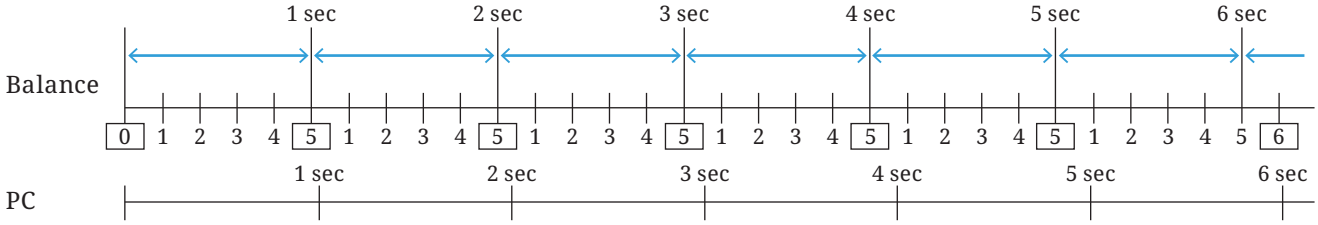
Flow rate measurement

Flow rate is determined from the weight variation that occurs during a given interval. Many operators time this interval by using a stopwatch. Besides being troublesome and error-prone, this method does not allow precise recording of flow rates that vary from moment to moment because the interval used to divide the weight variation (calculation time) is too long.

Alternatively, a PC can be connected to the balance to take the weighing data and perform the calculation. This method enables measurement to be more responsive to flow rate changes by shortening the calculation time. However, due to the syncing problems that inevitably occur between the internal clocks of the balance and the PC, the timing at which the balance receives the command from the PC to send the weight value and its display refresh cycle gradually go out of alignment. In consequence, the PC intermittently produces irregular values even when the actual flow rate is constant.



Time disparity of two different internal clocks (when the balance display refresh rate is 5 times/sec, the calculation time is 1 sec, and the balance's internal clock goes slightly ahead of the PC's)

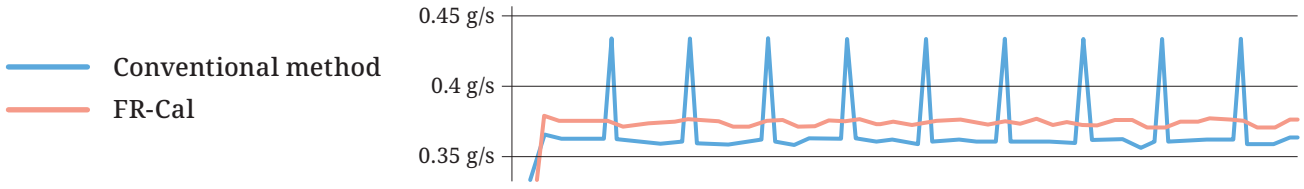
FRD

Flow rate display (FRD) for calculating flow rate with the balance itself

FR-Cal

A&D Apollo can calculate and display/output the mass flow rate (the unit of measure can be selected from g/s, g/m or g/h), or the volume flow rate (mL/s, mL/m or mL/h) by entering the density of the material—up to 10 densities can be saved to the device. Both the display refresh rate and calculation time (set either manually between 1 second and 1 hour or automatically according to the selected level of responsiveness to weight/flow rate variation♦) are regulated by the same internal clock of the balance, allowing measurements to be precisely performed without the time disparity problem described above.

♦ Patent pending



Flow rate measurement using FR-Cal as opposed to the conventional method

FR-Compare

The balance indicates whether the flow rate is maintained within the designated limits (either 3 levels or 5 levels). The results can be output using the optional GXA-04 interface.

WinCT-FRD (freeware)

This software enables a PC to simultaneously display the weight and flow rate values transmitted from the balance on a two axis graph so that you can see their changes in real time. The graph can be printed out using a printer or saved as an image file, whereas the recorded data can be saved in CSV or TXT format.

Tare memory

The tare value can be saved in non-volatile memory. When this function is activated, the power-on re-zero/tare is turned off. Therefore, even if the power supply is cut off while performing, for example, flow rate measurement, the weight value displayed before the power off will be displayed as the balance is turned on again.

