



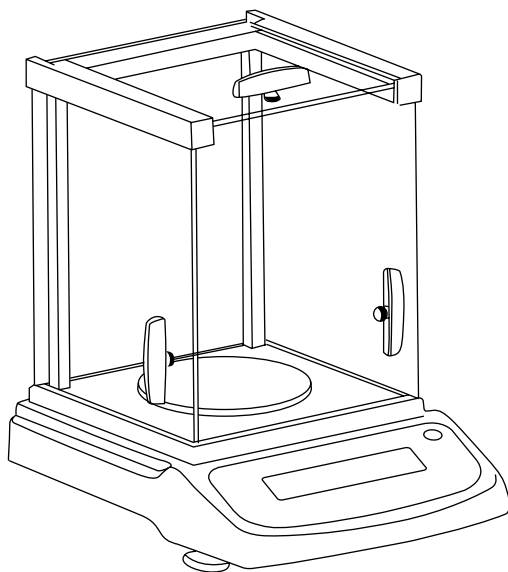
GRAM



SERIES

FD

410



EN



OPERATION MANUAL



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ENGLISH

SAFETY INFORMATION

- To avoid unnecessary damage to the balance, please pay attention to the following tips.
- Please do not use this balance in dangerous area.
- Only the trained technicians could operate this balance.
- Please turn off the power of the balance before connect it or disconnect it with other facilities.
- If the environment requires a higher safety standard, please follow the relevant installation instructions.
- Excessive electromagnetic interference will make the displayed value in this balance change. Once the interference is dismissed, the balance could operate in normal way.
- Please avoid any liquid on the surface of the balance. A piece of lightly damp cloth is allowed to wipe the balance.

INSTALLATION

- Please make sure the local voltage is in line with the rated voltage on the name board.
- Please pay special attention when use RS-232 as the pins location might be incompatible with our facilities. Please check the pins locations before the connection and turn off the connection of different configuration.
- If the facility or the power cord has apparent damage, please turn off

the power, put it or them in a safe place and do not use it or them before they are fixed.

- This balance could only be connected to our accessories or optional fittings. We are not responsible for any modification the operator makes to our balance, including using the facilities and cable which are not supplied by us. However, we are always ready to offer the operation norms information.
- Please do not open the balance. If the guarantee label is damaged, our quality guarantee will automatically cease being effective.
- If the balance does not work well, please contact your local distributor or our customer service center.

PREPARATORY BEFORE USING

Storage

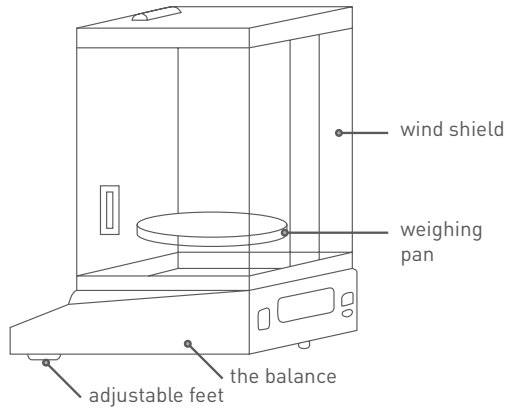
This balance requires an environment which is free from excessive high or low temperature, corrosive, vibration, air current and collision.

Unfolding the package

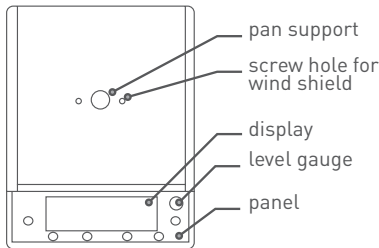
- Unfold the package and check if there is any outer damage of the balance.
- If there is outer damage, please refer to section routine maintenance and troubleshooting.
- Please keep all the package for possible transportation in the future. When pack the balance, please remove all the cables to avoid unnecessary damage.

