CDF7000

User manual

Table of Contents

ATEQ

ATEQ – Measurement Solution, Global Leader.

ATEQ 15, rue des Dames, Z.I. 78340 LES CLAYES-SOUS-BOIS FRANCE	info@ateq.com ateq.com	Tel. +33 1 30 80 1020 Fax: +33 1 30 54 1100
ATEQ K.K. 3 – 41 ATEQ Building, Ikehata Chiryū, Aichi pref. JAPAN	info@ateq.co.jp ateq.co.jp	Tel: +81 566 84 4670 Fax: +81 566 84 4680
ATEQ China 98 Jian Peng Lu Shanghai CHINA	shanghai@ateq.com.cn ateq.com.cn	Tel: +86 21 6763 9508 Fax: +86 21 6763 9528
ATEQ SYSTEMS ANALYSIS TAIWAN CO., LTD. No. 3, LAN 223, San Jia Dong Street 40642, TAICHUNG TAIWAN	ateqtaiwan@ateq.com.tw ateq.com.tw	Tel: +886 4 2437 5278 Fax: +886 4 2437 3675
ATEQ CORP. 35980 Industrial Road Suite L Livonia, MI 48150 UNITED STATES	leaktest@atequsa.com atequsa.com	Tel: +1 734 838 3100 Fax: +1 734 838 0644

We are working continuously to improve our products. So the information contained in this manual, the device and the technical specifications may be modified without prior notification.

The images and illustrations in this manual are non-contractual.

Safety instructions / Warranty

GOOD PRACTICES AND SAFETY INSTRUCTIONS

Safety recommendations

The power supply provided with the device must be used to recharge the battery or to operate the device directly connected to the mains.

For safety and quality purposes, the unit must be supplied with air at a minimum operating pressure (0.6 MPa ± 15%) before being powered up.

Recommendations for the test environment

Keep the test area as clean as possible.

Recommendations for operators

ATEQ recommends that operators using the devices are trained and have a level of qualification that corresponds to the work to be carried out.

General recommendations

— Read the user manual before using the device.
— All electrical connections to the device must be equipped with safety systems (fuses, circuit breakers, etc.) suited to the needs and in compliance with the applicable standards and rules.
— To avoid electromagnetic interference, electrical connections to the device should be shorter than 2 m.
— The power supply plug must be earthed.
— Disconnect the device from the mains before carrying out any maintenance work.
— Shut off the compressed air supply when working on the pneumatic assembly.
— Never open a connected device.
— Avoid splashing water on the device.
— Do not drop the device when moving it.
— Do not place the device on its front panel.

ATEQ is ready to give any information about using the device in optimum safety conditions.

Please note that ATEQ cannot be held responsible for any accident related to misuse of the measuring instrument or the workstation or to non-compliance of the installation with the safety rules.

Furthermore, ATEQ declines any responsibility for the calibration or installation of their instruments that is not carried out by ATEQ.

ATEQ also declines any responsibility for any modification (program, mechanical or electrical) of the device carried out without their written consent.

AIR QUALITY REQUIREMENTS

Air quality requirements according to ISO 8573

The air must be clean and dry.

The presence of impurities, oil or humidity in the air can lead to deterioration which is not covered by the warranty.

When the instrument is used in a vacuum, prevent impurities from getting inside.
We strongly recommend that a suitable airtight filter is installed between the tested part and the instrument.

ATEQ specifies the following for the air supply to the device.

Air characteristics		ISO 8573 class
Particle size and concentration	0.1 µm and 0.1 mg/m^3	Class 1
Dew point under pressure	- 40°C dew point	Class 2
Maximum concentration of oil	0.01 mg/m^3	Class 1

Recommended additional equipment

ATEQ recommends the installation of the following additional equipment:
— An air dryer to supply air at less than -40°C dew point.
— Double filter, 25 micron and 1/100 micron.

Introduction

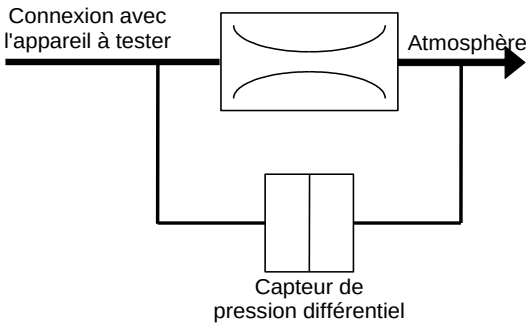
ATEQ CDF7000, MULTI-RANGE LEAKAGE CALIBRATOR

The ATEQ CDF7000 is a multi-range flowmeter for calibrating leakage devices, especially ATEQ devices.