User access control (UAC) and key lock to prevent misusage

The balance can be password-protected in two ways: The first way is to limit the use to authorized individuals (up to 11 including one administrator—the administrator can perform all operations while other users are limited to measurements and calibration*6 only) by setting a password for each user. The second way is to set a password just for the administrator and anyone else can use the balance without entering a password but for measurements and calibration*6 only.

Moreover, upon receiving a command to disable its keys, the balance becomes operable only by sending commands from an external device such as a PC.

∗6 The administrator can inhibit calibration also so that others can perform measurements only.

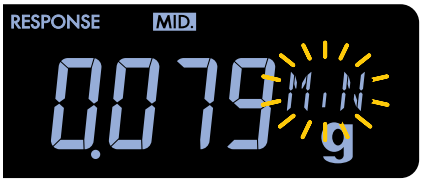
Automatic minimum weight calculation and implementation

You can enter the minimum weight into the balance by either direct key input, using the result of QuickMin-S described earlier, or having the balance calculate the minimum weight from 10 repeated measurements of an actual, external weight (as with QuickMin-S, the tolerance can be set to either 0.1% pursuant to USP Chapter 41 or 1%) . The stored value can always be called up to see/change or output together with timestamp. When QuickMin-S or an external weight was used, the calculation data is also output.

Min-S Alert

To ensure that the measured sample amount meets the minimum weight requirement, the balance can display an alert until the sample amount reaches the value entered as the minimum weight.*7

∗7 When g is selected as the unit of measure only



Blinking minimum weight alert

Universal Flexi Coms (UFC)

This function enables you to customize printout content and layout by editing and sending commands (UFC setting commands) to the balance. Following the commands, the balance creates data to be output to either a printer capable of dump printing such as the AD-8127 compact printer or a commercially-available label printer*8 for barcode printing.

∗8 A label printer that supports ZPL/ZPL II

WinCT-UFC (freeware)

With this software, you can easily edit UFC setting commands on a PC and send them to a balance/scale that has a UFC function, such as A&D Apollo. All that is required is to select data (e.g. weighing result, date, time, ID number, etc.), enter text and adjust the layout while checking the preview screen, which the software automatically converts to UFC setting commands. For label printing, users can choose one of three kinds of barcodes; namely, QR code, Data Matrix code and Code 39.

Gross/Net/Tare output

On receiving a command or with key operation, the balance can also output the gross, net, and tare values.

Statistical calculation function (SCF)

A&D Apollo can display/output statistical calculation data including the number of data, sum, maximum, minimum, range (maximum-minimum), average, standard deviation, coefficient of variation and relative error to facilitate the analysis of measurements.

GLP/GMP/GCP/ISO compliant output

For documentation requirements, the balance manufacturer, model, serial number, ID number, date + time,*9 space for signature for calibration report, calibration test report, and title & end blocks for a series of weighing results can be output.

*9 When the AD-8127 compact printer is used, it is possible to use its clock & calendar function instead of the balance's to print date + time. This allows you to prevent falsification of the timestamp using the password lock function on the printer side as you prefer.

Data memory

A&D Apollo has a capacity to store up to 200 weighing results + 50 calibration results (all with timestamp), and 50 unit masses to be used in counting mode for cases when no external memory device is available. The stored weighing results or calibration results can be output to a printer or PC in one batch.

Other advanced features

RS-232C and USB interfaces as standard

For the USB interface, you can toggle between the Quick USB mode (plug-and-play with weighing data output to a PC only) and the Virtual COM mode (for bi-directional communication*10) with internal settings. A USB cable is provided as standard.

*10 A special driver downloaded from the A&D website needs to be installed on the PC (except for those with Windows 10).

Security slot

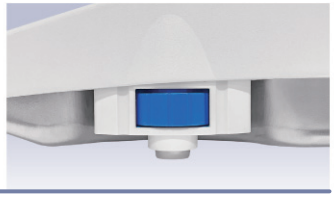
An off-the-shelf (such as Kensington) anti-theft lock can be used to prevent the balance from being lost.

