dado lab

Isokinetic sampler

ST5

User manual

English - 01/2022 - rev1.7

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1 General information

Receiving the goods

Remove the instrument from packaging and verify immediately the integrity and presence of the content.

Important

In case of damages of the packaging, a note to the courier must be immediately written on the transport papers supplied they will ask you to sign. If the note it's not carried out, no claims for refunding or replacing the instrument will be accepted.

Any damage observed after unpacking must be notified within 8 days from receiving the goods and a written communication to the delivery company must be sent considering them responsible for any consequence.

Test

Test and calibration are carried out in Dado Lab facilities, at the end of test, a report with test and calibration results will be produced and given to the customer.

To request a test in your facility, please contact your local dealer. .

Warranty conditions

Warranty cover a period of 12 months from the day you receive the goods or from test in your facility (if applicable).

Disposable or rechargeable batteries have a 6 months warranty.

Consumable materials, such as components which have to be replaced periodically during the instrument lifetime (protection filters, fuses, lamps etc) are not covered by warranty.

Warranty exclusion/limitation

Dado Lab takes no responsability for damages caused by external factors, unvolontary damages, improper use, modifications of the instrument or use of third party devices, negligency, improper transport or loss caused by shipping back the instruments, in those cases, warranty will not be applied.

Moreover, warranty expires in case of service or maintenance not carried out by Dado lab or non authorized dealers.

Warranty is limited to the value of the purchased instrument. .

In case of malfunctioning, please contact :

service@dadolab.com

Conformity

Safety and CE mark

Dado Lab declares the instrument is in compliance with the following standard:

Low voltage instruments directive BT 2014/35/UE

Directive 2011/65/UE ROHS - Restriction of Hazardous Substances Directive

Directive EMC 2014/30/UE for the electro-magnetic compatibility (EMC)

Machinery Directive 2006/42/EC

Sampling methods

Dado Lab declares the instrument is compliant to the followng standards and rules for the sampling :

Emissions

UNI EN 16911-1

Measurement of stationary source emissions — Manual and automatic determination of velocity and volumetric flow in ducts - Part 1 : Manual reference method

UNI EN 13284-1:2003

Stationary source emissions – Determination of low range mass concentration of dust – Part 1: Manual gravimetric method.

UNI EN 1911

Stationary source emissions - Determination of mass concentration of gaseous chlorides expressed as HCl - Standard reference method

UNI EN 14385

Stationary source emissions – Determination of the total emission

of As, Cd, Cr, Co, Cu, Mn, Ni, Pb, Sb, Tl and V

UNI EN 13211

Air quality. Stationary source emissions - Manual method of determination of the concentration of total mercury.

UNI EN 13649

Stationary source emissions. Determination of the mass concentration of individual gaseous organic compounds. Activated carbon and solvent desorption metho.d

US EPA Method 2 - Determination of stack gas velocity and volumetric flow rate (type s pitot tube)

US EPA Method 5 & 17- Determination of particulate matter emissions from stationary sources

Safety rules

To correctly use the instrument, please follow carefully the safety indications:

1. Do not remove, for any reason, the side panels without having turned off the instrument and unplugged the power.
2. Always connect the instrument to sockets equipped with operational grounding.
3. Do not use the ST5 outdoor without a proper protection from rain and possible sources of humidity.
4. Before any operation, place the ST5 on a flat, stable surface and be sure there is space for an adequate venting.
5. Max operating temperature within -10÷40 °C range
6. Max sampled gas temperature not exceeding 45°C
7. Avoid contact and suction of corrosive or flammable compounds.
8. Do not connect to the USB port any recharging device or portable hard drives. Use only USB keys.

The supply includes

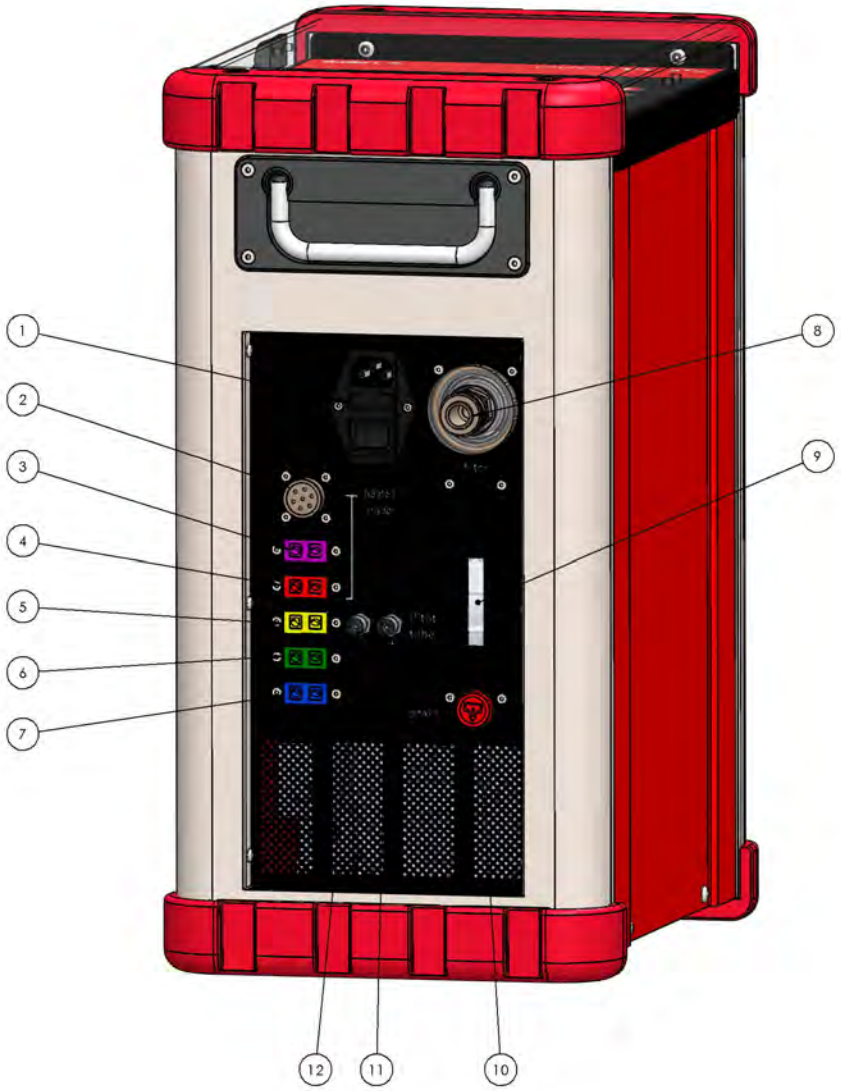
ST5 is supplied with the following accessories :

- ST5 instrument
- Trolley transport case
- Power cord
- Test and calibration report
- USB key with Administrator access

2 Parts identification

ST5 connection panel

1. Power switch. Drawer for protection fuse type 3x20 T6.3 (A)
2. Probe power socket HP5
3. Filter temp. thermocouple connector
4. Probe temp. thermocouple connector
5. Stack fumes temp. thermocouple connector
6. Condenser outlet temp. thermocouple connector.
7. Auxiliary temp. thermocouple connector
8. Suction quick connector and particulate matter protection filter
9. H_2O trap inspection window
10. H_2O trap water discharge cap.
11. Pitot quick connector (+)
12. Pitot quick connector (-)



Control panel

20. USB port to download data

ATTENTION :
Do not connect any other device then USB keys!
Do not use this port to recharge portable devices such as mobile phones or hard drives.