FLOW TEST

Measurement principle

The ATEQ CDF7000 measures a pressure drop using a differential sensor, at the terminals of a calibrated pneumatic orifice. It can also be used to check a leakage or a calibrated jet.



Your ATEQ CDF7000

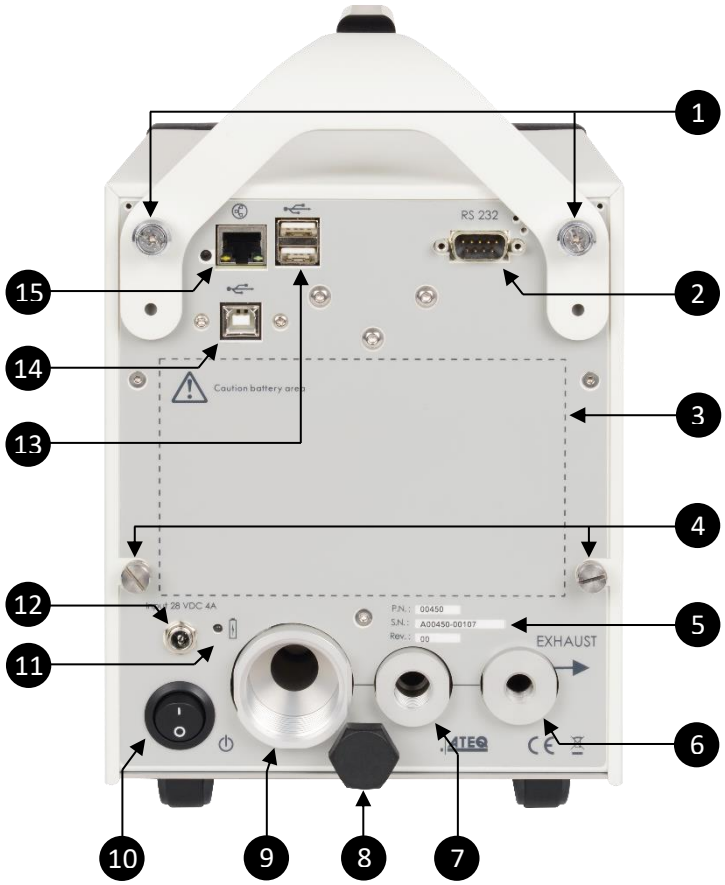
FRONT PANEL

The user interface is located on the front panel.

1. Touch screen.
2. Removable handle.
3. Cycle button (START/RESET)
4. Quick connect for pressure measurement.
5. Flow rate measurement connections.

For more information, refer to the User Interface chapter.

REAR PANEL



1. Handle screws.
2. RS232 connector for Printer / Modbus (option) or Profibus (option)
3. Space for internal battery.
4. Cover screws.
5. Part number/Serial number.
6. Capillary exhaust 2–20 cc/min.
7. Capillary exhaust 250–2500 cc/min.
8. Protective stop.
9. Optional capillary exhausts.
10. Main ON/OFF switch.
11. Charging LED.
12. Connector for power supply 28 VDC ⎓ 4A/h.
13. USB A connector.
14. USB B connector.
15. Ethernet connector.

NB Check that the two handle screws are tight before lifting the device.

Leave enough space at the back of the device for quick access to the main switch.

POWER SUPPLY CONNECTOR

The device has a 24 V lithium-ion battery with 8 hours life.
It takes 3 hours to recharge the battery.

External power supply

24 VDC connector

For charging purposes, connect the device to an external power supply (28 VDC ⎓ 4 A), using a 2.5 mm jack.

The external power supply of the previous version of the CDF device cannot be used with the CDF7000.

NB Do not use any power supply other than the one provided by ATEQ.

Charging

When the charger is not connected, the LED is off.
When the charger is connected, the LED comes on:
- It is red if the battery is charging.
- It is green if the battery is already charged.

When the charger is connected and the battery reaches full charge, the LED goes from red to green.

Main ON/OFF switch

I On

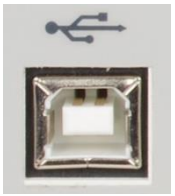
O Off

DIGITAL CONNECTIONS

PC USB connector

USB connectors can be used for connecting miscellaneous compatible USB devices.

The USB connectors are on the rear of the device (see illustration).



USB connector to PC

USB connector to USB key

Do not connect two USB devices at the same time.

Do not use a cable longer than 2 m.

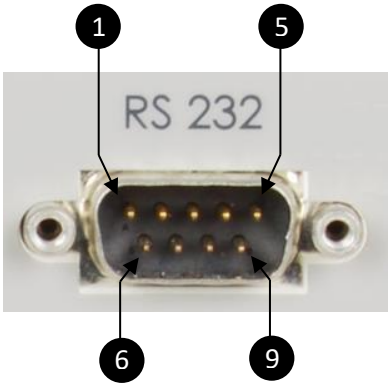
Only use this connection for temporary communication.
Connection to a PC cannot be used permanently because the communication can be disconnected by the PC.