Reverse backlit LCD display

The contrast of black and white provides excellent visibility even in poorly-lit areas and also prevents eye fatigue.

Bright Bubble

The large, front-mounted spirit level is easy to see with LED illumination, which blinks for 5 seconds after the display is turned on to call for attention to make sure the balance is level.



Fly-Thumbwheel

The leveling feet can be adjusted up or down smoothly using large thumbwheels set in higher position.

Options*11

GXA-03 — **2nd RS-232C interface**

GXA-04 — **Comparator relay output/buzzer/external key input interface**
Enables signaling check weighing results (3 or 5 levels) by buzzer and/or external comparator (traffic) lights. It also has two jacks for separately-sold foot switches.

GXA-06 — **Analog output interface (factory-installed/dealer option)**
0-1 V, or 0.2-1 V for conversion to 4-20 mA.

FXi-08 — **Ethernet interface**

GXA-09 — **Built-in rechargeable battery (factory-installed/dealer option)**
10 hours of charging for 14 hours of operation (the remaining battery level will be indicated on the display). The balance can be used while recharging the battery.

GXA-10*12 — **Large glass breeze break**

GXA-12 — **Animal weighing pan (0.001/0.01/0.1 g readability models of 320 g capacity or higher)**
Use together with the animal weighing (average & hold) mode.

GXA-13 — **Density determination kit for the 0.001 g readability models**

GXA-14 — **Density determination kit for the 0.0001 g readability models**

GXA-17*13 — **Large glass breeze break with built-in fanless ionizer and external IR switch**

GXA-23-PRINT — **External key input interface + the AX-SW137-PRINT foot switch**

GXA-23-REZERO — **External key input interface + the AX-SW137-REZERO foot switch**

GXA-23-PLUG — **External key input interface + the AX-T-314A-S plug**

GXA-24 — **USB host interface (factory-installed/dealer option)**
Accepts an off-the-shelf USB flash drive to save weighing results in CSV format.

GXA-25 — **Fanless ionizer of Quick Ion technology**
Power is supplied from the balance. Activated for a set duration with an embedded IR sensor.

GXA-26 — **External IR switch**
For touchless operation of print or re-zero (tare).

Density determination kits
Make weighing the sample in air and in water quicker, easier and more precise. A&D Apollo can then perform a density calculation automatically.

∗11 Only one of GXA-03, GXA-04, GXA-06, FXi-08, GXA-09, GXA-17, GXA-23-PRINT/REZERO/PLUG, GXA-24, GXA-25 or GXA-26 can be installed (meaning that GXA-03, GXA-04, GXA-06, FXi-08, GXA-09, GXA-23-PRINT/REZERO/PLUG, or GXA-24 cannot be installed in the GX-AE series without first removing its interface for the built-in fanless ionizer.).
∗12 Provided as standard for the 0.0001 readability models of the GX-A/GF-A series.
∗13 Provided as standard for the GX-AE series.

Accessories

AD-1641 — **Air flow logger**

AD-1682 — **Rechargeable battery unit**

AD-1683 — **Static eliminator*14**

AD-1684A — **Electrostatic field meter**

AD-1687 — **Weighing environment logger**

AD-1688 — **Weighing data logger**

AD-1689 — **Tweezers for calibration weight**

AD-1691 — **Weighing environment analyzer**

AD-8127 — **Compact printer**

AD-8526 — **Serial/Ethernet converter**

AD-8920A — **Remote display**

AD-8922A — **Remote controller**

AX-BM-NEEDLESET — **Electrode unit for ionizer (4 pcs)**

AX-GXA-31 — **Main unit cover (5 pcs)**

AX-SW137-PRINT — **Foot switch for print**

AX-SW137-REZERO — **Foot switch for re-zero**

AX-USB-9P — **Serial/USB converter with cable**

AD-8127

AX-SW137-PRINT AX-SW137-REZERO

∗14 Power needs to be supplied from an AC adapter. Recommended when A&D Apollo has another option than GXA-17 or GXA-25 installed.