Packing list

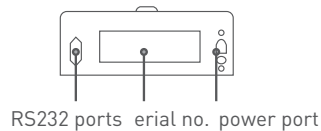
- The balance
- Weighing pan
- Pan support
- Glass windshield
- Density accessories
- Power adapter
- User manual



Plan view



Top view



Back view

INSTALLATION OF THE BALANCE

Put it in a proper place, please avoid the following situations:

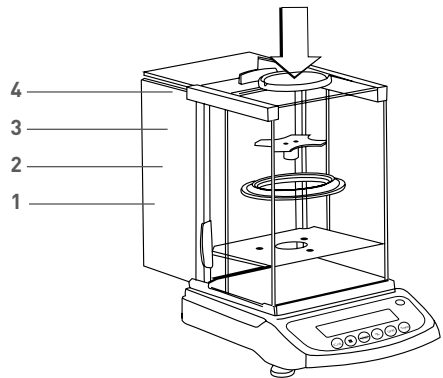
- Much heat and direct sunlight.
- Air currents and vibrations.
- Excessive moisture.

Usage Conditions

Please do not lay the balance in a quite damp palce for a long time. If the balance is transferred from a lower temperature environment to a higher temperature environment, please lay it there with power off foraround 2 hours.

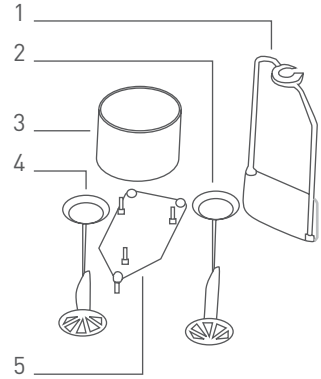
Installation sequence

- Assemble the parts in the indicated order.



Install the balance with density measurement device

1. Bracket
2. Beaker holder
3. Beaker
4. Convex holder (concave holder)

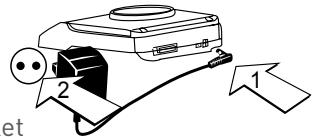


1. Put the bracket on the balance and adjust it to the right angle.
2. Put the beaker support and beaker onto the bracket in proper sequence.
3. Fill the beaker 5mm from the rim of it.
4. Test the temperature of liquid with thermometer.
5. Choose the right holder and hang it on the holder.

Connect the Power Adaptor

Only the power adaptor offered by us is allowed.

- Connect the power adaptor to the balance
- Connect the power adaptor to the power socket



Install the External Facilities

Make sure to turn off the balance before connect it or disconnect it with external facilities (such as printer or computer)

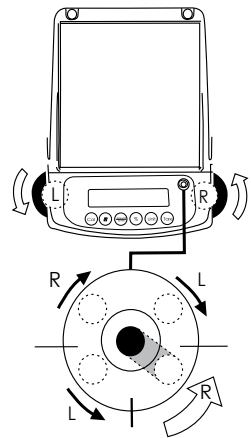
Preheat Time

To assure the measure accuracy, the balance must be preheated for 30 minutes before normal operation.

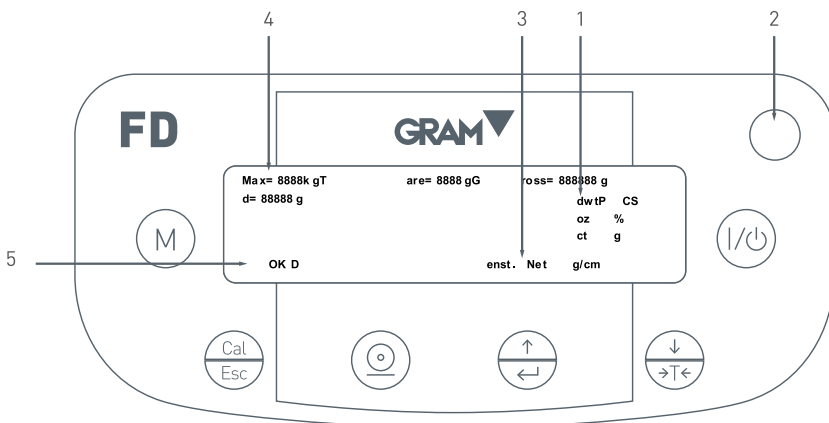
Adjust the Level Gauge

Purpose:

- Adjust the level gauge of the balance, the level gauge needs to be adjusted once its place is changed. The two front bottom bolts are used to adjust the level gauge.
- Spin the two bolts as shown in the figure until the bubble in the level gauge is in the center of the circle.
- Normally, it needs to be adjusted repeatedly.