RS232 connector

RS232 - 9-pin male SubD connector

For Printer, Modbus (option) or Profibus (option).

RS232 for printer, barcode reader, PC connection.



Pin number	Signal
1	Not used.
2	RXD data input.
3	TXD data input.
4	Not used.
5	Ground.
6	Not used.
7	RTS request to send.
8	CTS clear to send.
9	Not used.

Ethernet connector (option)

Standard connection Ethernet TCP / IP protocol.

One of these network protocols is available:
— Ethernet.
— Profinet.
— Ethercat.

PNEUMATIC CONFIGURATION

The leakage calibrator can perform a pressure measurement and a leakage measurement.

Pressure measurement

Connect to the pressure circuit of the device under test.

Circuit of the device under test

Leakage measurement

Connect to the measuring circuit of the device under test.

The leakage calibrator has two (or three, depending on options) connections for the leakage test outlet:

- One connection for low flow rates (0.001 – 20.00 mL/min),
- One connection for high flow rates (20.00 to 2500 ml/min).
- **A 3rd optional connection allows different flow rates to be measured according to the size selected (150 l/h, 4000 l/h, 10,000 l/h or 20,000 l/h).**

Circuit of the device under test

Leakage calibration

Test pressure — STANDARD LEAKAGE

User interface

INTRODUCTION

The front user interface has a touch screen and a user button.

1. Touch screen.
2. Cycle button (START/RESET)

BUTTON

Cycle button

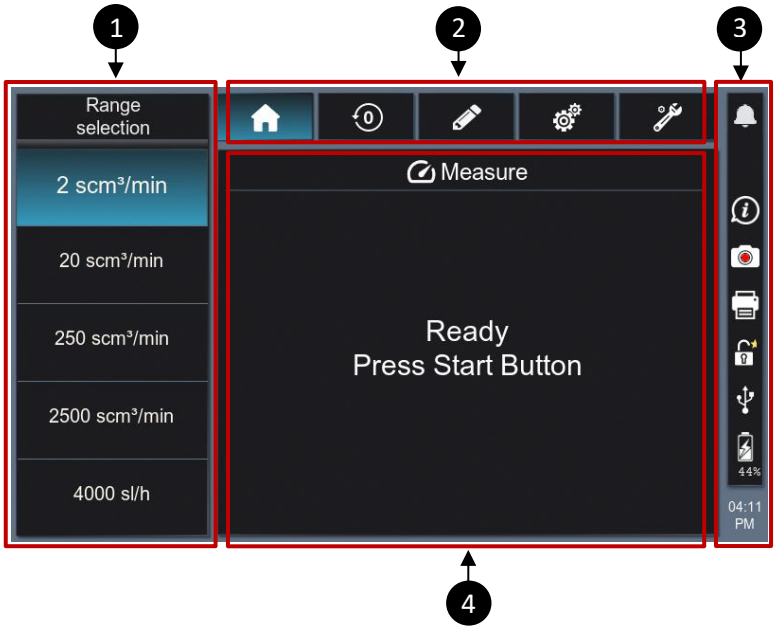
The cycle button starts and stops the measurement.
In Standby mode, the button is green.

Status	Name	Function
○ ⋙ ○	**Start**	Press the button to start the measurement and display the **bar chart measurements**.
○ ⋙ ○	**Stop**	Stops the current measurement and returns to the **Standby** screen.

DISPLAY

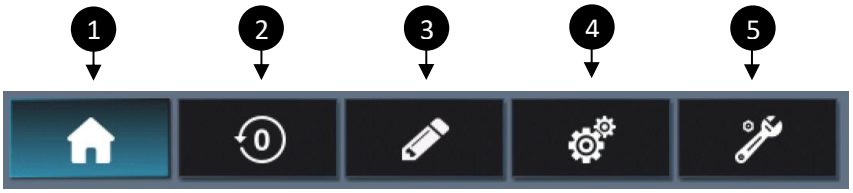
The device has a home screen that changes, depending on the various processes.

HOME screen (Standby mode)



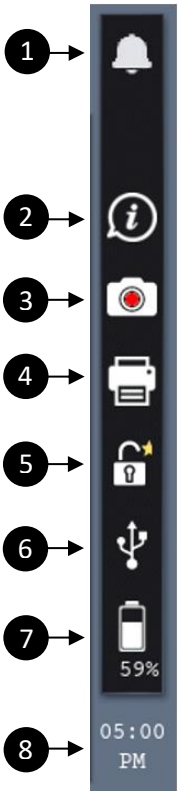
1. Range selection.
2. Navigation tool.
3. Status icon/shortcuts.
4. Measurement display area.