AD-8529PC/PR-W Bluetooth® converters

Enable wireless communication between a balance/scale and a PC/printer using Bluetooth® technology*15 (line-of-sight distance approx. 10 m when there is no radio wave interference).

D-Sub connector

AD-8529PC-W for communication with a PC

Approx. 10 m

AD-8529PR-W for communication with a printer

USB connector

D-Sub connector

*15 Please contact your local A&D representative to find out whether the AD-8529PC/PR-W is certified for compliance with Bluetooth® communication laws in your country.

Specifications

GX-AE/GX-A/GF-A (0.0001g)

Models		GX-124AE / GX-124A / GF-124A	GX-224AE / GX-224A / GF-224A	GX-324AE / GX-324A / GF-324A
Capacity		122 g	220 g	320 g
Readability		0.0001 g		
Repeatability (standard deviation)		0.0001 g		0.0002 g (300 g) 0.0001 g (200 g)
Minimum weight*i (typical)		120 mg		
Linearity		±0.0002 g		±0.0003 g
Stabilization time (when set to FAST under a good environment)		Approx. 1.5 sec (100 g)	Approx. 2 sec (200 g) Approx. 1.5 sec (100 g)	Approx. 2 sec (300 g) Approx. 1.5 sec (100 g)
Sensitivity drift		±2 ppm/°C (10 to 30 °C/50 to 86 °F, when automatic self calibration is OFF)		
Operating environment		5 to 40 °C (41 to 104 °F), 85%RH or less (no condensation)		
Display refresh rate		5 times/sec, 10 times/sec or 20 times/sec		
Units of measure*ii		mg (milligram), g (gram), oz (ounce), ozt (troy ounce), ct (metric carat), mom (momme), dwt (pennyweight), gr (grain), pcs (counting mode), % (percent mode), SG (density mode), and a user-programmable unit		
Counting mode	Minimum unit mass	0.0001 g		
	Number of samples	5, 10, 25, 50 or 100 pieces		
Percent mode	Minimum 100% reference mass	0.0100 g		
	% readability	0.01%, 0.1% or 1% (depends on the reference mass stored)		
Communication interface		RS-232C and USB		
Applicable calibration weight value		50 g 100 g	50 g 100 g 200 g	50 g 100 g 200 g 300 g
Weighing pan size		Ø90 mm		
External dimensions		259 (W) × 358 (D) × 332 (H) mm (including the large glass breeze break)		
Net weight		Approx. 7 kg		
Power supply / consumption		AC adapter / approx. 30 VA		

GX-A/GF-A (0.001g)

Models		GX-203A / GF-123A	GX-203A / GF-203A	GX-303A / GF-303A	GX-403A / GF-403A	GX-603A / GF-603A	GX-1003A / GF-1003A	GX-1603A / GF-1603A
Capacity		122 g	220 g	320 g	420 g	620 g	1100 g	1620 g
Readability		0.001 g						
Repeatability (standard deviation)		0.001 g						0.002 g (1600 g) 0.001 g (1000 g)
Minimum weight*i (typical)		1.4 g						
Linearity		±0.002 g					±0.003 g	
Stabilization time (when set to FAST under a good environment)		Approx. 1 sec Approx. 0.8 sec (5 g)						Approx. 1.5 sec Approx. 0.8 sec (5 g)
Sensitivity drift		±2 ppm/°C (10 to 30 °C/50 to 86 °F, when automatic self calibration is OFF)						
Accuracy immediately after internal calibration (for the GX-A series)*iii		±0.010 g						±0.010 g (1000 g)
Operating environment		5 to 40 °C (41 to 104 °F), 85%RH or less (no condensation)						
Display refresh rate		5 times/sec, 10 times/sec or 20 times/sec						
Units of measure*ii		g (gram), oz (ounce), lb (pound), lb-oz (pound-ounce), ozt (troy ounce), ct (metric carat), mom (momme), dwt (pennyweight), gr (grain), pcs (counting mode), % (percent mode), SG (density mode), and a user-programmable unit						
Counting mode	Minimum unit mass	0.001 g						
	Number of samples	5, 10, 25, 50 or 100 pieces						
Percent mode	Minimum 100% reference mass	0.100 g						
	% readability	0.01%, 0.1% or 1% (depends on the reference mass stored)						
Communication interface		RS-232C and USB						
Applicable calibration weight value		50 g 100 g	50 g 100 g 200 g	50 g 100 g 200 g 300 g	50 g 100 g (100 g interval) 400 g	50 g 100 g (100 g interval) 600 g	50 g 100 g (100 g interval) 1000 g	50 g 100 g (100 g interval) 1600 g
Weighing pan size		128 × 128 mm						
External dimensions		212 (W) × 317 (D) × 171 (H) mm (including the small plastic breeze break)						
Net weight		Approx. 5 kg						
Power supply / consumption		AC adapter / approx. 30 VA						