21. Display

22. START - STOP - PAUSE key

23. Page up key

24. Page down key

25. Enter key, accept what edited

26. Arrow keys to move the cursor

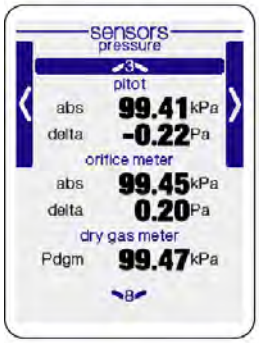
3 Main page

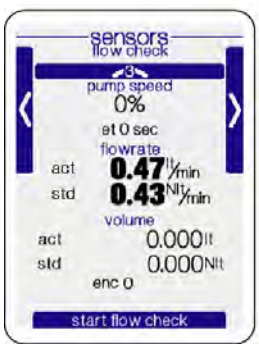
When turning on the ST5, after the loading the system (about 30 secs), the main menu will be displayed.

Using the F1 and F3 keys is possible to move to the desidered activity window.

Available activities are :

1. Isokinetic sampling
2. Constant Flow Sampling
3. Duct traverse velocity profile
4. Sensor and flowrate test





Using the 8 and 3 keys, is possible to move to the next or previous menu (if applicable)

4 Libraries

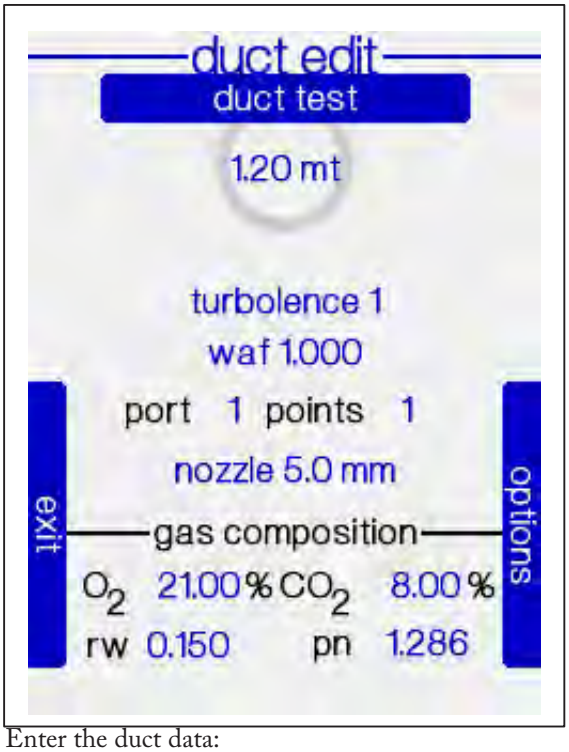
Duct libraries

Before starting any activity, it's necessary to enter in the ST5 the information related to the duct.
The ST5 can log a wide number of ducts which can be called back before starting a new sampling activity or velocity evaluation.

The main screen shows the actual duct specifications, to enter a new duct or edit an existing one, press **ENTER.** Press the **OPTION** and select.

Select the duct shape:

Circular or Rectangular.



Enter the duct data:

Press **ENTER** to enter the duct identification name.

Used Symbols

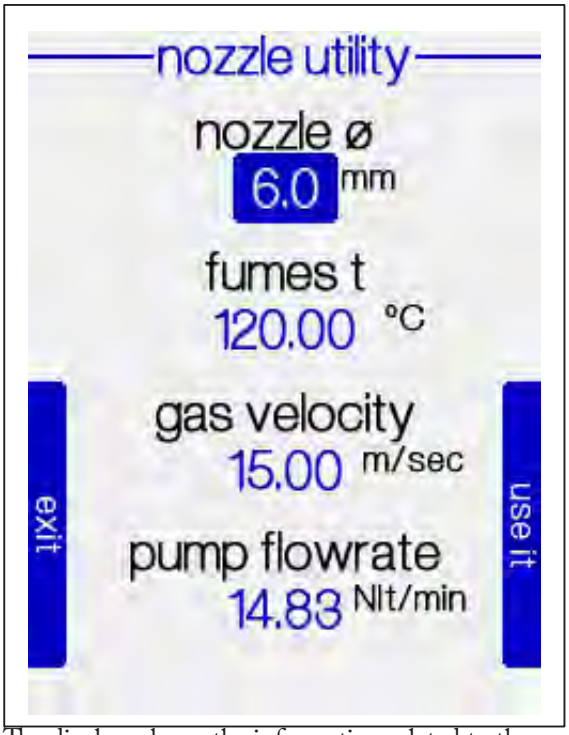
Turbolence Velocity measurement integration time, from 1 to 9 seconds.

waf Wall adjustment factor (check ISO EN 16911 chp. 10.4)

port number of stack ports on the sampling plane

points number of points for the sampling plane.

nozzle nozzle diameter, press ENTER to access to the nozzle evaluation utility.



The displays shows the information related to the last measurement and suggest a theorical nozzle diameter which allows to have a working flowrate of about 15 Nl/min.

In any case, is possible to manually enter the values of temperature and velocity to update the calculation.

Be sure to **enter at the end the exact nozzle diameter** which will be used in the sampling and then select **use it** to link it to the duct specifications.

Gas composition

Entering the duct flue gas composition and absolute humidity ration will allow the ST5 to calculate the density, used to determine the gas velocity.
If you know already the density value, you can enter it directly.

O_2 Oxygen percentage

CO_2 Carbon Dioxide percentage

rw Water vapour content expressed as ratio between volumes (eg. rw=0.15 = 15 AH%)

ρn Gas density in kg/Nm^3

Note

The fumes water content is a very important parameter and must be entered correctly in the instrument. The isokinetic sampling methods require to determine this value before any sampling.
An error in the evaluation of the rw may lead to over/underestimation of the sampled volumes and isokinetic flowrates.