Navigation tools



No.	Button	Description
1	**HOME**	Returns directly to the home screen.
2	**AUTO-ZERO**	Manual start of an auto-zero phase.
3	**SETTINGS**	Measurement settings.
4	**CONFIGURATION**	Goes to device main configuration menu.
5	**MAINTENANCE**	Goes to device maintenance information.

Status icons/Shortcuts

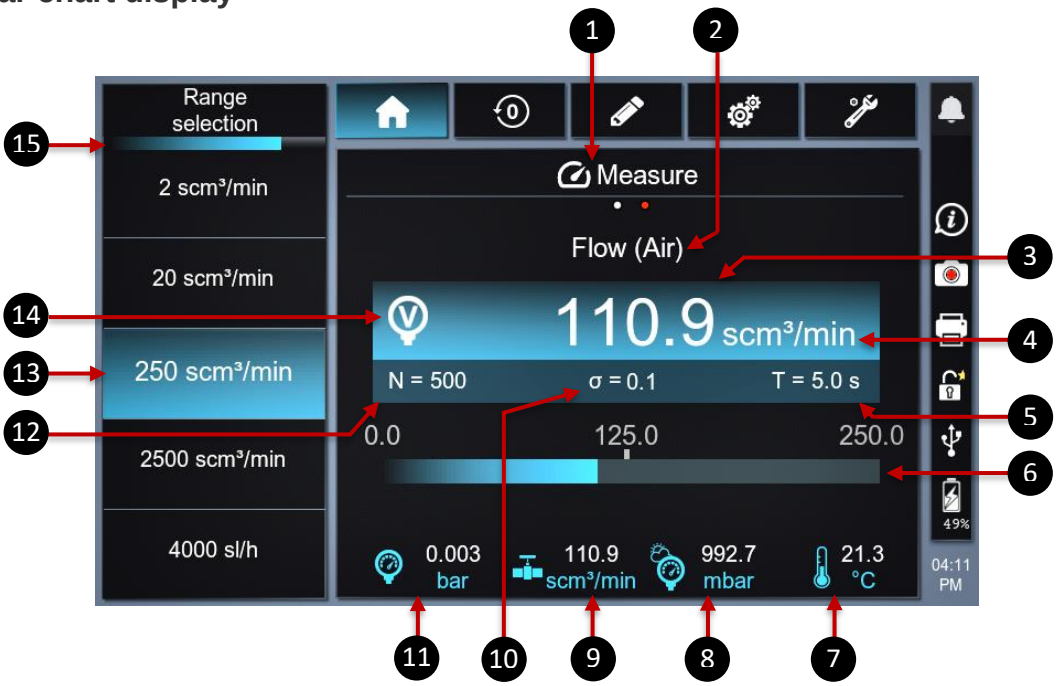


No.	Button	Description
1	**NOTIFICATIONS**	Notification indication / Shortcut to notifications.
2	**INFORMATION**	Shortcut to device information (configuration).
3	**SCREEN CAPTURE**	Takes a screen shot of the live screen (in ATEQ mode).
4	**EXPORT**	Shortcut to export settings.
5	**UNLOCKING**	Indicates that the ATEQ settings are unlocked.
6	**USB**	Indication that the USB connection is active / Shortcut to port configuration.
7	**BATTERY GAUGE**	Indication of battery level / Shortcut to battery information.
8	**TIME**	Indication of time / Shortcut to time and date setting.

HOME screen (in Measurement mode)

The measurement screen displays the current measurement. The device measures continuously and displays the measurements from the various sensors