GX-A/GF-A (0.01/0.1g)

Models		GX-2002A / GF-1202A	GX-2002A / GF-2002A	GX-3002A / GF-3002A	GX-4002A / GF-4002A	GX-6002A / GF-6002A	GX-10002A / GF-10002A	GX-6001A / GF-6001A	GX-10001A / GF-10001A
Capacity		1220 g	2200 g	3200 g	4200 g	6200 g	10200 g	6200 g	10200 g
Readability		0.01 g						0.1 g	
Repeatability (standard deviation)		0.01 g					0.02 g (10000 g) 0.01 g (5000 g)	0.1 g	
Minimum weight*i (typical)		14 g						100 g	
Linearity		±0.02 g				±0.03 g		±0.1 g	
Stabilization time (when set to FAST under a good environment)		Approx. 1 sec Approx. 0.8 sec (50 g)					Approx. 1.5 sec Approx. 0.8 sec (50 g)	Approx. 1 sec Approx. 0.8 sec (500 g)	
Sensitivity drift		±2 ppm/°C (10 to 30 °C/50 to 86 °F, when automatic self calibration is OFF)							
Accuracy immediately after internal calibration (for the GX-A series)*iii		±0.10 g		±0.15 g		±0.15 g (5000 g)		±0.5 g (5000 g)	
Operating environment		5 to 40 °C (41 to 104 °F), 85%RH or less (no condensation)							
Display refresh rate		5 times/sec, 10 times/sec or 20 times/sec							
Units of measure*ii		g (gram), oz (ounce), lb (pound), lb-oz (pound-ounce), ozt (troy ounce), ct (metric carat), mom (momme), dwt (pennyweight), gr (grain), pcs (counting mode), % (percent mode), SG (density mode), and a user-programmable unit							
Counting mode	Minimum unit mass	0.01 g						0.1 g	
	Number of samples	5, 10, 25, 50 or 100 pieces							
Percent mode	Minimum 100% reference mass	1.00 g						10.0 g	
	% readability	0.01%, 0.1% or 1% (depends on the reference mass stored)							
Communication interface		RS-232C and USB							
Applicable calibration weight value		500 g 1000 g	500 g 1000 g 2000 g	500 g 1000 g 2000 g 3000 g	500 g 1000 g (1000 g interval) 4000 g	500 g 1000 g (1000 g interval) 6000 g	500 g 1000 g (1000 g interval) 10000 g	500 g 1000 g (1000 g interval) 6000 g	500 g 1000 g (1000 g interval) 10000 g
Weighing pan size		165 × 165 mm							
External dimensions		212(W) × 317(D) × 93(H) mm							
Net weight		Approx. 5 kg							
Power supply / consumption		AC adapter / approx. 30 VA							

*i Pursuant to the United States Pharmacopeia (USP), Chapter 41
*ii One additional unit from tael (Singapore/HK jewelry/Taiwan/China), tola or Newton can be added upon request.
*iii Under stable environment (no rapid temperature/humidity change, vibration, draft, magnetism, static, etc). The mass of the internal weight may vary with age.

Dimensions (mm/inches)

GX-124AE / GX-224AE / GX-324AE
GX-124A / GX-224A / GX-324A
GF-124A / GF-224A / GF-324A