DISPLAY DESCRIPTION



1. Weighing Units
2. Level Gauge
3. Weighing Mode Signs: Density: Density Measurement Mode
Net: Tare Weight / Gross Weight / Net Weight
4. Capacity / Readability
5. OK indicator: stable display

Display Information:

OK - Reading shown is stable.

g - Reading shown is given in grams.

g/cm³ - Reading shown is given in density units.

----- The balance is developing a stable reading

UNABLE - Error operation.

HHHHH - The weight on the pan exceeds the max. capacity of the balance.

LLLLLL - The pan is not properly seated or has been removed.

KEYS DESCRIPTION



Menu key



Calibration / Adjustment key



Print / Output key



Function / Confirmation key







Tare key



Power switch



CALIBRATION


Procedure

1. Adjust the level gauge and preheat it for 30 minutes.
2. Press  key.
3. Press  key, the balance will read its full range (e.g.200), press  key repeatedly, it reads the calibration point within the range (e.g.200, 100, ...).
4. Choose one calibration point and place the right weight on the pan. Press  key, the balance starts calibration, **"ACAL"** displayed.
5. When the external calibration is 200.000g finished, the balance reads the value of the weight on the pan (e.g.200).

BASIC WEIGHING (Tare function)

Procedure

1. Press the key , the balance will automatically proceed system initialization and deduct the tare weight.
2. Place the container on the weighing pan.
3. Press the  key.

4. Place the simple object in the container.
5. Print the weight value pressing the  key.

SOLID / LIQUID DENSITY MEASUREMENT






Applied formula:
























Sample density = Weight in the air / (Weight in the air – Weight in the liquid)

* Liquid density

Test solid material density

Because the buoyancy of the liquid density depends on the temperature, temperature varies 1°C, the density of distilled water will change 0.02%. In order to modify the effect of temperature on density, please set the temperature refer to function setting section:


Step	Procedure (Example)	Key / Instruction	Display
1	Preheat the balance for 30 min		
2	Tare the balance		0.000g
3	Set sample state (solid)		CEnTlg
			ShaPE
			SOLID
			0.000g

4	Set liquid's temperature	   (press  key to increase, press  key to reduce)   	CEnTlg 20 number flickers 0.000g
5	Set media parameter (distilled water)	        	CEnTlg SHAPE COEFF 1 0.000g
6	Put the measured sample onto the upper plate		7.788g
7	Save sample's weight in the air	 	7.788g
8	Take off the sample		0.000g
9	Test sample's weight in the liquid		6.889g
10	Save sample's weight in the liquid and display the counted value	 	1.221g/cm ³
11	Sign out density measurement	 	0.000g

If necessary for repeating, please start the procedure from step 5.

Test liquid material density






Step	Procedure (Example)	Key / Instruction	Display
1	Preheat the balance for 30 min		
2	Tare the balance		0.000g
3	Set sample state (liquid)	 	CEEnTlg ShaPE SOLID LIQUID 0.000g
4	Set weight's density, assume the weight's density is 2.24g/cm ³ (if the weight's density is unknown, refer to A. to test the weight's density)	 (two times) (repeat) 	CEEnTlg SHAPE COEFF 1 SET DP. SET .DP 1.00 2.24 2.24 flickers 0.000g
5	Put the weight on the upper plate		7.788g
6	Save the weight's weight in the air		7.788g

7	Take off the weight		0.000g
8	Test the weight's weight in the liquid		6.889g
9	Save the weight's weight in the liquid and display the counted value		0.98g/cm ³
10	Take off the weight and back to weighing state		

If necessary for repeating, please start the procedure from step 4.

USER SETUPS

The balance could be set up to meet individual requirement.

1. Press the  key to enter setup program.
2. Press the  key to choose the parameter to be set up and then press the  key to confirm.
3. Anytime to exit the setup program, press the  key, it reads "ESC", then press the  key to confirm.

PRINT SETUP

There are three types of printing mode for electronic balance:

Stable Output (STABLE): output after reading value is stable.













Instant Output (INSTANT): instant output after press  key.

Interval Output (INTERVAL): interval output with preset time.



Users can set up Line Feed for label printing.







※ Printing mode and line feed numbers set apart, after setting up printing mode, line feed numbers can be set.