Bar chart display

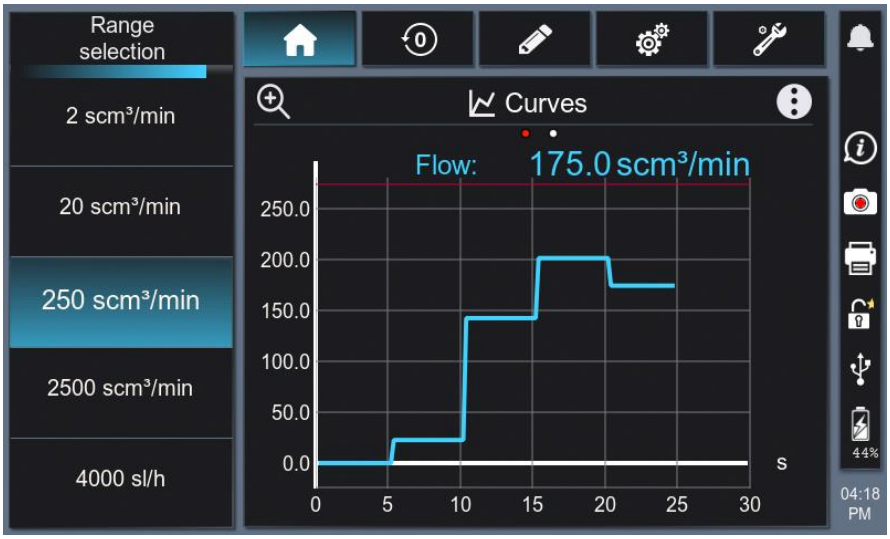


1. Type of measurement display
2. Gas used
3. Flow rate measurement
4. Flow rate unit
5. Filtering time
6. Bar chart / indication of flow rate dynamics
7. Capillary temperature measurement
8. ATM pressure measurement
9. Shortcut to proportional valve setting (not available on pre-series devices)
10. Standard deviation (Sample filter function)
11. Test pressure measurement
12. Number of measurements linked to the filter (Sample filter function)
13. Full scale of selected range
14. Indication of pressure/vacuum
15. Filtering time tracking (Sample filter function)

Other types of display or measurement mode are available by swiping the home screen horizontally.

Curve display

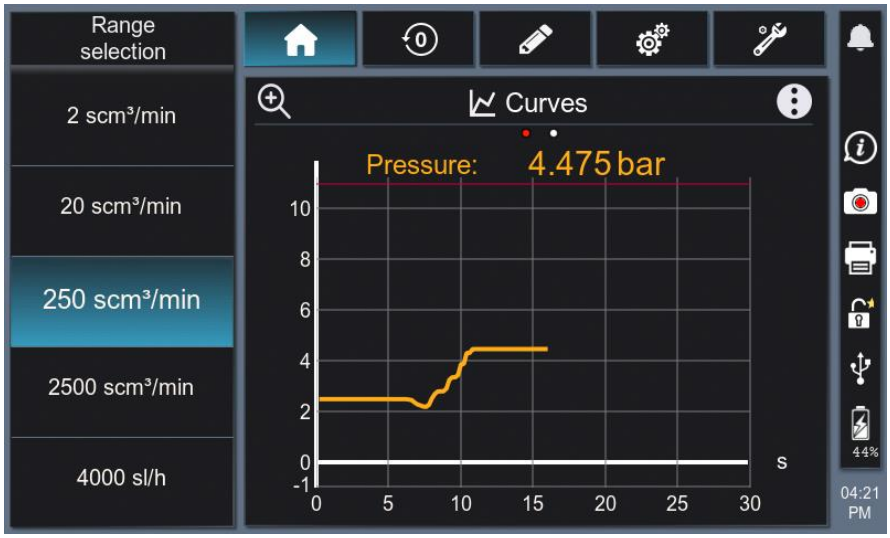
The curve display gives the measurement shown as a bar chart, but the measured points are also displayed as a curve.



The curve display can be enlarged to full screen by clicking the magnifying glass icon 

The measurement curve of another sensor can be displayed. Go to the selection menu using the  button, then select the sensor to be displayed.

The time scale of each curve can be set using the list of times available on the Action Key menu  .



Start-up

POWERING UP

1. **Make sure that all the necessary connections are made.**
   Electrical: e.g., power supply, inputs/outputs, etc.
   Pneumatic: including air line supply pressure.

2. **Power up the device.**
   After powering up the device, the **Home (Standby mode)** screen appears.
   It displays the 2 cc/min range by default.

RANGE SELECTION

Range selection is done directly on the HOME screen, whether the device is in Measurement mode or in Standby mode.

If the device is in Measurement mode, it will automatically perform an auto-zero when changing range.

In automatic mode, the device changes range automatically (present on the same pneumatic connection).

If the flow rate is too high or too low, the device highlights the range suitable for the flow rate applied.

The range can be changed while the measurement is in progress.
The device changes range automatically and performs an auto-zero.

STARTING AND STOPPING MEASUREMENTS

Use the START/STOP button on the front panel to START/STOP the measurement.

Starting the measurement

1. **Press the Start button ◯.**

   The CDF performs a measurement “infinitely” so long as the measurement phase has not been stopped (by pressing Stop).

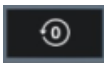
Stopping the measurement

1. **Press Stop ◯ to stop the measurement immediately and return to the Standby screen.**

AUTO-ZERO

An auto-zero can be performed manually or automatically at any time during the measurement.

In manual mode, press the manual auto-zero button.
The unit will perform an auto-zero of the sensors immediately.



The auto-zero function vents the flow rate sensor and the pressure sensor.

To perform an auto-zero automatically, the auto-zero function can be programmed.
This function is found in the Configuration > Pneumatic menu.
A list of time intervals is available.

