and then "0.0000g" is displayed.
2. Problem: Switch on the balance and "P FAIL" is displayed. After you press "POWER", the screen display is unchanged, the display is abnormal and the pressing sound is sent out.
Failure analysis and Solution:
 - 1) Switch on the balance again and check if the failure has been solved.
 - 2) Z80 core is damaged and shall be replaced.
3. Problem: "P FALI 2" is displayed after the balance is switched on.
Solution: check zero point and full scale count values.
4. Problem: "+E"/"-E" is displayed after the balance is switched on, and nothing happens when POWER is pressed.
Failure analysis and Solution:
 - 1) If the original part of the circuit board is damaged: replace Q3/Q4 and 1016E cores.
 - 2) Check if there is a scale pan and if the scale pan has been overloaded.
5. Problem: "CAL NO" appears during calibration:
Failure analysis:

1) External calibration balance:

- A: If a mistake happens when the weight is loaded, F1 100g standard weight shall be loaded.
- B: If the zero point count value and the full load count value exceed the scope, check and adjust these count values.

2) Internal calibration balance:

- A: The weight interferes with other parts when it is loaded and cannot be loaded in place: disassemble the upper cover plate of the balance, check the action when the weight is

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loaded, confirm if the weight is loaded to the weight bracket correctly and does not interfere with other parts.

B. Check if zero point and full load count values are in the specification scope. If not, adjust them into the scope.

6. Problem: “ERR 0” is displayed when the balance is switched on.

Failure analysis: The 2444 core is damaged.

7. Problem: The repeatability of the balance is poor and the balance returns to zero slowly or poorly.

Failure analysis: the reed has corrugation.

Solution: replace the reed.

1) Disassemble the balance shell.

2) Disassemble the sensor.

3) Check if there is any corrugation or fracture on two pivot reeds, 2 front reeds, 4 rear reeds, 1 force reed and at the rear elbow.

4) Replace the reed: (Refer to the assembly work instruction).

5) Assemble the sensor after replacement and then repeat the commissioning.

6) Install the shell.

7) Make the linearity calibration again.

8. Problem: The balance reading is unstable and always changes.

Failure analysis:

A. The reed has corrugation.

B. There are foreign matters in the magnetic steel of the sensor.

Clear foreign matters: disassemble the balance shell and sensor, remove the magnetic steel, observe if there are foreign matters in the magnetic steel gap. If so, use a special single-face adhesive tape to clean it up.

C. Check if there is interference between the sensor and the core shell, etc. Remove the shell and observe if the sensor interferes with other parts.

9. Problem: The screen turns into black or white when the balance is switched on, and the buzzer alarms all the time:

Failure analysis: check if the data line of the monitor is connected well. Pull it out and plug it again. Switch on for testing.

10. Problem: Unreadable codes appear when the balance is switched on.

Failure analysis: the W27C512 core is damaged.

Solution: Replace it into a new core with the program.

11. Problem: Changing figures when the door is open.

Failure analysis: check if three pivots touched between the floor and the balance are placed stably. If not, readjust these positions.

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12. Problem: Glass damage.

- A. The side glass is damaged: replace the side glass.
- B. The front glass is damaged: replace the front glass.

Method of Replacing Glass:

1) Remove the bottom of the balance:

Disassemble 6 pieces of M3 cross-head screws and then remove the bottom cover plate of the balance.

2) Disassemble the upper cover plate of the balance:

Disassemble 3 pieces of M3 cross-head screws and then remove the upper cover plate of the balance.

3) Remove two pieces of side glass together with their protective plates:

Loosen handle tightening screws on the protective plate of the side glass and then remove the side glass together with the protective plate.

4) Loosen the front glass protective plate:

Remove the two M3 inner hexagon screws for tightening the front glass protective plate and then loosen the front glass protective plate.

5) Remove the balance baffle:

Loosen the two M4 inner hexagon screws (at the bottom of the balance). Remove the baffle and front glass protective plate.

6) Remove the front glass from the glass frame:

Try to prevent the frame from being deformed.

7) Replace a new front glass protective plate:

Use an adhesive tape to paste the front glass together with the protective plate in the frame and pay attention to keeping the left and right even.

8) Install the glass suite of the balance:

Install the glass suite according to the sequence opposite to disassembly. Install and tighten the baffle, side glass suite and front glass on the balance accordingly.

9) Install the balance shell:

Assemble and tighten the upper and bottom cover plates.