Please set up printing mode according to below steps:




1. Press the  key, the display will show “PrInT”.
2. Press  key to enter into menu, “STABLE” displayed, default is to stabilize the output.
3. Press  key to choose printing mode you would like, press  key for confirmation.
4. After enter into menu, press  key to choose Line Feed “InTEr”, press  key for confirmation, balance displays “0 SEC”, press  key repeatedly to check the preset time interval, then press  key for confirmation. If to choose “0 SEC”, it means Continuous Output.
5. Press  key to back to normal weighing mode.
6. Enter into Print Setup Menu, press  key repeatedly, choose Line Feed to set up “LinEFd”.
7. Press  key repeatedly to check the preset line feed numbers (1-18). After choosing proper line feed numbers, press  key for choice, back to normal weighing mode.

SET BAUD RATE AND CALIBRATION MODE





1. Press  key for entering into Menu Setup Mode.
2. Press  key repeatedly till “bAud” displayed.


3. Press  key to enter into Baud Rate Setup Menu, **“300”** displayed.
4. Press  key repeatedly till the baud rate you want displays, then press  key for confirmation, after **“PARITY”** displays, set up Parity Check.
5. Press  key for choosing Parity Check, balance first displays **“nOnE”** [no check].
6. Press  key for checking choice, **“Odd”** means odd number check, **“EvEn”** means even number check.
7. Press  key for confirming proper checking type, then back to normal weighing mode.

RESTORING FACTORY SETUP







1. Press  key for entering into menu of the balance, **“PrInt”** displays.
2. Press  key repeatedly till **“InITIA”** displays.
3. Press  key for confirmation, after the balance displays **“BUSY”**, back to normal weighing mode, Restoring Factory Setup is over.

BACKLIGHT SETUP

1. Press  key for entering into menu of the balance, **“PrInt”** displays.
2. Press  key repeatedly till **“bLgHT”** displays, press  key for confirmation, balance displays **“1 nln”**.
3. Press  key repeatedly to choose backlight time (1, 2, 3, 5, 10, 15, 30, 60 are options, means backlight turns off time range is 1-60 minutes).




4. Press  key for confirmation, balance can be back to normal weighting mode.

TEMPERATURE SETUP


1. Press  key, “CEnTlg” displays.
2. Press  key, default “20” temperature value displays (or the temperature value set last time displays). If the referential liquid’s measured temperature is lower than the displayed temperature, press  key to reduce till the reading is same as the referential liquid’s measured temperature. If the referential liquid’s measured temperature is higher than the displayed temperature, press  key to increase till the reading is same as the referential liquid’s measured temperature.
3. After setting up temperature, press  key, value flickers, press  key for confirmation, Temperature Setup is over.

STATE OF GOAL OBJECT SETUP



Before density measurement, please set up the State of Goal Object, steps are as follows:

1. Press  key, “CEnTlg” displays;
2. Press  key, “SHAPE” displays;
3. Press  key, “SOLID” displays;









Remarks:

If measuring solid’s density, press  key for confirmation after step (3), State of Goal Object Setup is over; If measuring liquid’s density,



please continue to step (4).

4. Press  key, “**LIQUID**” displays, then press  key for confirmation.

MEDIA PARAMETERS SETUP

1. Press  key, “**CEnTlg**” displays.
2. Press  key repeatedly till “**COEFF**” displays.
3. Press  key, the parameters set last time displays, for example: **1**.
4. Press  key, “**SET dP.**” displays, press  key to move decimal point, then press  key for confirmation. Press  key to reduce density value, or press  key for increasing.

Remarks:

- a. Set up liquid media’s parameter as 1 (distilled water) while measuring solid’s density;
 - b. When measuring liquid’s density, user can choose weight as the measuring solid, measure its density first, then input density value, test the liquid’s density with the solid you chose).
5. After adjusting density value, press  key, the density value flickers, then press  key for confirmation, Media Parameters Setup is over.

ADDITIONAL FUNCTIONS

Bottom hook weighing

There is a hole at the bottom of the balance for the optional weighing hook (It is not allowed to use the bottom part to balance in Legal Metrology)

1. Open the bottom cover of the balance (please lay the side of the balance downwards to open the bottom cover, do not make the upside down)
2. To use the hook in the accessories: screw the hook clockwise in the bottom tapped hole. Stop at once to proceed if there is any resistance.
3. Put the goal object to the hook with a line a suspension line, for example.
4. If necessary, set a safety guard to avoid air current.