User settings

The **HOME** screen (whichever display mode) gives access to various sections for managing the device and measurement settings.

SETTINGS MENU

Use this menu for the measurement settings (units, measurement filters, etc.).

Go to settings using the settings button [ ] and select the required setting.

When the device is measuring and a setting is changed, it will perform an auto-zero automatically when returning to the measurement screen.

Available settings

Name	Setting	Description
UNITS	Units of the various sensors	Specific units for each sensor and each range.
>FLOW RATE	Flow rate unit	Flow rate unit displayed: — IS system: mm3/sec, cm^3/h, cm^3/min, cm^3/s, ml/h, ml/min, ml/s, l/h, l/min, m3/h. — US system: cc/sec, cc/min, in^3/h, ft^3/h, in^3/min, in^3/s.
>LINE PRESS.	Test pressure unit	Pressure unit (bar, mbar, PSI, kPa).
>ATM. P.	Atmospheric pressure unit	Atmospheric pressure unit (bar, mbar, PSI, kPa and hPa).
>TEMP.	Temperature unit	Temperature unit (°C, K, °F).
STD UNITS	STANDARD units	Activating flow rate units in STANDARD mode calculates the flow rate measured in other ATM conditions (ATM pressure and temperature): — IS system: smm^3/sec, scm^3/h, scm^3/min, scm^3/s, sml/h, sml/min, sml/s, sl/h, sl/min, sm^3/h. — US system: scc/sec, scc/min, sin^3/h, sft^3/h, sin^3/min, sin^3/s.
> ATM. PRESSURE	Atmospheric pressure	For setting the atmospheric pressure in the calculation of standard units.
>ATM. TEMPERATURE	Atmospheric temperature	For setting the atmospheric temperature in the calculation of standard units.
FILTER	Measurement filtering	Selection of a filter type (none, standard, sampling).
FILTER TIME	Filtering time	Filtering time setting (specific for each filter type).
PRESSURE MODE	Pressure mode	For switching to 'pressure' or 'vacuum' mode.
BUZZER	Buzzer	Buzzer activation configuration
GAS	Gas	Activation and selection of a specific gas.
>GAS TYPE	Gas type	Gas selection (nitrogen, natural gas, butane, propane, G110 or user gas).
>VISCOSITY	Viscosity	Gas viscosity setting.
%/DEG °C	Gas concentration	Gas concentration setting.
DISPLAY OPT.	Display option	Setting of flow rate measurement.
ABSOLUTE	Absolute	Replaces a negative flow rate value with a positive value.
NON-NEGATIVE	No Negative	Replaces a negative value with 0

Changing units

Units can be changed at any time.
The measurement unit of each sensor can be changed.
The unit used to read the measurement is then updated, but the full scale of the active measurement range is also updated according to the new unit selected.

Changing the flow rate unit only affects the selected range. A different flow rate unit can be used with each range.

The list of flow rate units offered is linked to the configuration settings of the standard units or the IS/SAE units.
This list is updated automatically.

According to the active range, some units are not available.

Switching to standard units and settings

By default, the device measures the flow rate in actual atmospheric conditions.
The Standard Units setting changes the flow rate measurement to standard units, and the temperature and atmospheric pressure conditions can be adjusted.

By default, the preset atmospheric conditions are 20.3°C for temperature and 1013.25 mbar for atmospheric pressure.
These conditions can be changed by selecting the corresponding setting.

When the Standard Units function is activated, the Atmospheric Pressure and Temperature settings are displayed and can be changed.

The flow rate is then calculated using these new atmospheric conditions.

Activating the Standard Units function affects all the flow rate ranges of the device (measurement and range indication).

Measurement filters

With the CDF7000, different filter types can be applied to the flow rate measurement.

By default, the Filter function is disabled.

Two filter types are available:

- Standard Filter: the standard filter gives a moving average of the n measurements taken in the indicated time period.
- Sample Filter: the sample filter gives an average of the n measurements over the indicated time period.

According to the status of the Filter function, the bar chart display changes.

Simple display with no filter function activated.

Display with Standard Filter activated.

The filtering time (T) is shown.

Display with Sample Filter activated

This shows:

- The filtering time (T).
- The number of measurements (N) corresponding to the filter frequency.
- Standard deviation.

The Filter function affects the measurement whatever the display type (bar chart or curve).

Selecting the gas type

This function is for gas flow rate measurements different from that commonly used by the device (air).

When the function is activated, 3 settings appear:

- Gas type
- Viscosity
- Concentration (%/deg C)

Different gas types can be selected from a list.

For each gas, the Viscosity and Concentration values are shown by default. They can also be changed.

When the Gas function is activated, the symbol for the selected gas is shown in the measurement screens.