At the end of the duct setup, press **options** and then **Save duct & actual** to use this duct.

Sampling points determination

Respect to the EN 10169 standard, the EN 16911 refers to the EN 15259 for the points number evaluation, this method slightly modifies the past method for the sampling points number. The main difference is the adoption of the tangential method, which means no central point for circular ducts.

Minimum sampling points for circular ducts

Sampling plane area (m^2)	Diameter range (m)	Minimum number of diameters	Minimum bumber of sampling points per diameter
< 0,1	< 0,35	-	1[a]
0,1 a 1,0	0,35 a 1,1	2	4
1,1 a 2,0	> 1,1 a 1,6	2	8
> 2,0	> 1,6	2	At least 12 o 4 per m2[b]

[a] Using a single sampling point may lead to errors bigger than the defined ones for this standard
[b] For very large ducts, 20 points are generally enough

Minimum sampling points number for rectangular ducts

Sampling plane area (m^2)	Minimum number of lateral divisions[a]	Minimum bumber of sampling points per diameter
< 0,1	-	1[b]
0,1 a 1,0	2	4
1,1 a 2,0	3	9
> 2,0	≥ 3	At least 12 o 4 per m2[c]

[a] Further lateral divisions my be necessary if, for instance, the lenght of the duct side is greater than the double of the short one.
[b] Using a single sampling point may lead to errors bigger than the defined ones for this standard
[c] For very large ducts, 20 points are generally enough

Pitots Library

The ST5 instrument logs the serial number and the used Pitot constants serie in order to have the correct Pitot constant in relation to velocity value.

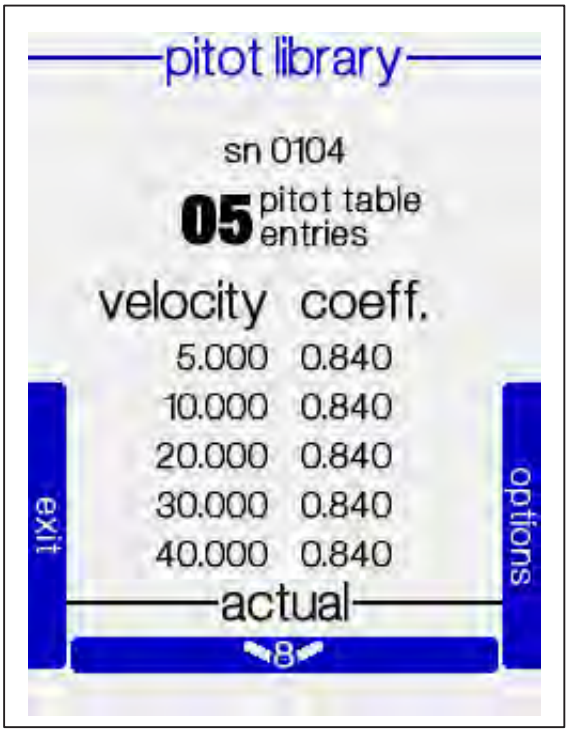
Select the Pitot and press **Enter** to enter the library

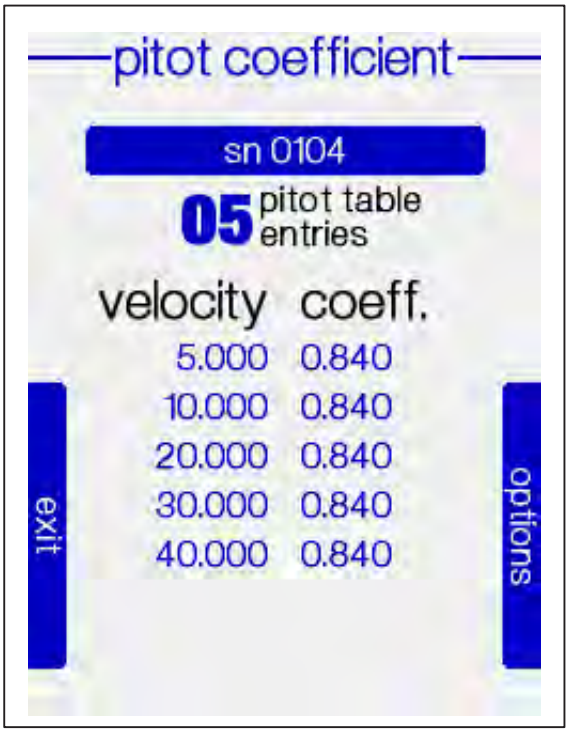
On the screen will appear the actual Pitot with the programmed constants.

The Pitot constants are usually supplied by the manufacturer and calculated by comparison with a reference Pitot as requested by the ISO EN 16911.

To modify or enter a new Pitot, press **option** and then select **edit Pitot** or **new Pitot**

For a new Pitot, enter the serial number and the new constants.





5 Velocity profile and swirl test

Execution of the duct velocity profile

In compliance to ISO EN 16911-1 method

Select Velocity Profile application, on the display there is the actual duct and Pitot.

Disconnect from the ST5 the Pitot tubes and execute the autozero of the differential pressure sensor selecting **zero differential.**

In case the "autozero dp" option is installed, there is no need to disconnect the Pitot.

Insert the probe in the duct and the velocity will be displayed.

Press Start sampling to start the measure.

An zeroing dP request will appear, press **Start** to zero the dP sensor or choose **Skip** to proceed.

On the display the first measuring point distance "**probe pos**" will appear

The **"probe pos"** shows on screen.

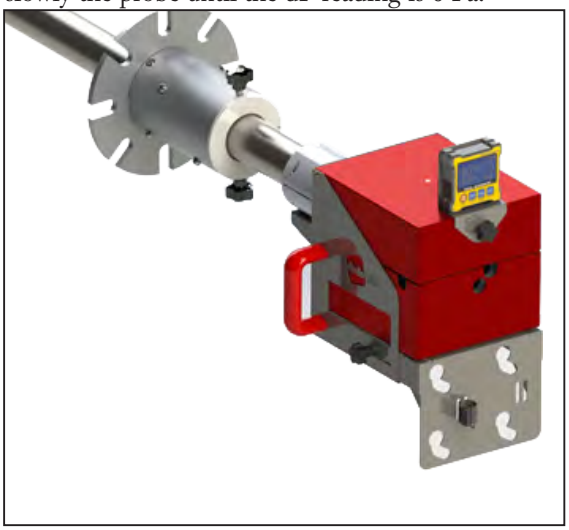
Press **Enter**, to execute the **Swirl test**, otherwise press **start**.