Attached list:


Density measurement at different temperature (°C).


T/°C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
10	0,99973	0,99972	0,99971	0,99970	0,99969	0,99968	0,99967	0,99966	0,99965	0,99964
11	0,99963	0,99962	0,99961	0,99960	0,99959	0,99958	0,99957	0,99956	0,99955	0,99954
12	0,99953	0,99951	0,99950	0,99949	0,99948	0,99947	0,99946	0,99944	0,99943	0,99942
13	0,99941	0,99939	0,99938	0,99937	0,99935	0,99934	0,99933	0,99931	0,99930	0,99929
14	0,99927	0,99926	0,99924	0,99923	0,99922	0,99920	0,99919	0,99917	0,99916	0,99914
15	0,99913	0,99911	0,99910	0,99908	0,99907	0,99905	0,99904	0,99902	0,99900	0,99899
16	0,99897	0,99896	0,99894	0,99892	0,99891	0,99889	0,99887	0,99885	0,99881	0,99882
17	0,99880	0,99879	0,99877	0,99875	0,99873	0,99871	0,99870	0,99868	0,99866	0,99864
18	0,99862	0,99860	0,99859	0,99857	0,99855	0,99853	0,99851	0,99849	0,99847	0,99845
19	0,99843	0,99841	0,99839	0,99837	0,99835	0,99833	0,99831	0,99829	0,99827	0,99825
20	0,99823	0,99821	0,99819	0,99817	0,99815	0,99813	0,99811	0,99808	0,99806	0,99804
21	0,99802	0,99800	0,99798	0,99795	0,99793	0,99791	0,99789	0,99786	0,99784	0,99782
22	0,99780	0,99777	0,99775	0,99773	0,99771	0,99768	0,99766	0,99764	0,99761	0,99759
23	0,99756	0,99754	0,99752	0,99749	0,99747	0,99744	0,99742	0,99740	0,99737	0,99735
24	0,99732	0,99730	0,99727	0,99725	0,99722	0,99720	0,99717	0,99715	0,99712	0,99710
25	0,99707	0,99704	0,99702	0,99699	0,99697	0,99694	0,99691	0,99689	0,99686	0,99684
26	0,99681	0,99678	0,99676	0,99673	0,99670	0,99668	0,99665	0,99662	0,99659	0,99657
27	0,99654	0,99651	0,99648	0,99646	0,99643	0,99640	0,99637	0,99634	0,99632	0,99629
28	0,99626	0,99623	0,99620	0,99617	0,99614	0,99612	0,99609	0,99606	0,99603	0,99600
29	0,99597	0,99594	0,99591	0,99588	0,99585	0,99582	0,99579	0,99576	0,99573	0,99570
30	0,99567	0,99564	0,99561	0,99558	0,99555	0,99552	0,99549	0,99546	0,99543	0,99540

COMMUNICATION WITH A COMPUTER

The balance keyboard functions can be accessed via the RS-232 interface.
The following commands are available:

U -  : units conversion

T -  : deduct the tare weight

C -  : calibration with external standard weight

P -  : print function

- **#** : immediate print

When the balance is connected with a computer, it is suggested that immediate print (#) be used. In response to this command the balance will transmit whatever number or message appears on the balance display.

The string format output is shown below:

A B C D E F G H I J K L M

A - +/-: Signs field; usually no display as a space when it is a positive number, - is displayed when it is a negative number.

B - G: Number and decimal field; spaces are used when there are less than six digits.

H - I: Spaces fields.

J: Unit field, it describes the units of the number being transmitted. Your balance will transmit **G** for grams, **O** for ounces and **C** for carats.

K: Stable character, it corresponds to the **OK** indicator on the display. **S** means the reading is stable, space means the reading is not stable.

L: Return character.

M: Line feeds character, it indicates the line feeds.

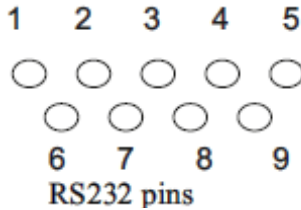
RS-232 INTERFACE HARDWARE

This balance adopts the transmit and receive lines of standard RS-232.