Adjustment and calibration of the device are established with air. Calibration with a specific gas can be performed on request.

CONFIGURATION MENU

Use this menu to configure your ATEQ device.

Name	Function	Description
REGIONAL SETTINGS		
> **LANGUAGE**	Language	Selection of the language displayed on screen
> **DATE FORMAT**		
> **TIME FORMAT**		
> **UNIT TYPE**		
> **DECIMAL**		
PNEUMATIC	Pneumatic	Configuration of the device's pneumatic functions.
> **AUTO AZ**	Automatic Auto-Zero	Automatic reset of the sensors (Diff and piezo) according to adjustable frequency.
LUMINOSITY		
AUTOMATION	Automation	Configuration of the different communications between the device and its environment.
>**USB**		For sending the result frames to a PC.
>**RS232**		Configuration of the communication type on the RS232 port.
>**CSV**		For selecting the separator type for export file.
DATE/TIME		For setting the time and date of the device.
STANDBY		Enables/disables device standby. Sets inactivity time before standby.

IS/SAE units

This function is found in the Regional Settings submenu.

The units can be set to IS (International System) or SAE (US system).

Depending on the selected system, the lists of available flow rate units are updated, along with the range indications.

By default, IS type units are selected

Automatic auto-zero

This function is found in the Pneumatic submenu.

Automatic auto-zero is for periodic auto-zeroing of the flow rate and test pressure sensor.
The frequencies are available on a list.

By default, this function is inactive.

Exporting data

This function is found in the Automation submenu.
Results are exported via the RS232 port.

CSV separator

This function is found in the Automation submenu.
It is for selecting the character to set the column end when exporting data.
Different characters are available on a list.

Standby

To save energy and optimise battery life, automatic standby can be activated.

Different periods are available on a list.

The unit will go to standby if the Start/Reset button on the screen is not pressed after the time given on the list.

The display goes off but the device remains active.

If the device is measuring on standby, the device will continue measuring and exporting (if the export function is active).

To exit standby, touch the screen or press the START/RESET button.

MAINTENANCE MENU

Use this menu to maintain your device (reset, status check, internal tests, etc.).

Name	Function	Description
RESET	Settings reset	
> **SETTINGS RESET**	Resets settings	Deletes any settings (and replaces with default settings).
> **FACTORY RESET**	Settings reset	Deletes the settings + settings of Actions Key + Configuration. Restores the factory settings (default settings).
SENSOR SETTING	For setting the sensors	(Only accessible in ATEQ mode).
VALVE CONTROL	Valve activation function	Enables each solenoid valve to be turned on/off independently.
DEVICE INFO	Device information	Information about the device, program version, built-in components, etc.
CALIBRATION		
> **CALIBRATION DATE**		
> **NEXT CALIBRATION DATE**		

Reset

This menu is for configuring the device according to 2 setting levels.

The Settings Reset function deletes all the settings in the device and replaces them with the default settings.

The Factory Reset function is used to delete all the settings in the device, as well as those in the Action Key and Configuration menus, and replace them with the default settings.

Valve control

This menu enables manual control of each solenoid valve independently.
This function lets users check the proper operation of each solenoid valve and perform an initial assessment for maintenance purposes.

Calibration date

This menu shows the date when the differential sensor was last calibrated.

It also gives the date recommended for the next calibration.
Users can change this date.

STATUS ICONS

Notification

This icon returns users to the notification menu.
On this menu, various information or warning messages can appear (calibration date overrun, etc.).
When a new event occurs, a red dot appears next to the icon to indicate a new unread notification.
Depending on the message, click it to go directly to the corresponding menu.

The event stays on the notification list until it is cleared (press bin icon).

Screen shot

Press this icon to capture the current screen.

The captured image (png format) is stored in the device's memory.
The image files can be recovered when a USB stick is connected to the device.

Information

This icon takes users to the Information menu of the Maintenance menu (electronic board version, software version).
This shortcut saves time for customer service calls.

Export

This icon appears when the export function is activated (Configuration).
Press the icon to go to the RS232 port settings menu (connection settings and export frequency).

Time

Press the icon to go directly to the time settings menu.

Alarm message

The interface shows users internal or handling problems in real time.

PRESSURE – FULL-SCALE EXCEEDED

This message shows that the test pressure level is greater than the sensor's full-scale. This can damage the pressure sensor or the device.

The START/RESET button flashes red along with the message.

To acknowledge this alarm, press the START/RESET button or the Home or auto-zero button.

Before acknowledging the alarm, it is preferable to deal with the cause of the overpressure so as not to damage the device.

FLOW RATE – FULL-SCALE EXCEEDED

This message shows that the flow rate is higher than the sensor's full scale. This can damage the differential sensor or the device.