Enter the swirl angle

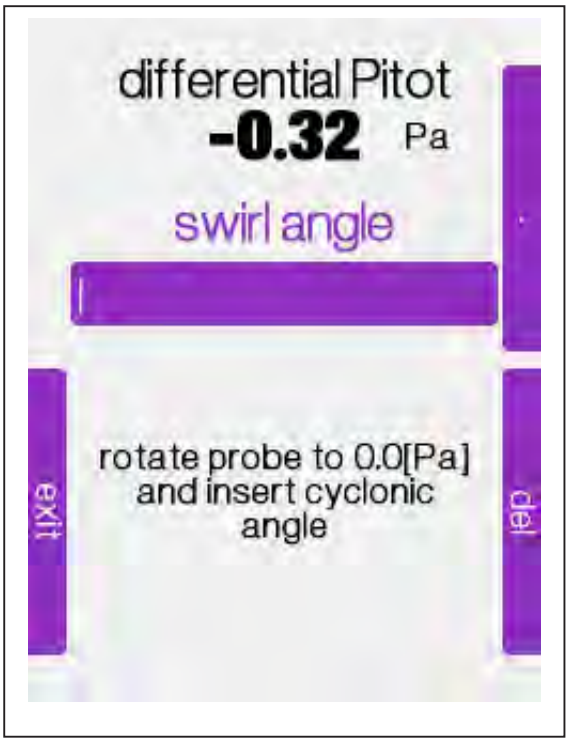
To make the swirl test, insert the probe with the Pitot rotated of 90° respect to the flow direction.

Check for the dP reading on the display, it should be, more or less, close to 0 Pa (considering the duct oscillation).

In case the dP reading is different from zero, rotate slowly the probe until the dP reading is 0 Pa.

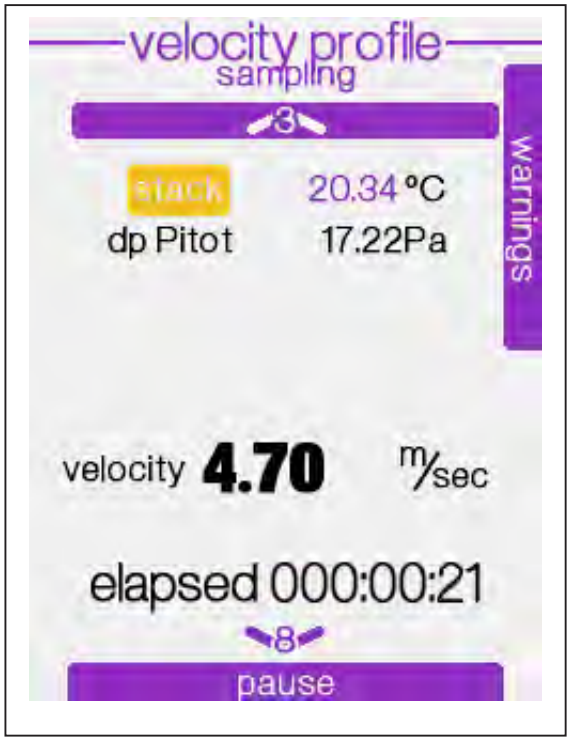


For this determination, Dadolab supplies a digital inclinometer (p/n 101 110 3001) which can be directly installed on the HP5 probe and shows on the display directly the inclination angle.



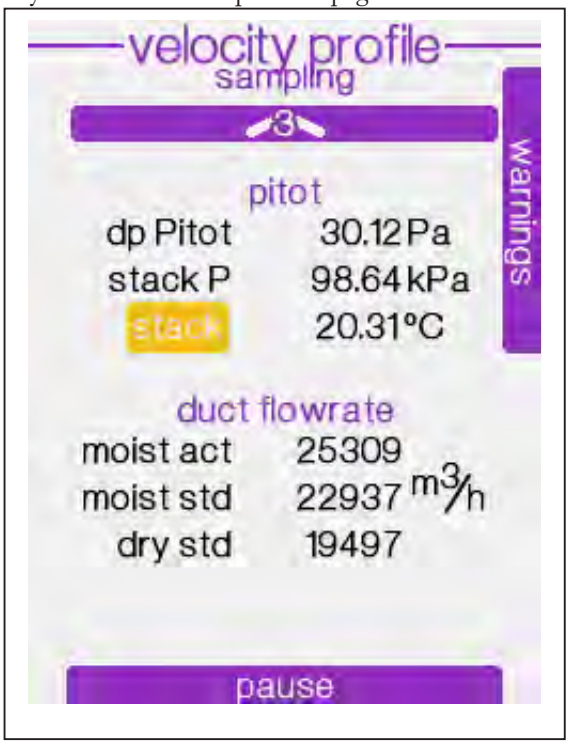
Once 0 Pa condition is reached, **enter** on the ST5 the corresponding ancle and rotate the probe to its normal position. Proceed with the next point.

Press enter to proceed with measurement.

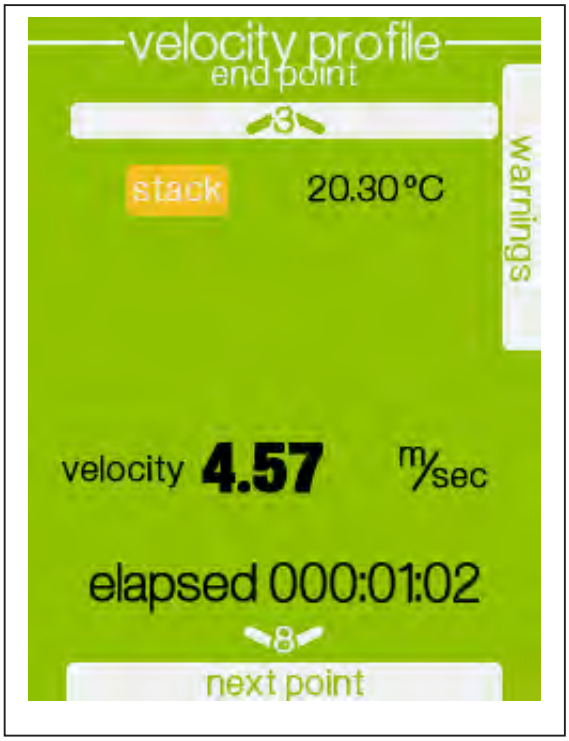


On the screen the velocity value will be displayed and the measure will start. The measure will go on until the time set is reached or user stops it.

To display the other parameters, press the **3** or **8** keys to move to next/previous page.



To stop the measure and move to the next point, press **pause**, then **option** and **close actual point**



Proceed and perform all the sampling points till the end of the program.

6 Isokinetic sampling

Leak test

The leak test is a common request in every isokinetic sampling methods and it's an import aspect to verify the correct assembling of the sampling line.