The data format is:

- 1 start bit.
- 8 data bits include parity.
- 1 stop bit.

The instruction to connect the balance to external device is as follows:



Pin description

- 2 – TXD - - - scale transmits data
- 3 – RXD - - - scale receives data
- 5 – GRD - - - signal ground

Note: “Handshake” signals, such as **“clear to send”** (CTS) are not used. The peripheral must have a minimum buffer (15 characters).

It is suggested that the maximum recommended cable length is 15 meters, the load impedance of the device connected should be between 3000 and 7000 ohms with no more than 2500 pf shunt capacitance.

ROUTINE MAINTENANCE AND TROUBLESHOOTING

Troubleshooting

Only the trained professionals are allowed to do repair work. There is a risk for the user if non-professionals do the repair.

Clearance

- Turn off the balance and unplug the data cables.
- Avoid the liquid into the balance.
- Any corrosive cleaner (solvent) is forbidden to use.
- Wipe the balance with a piece of soft cloth.
- Remove the weighing pan before wipe the balance.
- Remove the shield ring and pan support with the weighing pan which helps avoid damage to the weighing system.

Clearing the stainless steel surface

All the stainless Steel components need to clean regularly. Remove the weighing pan and thorough clean it with a damp cloth or sponge. The cleaner applicable to stainless Steel are recommended. Wipe the stainless Steel surface of the balance first and then clear the stainless Steel weighing pan. Make sure there is no dirt and then wipe the stainless Steel component again. Dry the balance by air. If necessary, smear the proper oil on the surface as additional protection.

Note:


After remove the weighing pan and the pan support, avoid any liquid or solid pellet into the installation hole.

Safety check

If the balance could not work normally:

- Cut off the power immediatelly, keep and do not use it again.
- Keep it in a safe place to make sure it won´t be used for the moment.
- Inform the nearest Service Center or your Distributor. The repairman must have had profesional training.

TROUBLESHOOTING

DISPLAY	REASON	SOLUTION
-----	The balance could not get a stable reading or the transducer is damaged.	Contact your local service center.
HHHHH	The real weight is 5% higher than its capacity or the transducer is damaged.	Unload or contact your local service center.
LLLLLLL	a) The weighing pan is not on. b) There is wrong connect with the pan. c) The transducer is damaged.	a) Install the right weighing pan and press the  key. b) Clear the connect. c) Contact your local service center.

NOCAL	Calibration is unresponsive.	Refer to calibration section, check if it is the right calibration weight.
UNABLE	Lack of data or wrong data with which the balance could not perform the function.	Refer to user manual.
UNSTABLE READING	Unstable the ambient environment (excessive vibration or air current) or there is wrong connect with the pan.	Put the balance in another place. Clear the wrong connect.
NO DISPLAY	No work voltage no connection with transformer.	Check the power supply circuit and the instrument, connect the transformer.
Apparent wrong weighing display	No calibration or the tare weight is deducted.	Calibrate the balance Deduct the tare weight before weighing.

If there is any other trouble, please contact your local distributor or service center.

TECHNICAL CONDITIONS

AC power, voltage, AC frequency output: AC-DC Adapter, input 220V/110V,
7.5V (+15% to -20%) 48-60Hz

Power consumption: Maximam=16W, average=8W

Work temperature range: +10°C to +30°C (50° F to 86° F)

Temperature range allowed: +5°C to +40°C (41° F to 104° F)

The balance could assure the normal work: +5°C (41° F) to +40°C (104° F)

TECHNICAL PARAMETERS

Model	FD410
Capacity	410 g
Readability	0.001 g
Tare range	410 g
Repeatability	0.001 g
Lowest density Reading	+/- 0.01 g
Reponse time	2.5 s
External calibration value	200 or 400 g
Minimum accuracy level calibration weight	Class F1
Net weight	4.0 kg
Pan size	115 mm diam
Inferior shield height	230 mm
Shape size	230 x 310 x 330 mm

GUARANTEE

This scale is guaranteed for one year from the delivery date. The guarantee covers any fabrication defect of the material.

During this period **GRAM PRECISION, SL**, covers the manpower and the spare parts necessary for the reparation of the scale.

This guarantee does not cover the failures caused by an inappropriate use or overcharge.

The guarantee does not cover the freight cost (transport) necessary to repair the scale.



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