The START/RESET button flashes red along with the message.

To acknowledge this alarm, press the START/RESET button or the Home or auto-zero button.

Before acknowledging the alarm, reduce the flow rate or change the range so as not to damage the device.

CALIBRATION DATE OVERRUN

This message shows that the calibration validity date of the differential sensor has been overrun.

This alarm corresponds to the date given for the 'next calibration'.
Press the date information to change it.

ATEQ recommends calibration of your devices every 12 months.
ATEQ recommends that this calibration is carried out by ATEQ personnel.

If this calibration is not performed periodically, measurement drift may not be detected in time.
This can result in reduced accuracy or performance of the device.

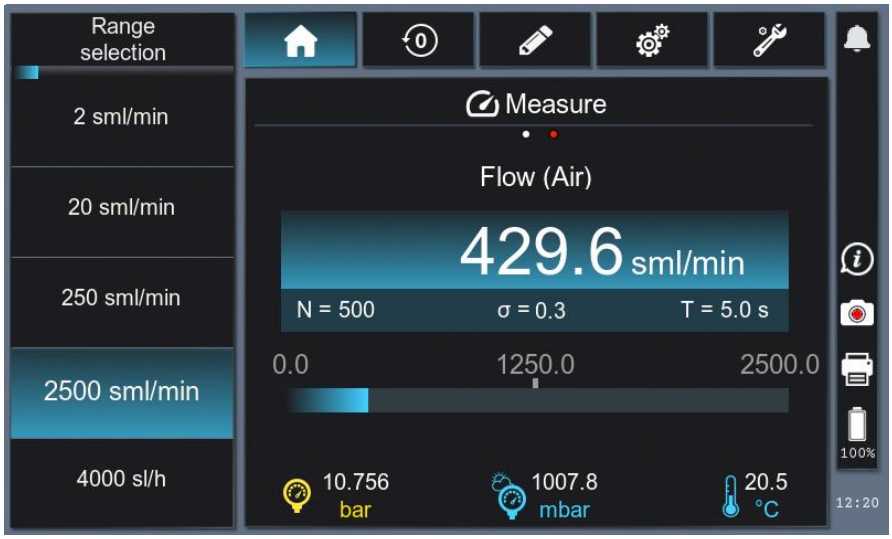
FLOW RATE WARNING

As the measured flow rate approaches the full-scale upper limit, the bar chart display changes colour to alert users.

When the buzzer is activated, it will sound faster when approaching the full-scale of the selected range.

PRESSURE WARNING

When the test pressure approaches the full-scale upper limit, the corresponding icon changes colour to alert users.



Maintenance and servicing

Cleaning instructions

The device should be cleaned regularly to limit any accumulation of dust.
Use the following procedure when cleaning.

1. Switch off the device.
2. Disconnect the power supply cable.

Hold the power cable by the plug and do not touch the cable with wet hands. Failure to do so may result in an electric shock.

3. Wipe the touch screen surface with a clean, soft, dry cloth.

Do not use any cleaners containing alcohol, solvents or surfactants, especially on the screen.

4. Moisten a soft, dry cloth with water and squeeze out as much water as possible.

Avoid wiping the power supply connector with a damp cloth.
Do not spray water or detergent directly on the device.

Handling precautions

Opening the device or dismantling any part of the device (other than accessories, e.g., handle) voids any warranty.
This may also harm proper operation of the device.

For working inside the device, apply the precautions for lithium-Ion batteries (wear suitable PPE)

Recycling

Do not dispose of the rechargeable battery or the device with general waste.

These components must be recovered and recycled.

The crossed-out wheelie bin symbol means that the product must be subject to separate collection at the end of its life within the EU. This measure applies not only to your device but also to any other accessory marked with this symbol. Do not dispose of these products with unsorted household waste. For more information, contact **ATEQ**.

Technical characteristics

Characteristics	Values
Overall dimensions: Height x Width x Depth	220 x 175 x 230 mm
Overall dimensions (with handle)	260 x 175 x 230 mm
Weight	Approx. 5 kg
Power supply	Li-ion 24 VDC ⎓ 4 A battery
	External power supply 28 VDC ⎓ 4 A
Pneumatic air supply (test pressure measurement)	Air supply: <1 MPa
Pneumatic connections: (internal/external diameters)	- STAUBLI RBE03 coupling for capillaries 1 and 2 - 25 mm barbed coupling for optional range - 4/6 mm for pressure measurement
Operating temperature	+5°C to + 45°C (+ 41°F to 113°F)
Storage temperature	0°C to +60°C (32°F to 140°F)
Operating altitude	Up to 2,000 m (6,500 ft)
Relative humidity	80% at 31°C (87°F) and 50% at 40°C (104°F)