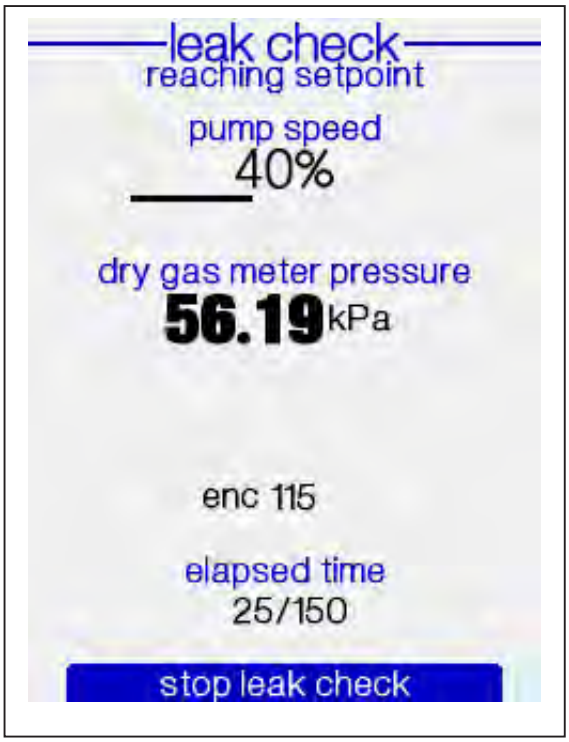
The standards define a maximum leak of 2% of the sampling flowrate.

Attention, carrying out the leak test using a different procedure than the one described here may lead to damages of the dry gas meter.
Please follow the indications carefully.

A complete test will last about 3 minutes

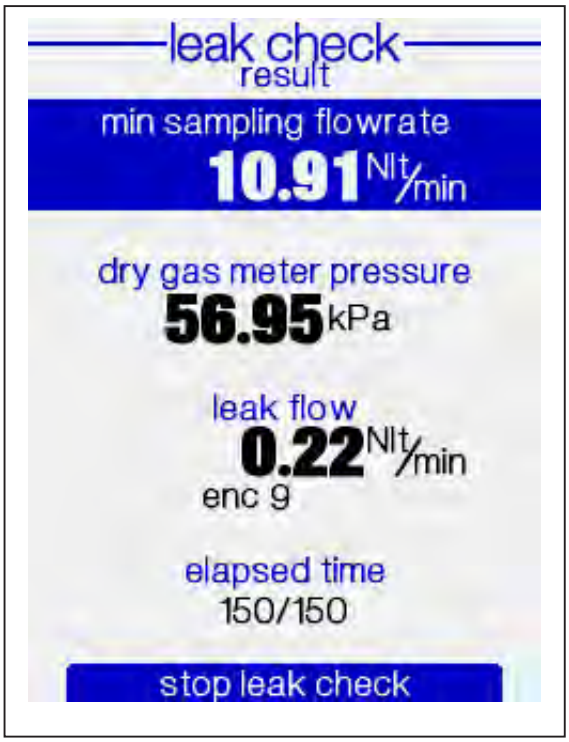
Select **leak check** and press **enter**

Assemble the sampling line as specified by the the adopted sampling standard and close inlet of the nozzle then press **START**.



The ST5 pump will start to create the vacuum in the sampling line.

The test will be done at an absolute pressure of about 60 kPa and will last 150-240 seconds.



At the end of the test, the mimimum sampling flowrate, calculated on the measured leak and acceptability criteria of 2%, will be indicated.

Press **STOP**

Note! Slowly open the inlet of the probe allowing a gradual balance with the ambient pressure.

Press **STOP** to end the test. The leak test result will be logged in the report

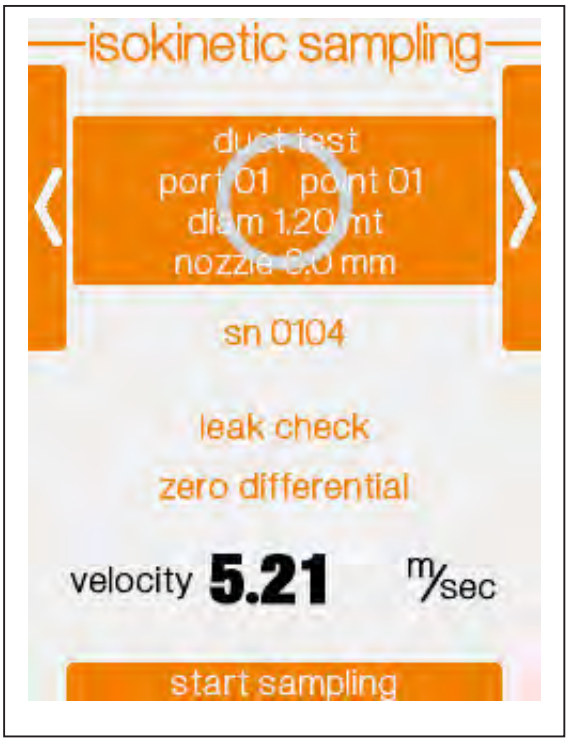
Starting the sampling

The actual duct settings will be displayed on the screem along with the Pitot tube.

Disconnect the Pitot tubes on the ST5 and execute the autozero of the dP sensor choosing **zero differential.**

If the "autozero dp" option is installed, do not disconnect the Pitot tubes.

Insert the probe in the stack to display the flue gas velocity.

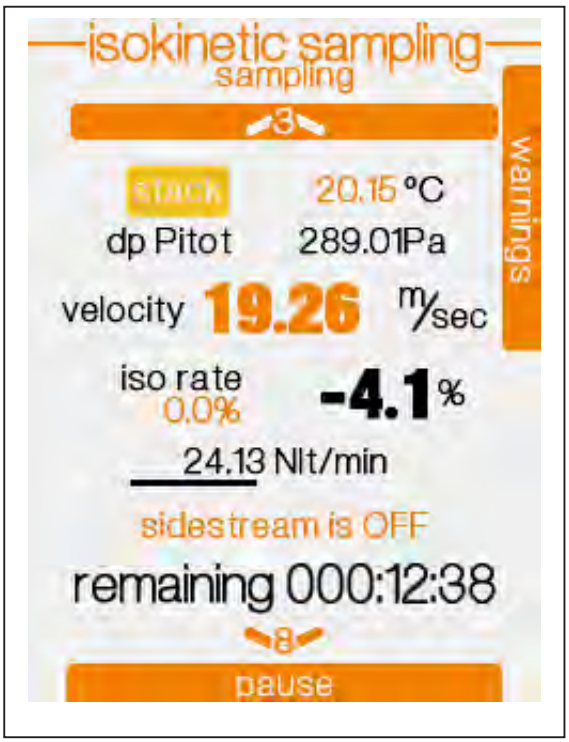


Press **START** to begin the sampling

The first point positioning will be displayed on the screen.

Press **ENTER** and choose the duration of each point.

Press **START** to begin the operation



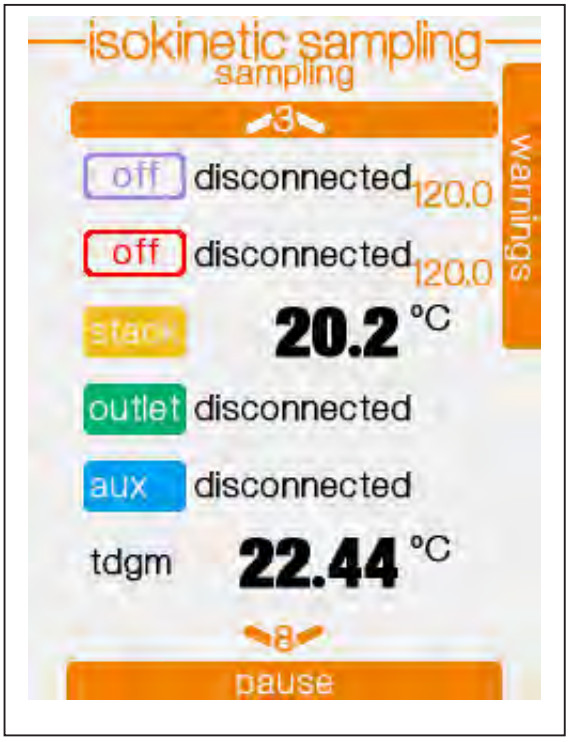
The sampling will start and on the display will appear the related information.

Parameters displayed during the sampling

To display the other parameters, press the **3 or 8 and scroll through the screens.**

Temperaures readings and set points of the heated devices.

To set the heating temperatures, refers to Ch. 7



Reported temperatures are :

- Filter heating temperature (HUB HP5)

  Set point

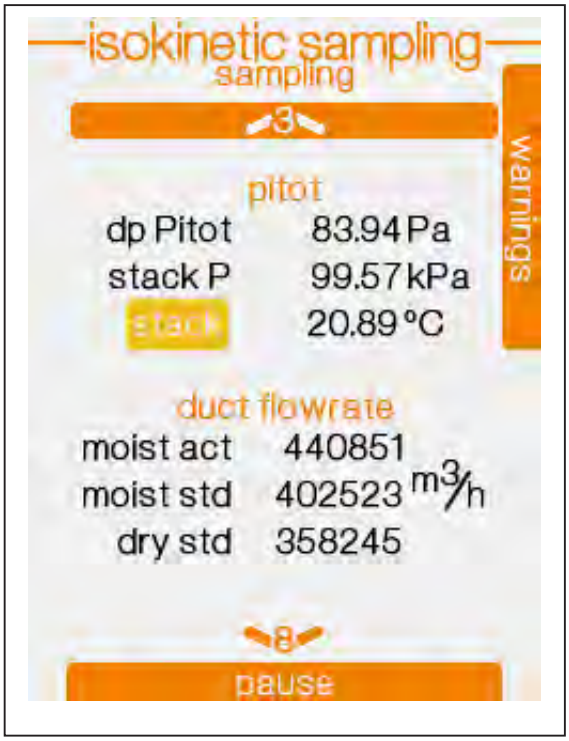
- Temperatura riscldamento sonda

  Set point

- Stack gases Temperature
- Condenser Out Temperature (FC5)
- Auxiliary Temperature (eg. for the cooling bath)
- DGM Temperature

"Disconnected" indicates the sensor plug isn't connected to the instrument.

Pitot readings and Duct flowrates



dp = differential pressure

stack P = Stack absolute pressurenterno condotto

stack = Stack temperature

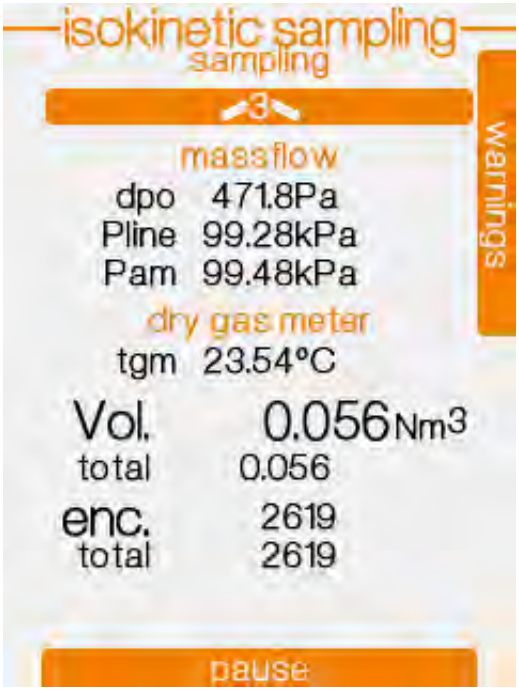
Instantaneous stack flowrate

moist act = Actual Wet

most std = Std Wet (@0°C 101.3kPa)

dry std = Std Dry (@0°C 101.3kPa)

Sampling flowrates and Volumes



Sampling flowrate measured by the mass flowmeter

dpo = MF orifice differential pressure

Pline = Sampling line absolute pressure

Pam = Atmospheric Pressure

tgm = DGM temperature

Vol. = Sampled Volume in the sampling point

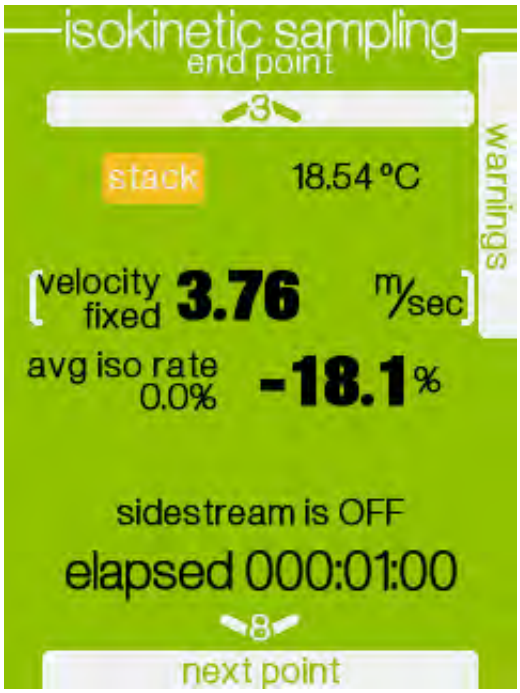
total = Total sampled volume

enc. = impulses collected by the DGM encoder for the sampling point

total = Total collected impulses by the DGM encoder

The encoder installed on the DGM transmits the collected voluume reading which is then converted by the ST5 in Nm^3 using the temperature and pressure data measured in the DGM.

The sampling operation will go on till the end of the set time is reached.



To close the sampling point and move to the next one, press **next point,**

The following point is displayed on the screen along with the new distance for the probe. Once in position, press **start**

Repeat the procedure for all the programmed sampling points.

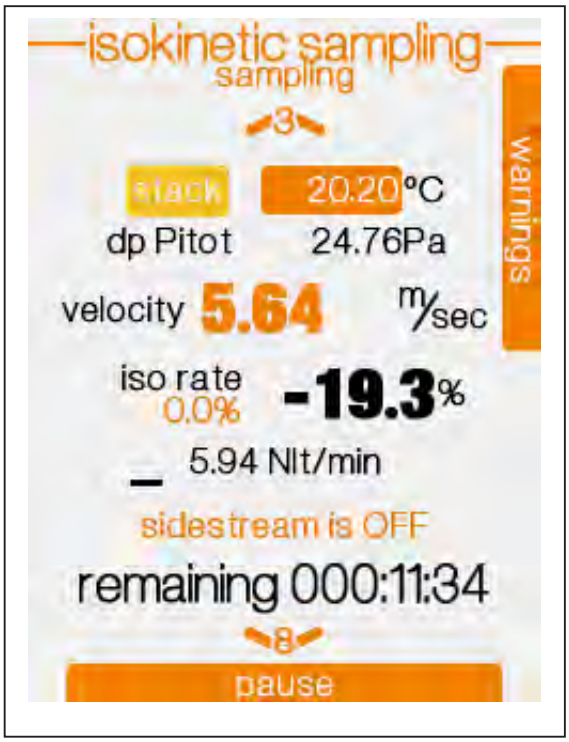
At the end, the following message will be displayed:

At the end of the sampling a pump purge is suggested in order to clean the pump

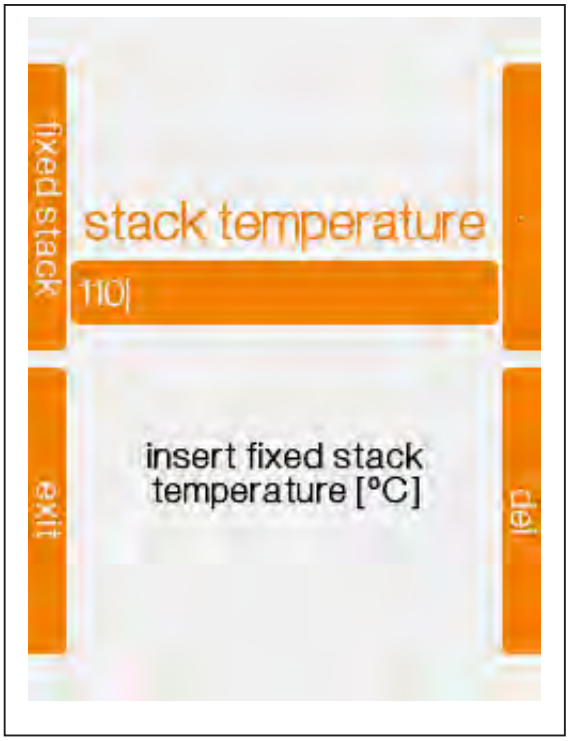
Set the temperature manually

During the sampling operation, it's possible to set manually the stack fumes temperature indicated as "**stack**"

Move the cursor on this voice and press **ENTER**



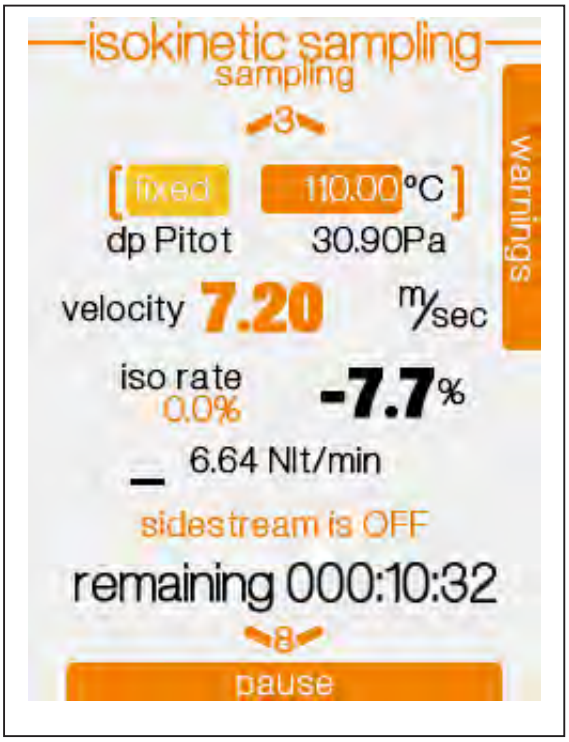
The following display will appear.



Press the **F1** key to enable the **"fixed stack"**

Now enter the desired temperature value .

Press **ENTER** to acknowledge and go back to the sampling screen.

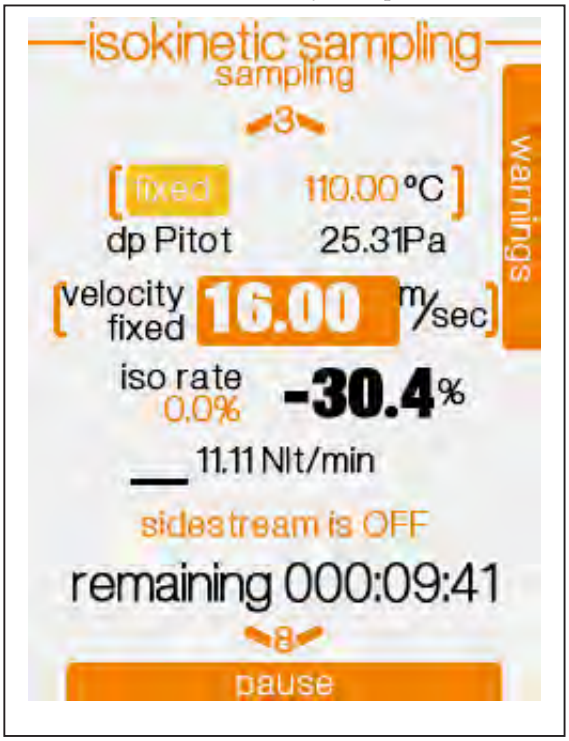


Temperature value will be displayed between parenthesis and the indication [fixed] will appear

Set the velocity manually

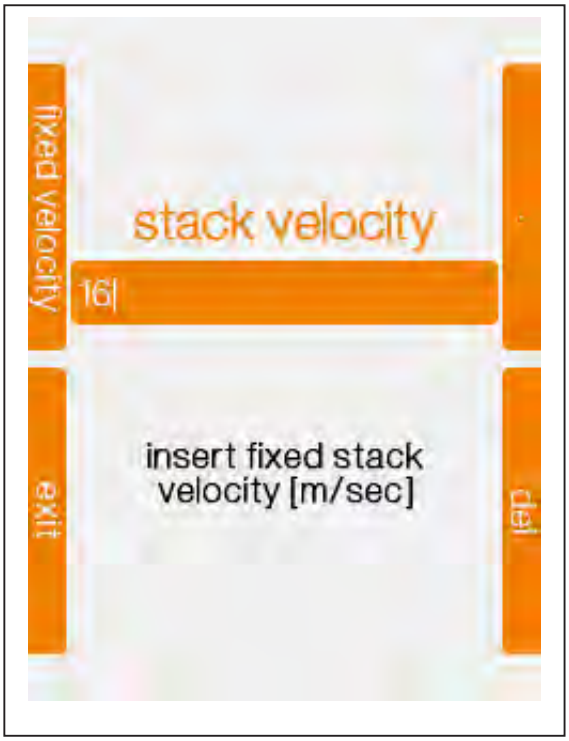
During the sampling operation, you can set manually the stack fumes velocity.

Move the cursor on "**velocity**" and press **ENTER**



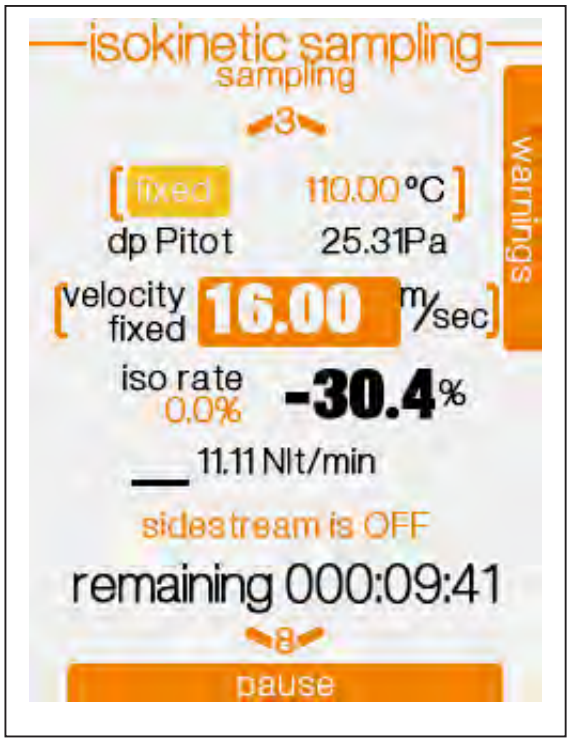
The following display will appear.

Press the **F1** key to enable the **"fixed velocity"**



Now enter the desired velocity value.

Press **ENTER** to acknowledge and go back to the sampling screen.



Velocity value will be displayed between parenthesis and the indication [velocity fixed] will appear

Setup of the Side Stream

Use this function during the side sampling.

Navigate pages until you reach the **side stream** page.

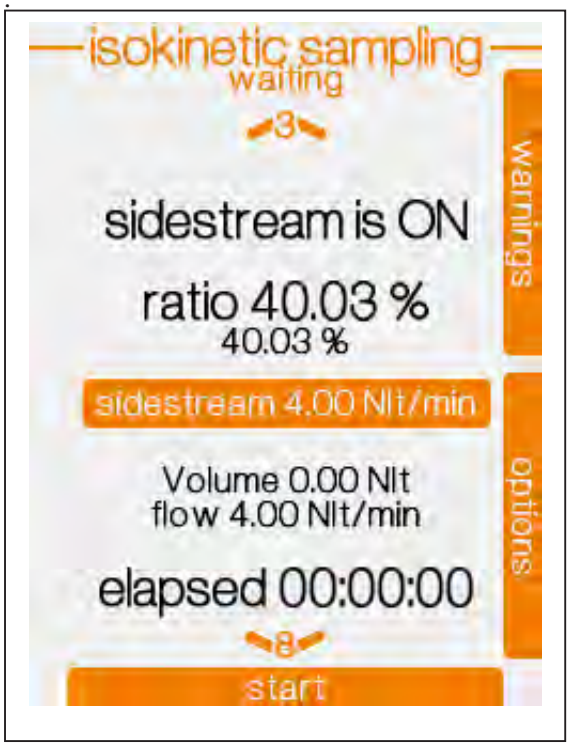
Press ENTER on "sidestream" button to enable and select sidestream flow.

Press **F1** to enable **"side stream ON"**

Enter the flowrate value set for the side sampling pump as Nl/min.

Press **ENTER** to confirm and go back to the sampling screen .

.

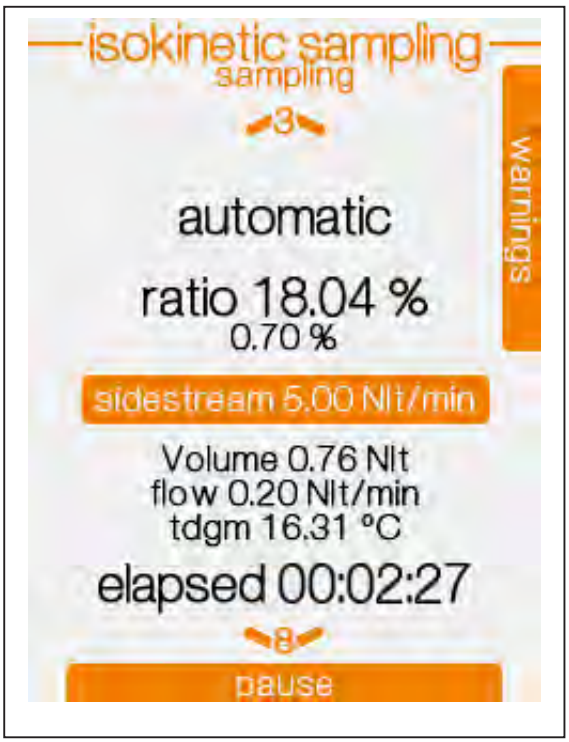


The instrument will go back to the sampling screen, the side stream value is displayed.

ADS - Automatic sidestream

When ST5 is connected to the automatic sidestream sampler ADS, a completely automatic sidestream sampling is enabled

During the sampling the ADS follows the sidestream value maintaining ratio with the ST5 instrument in isokinetic conditions.



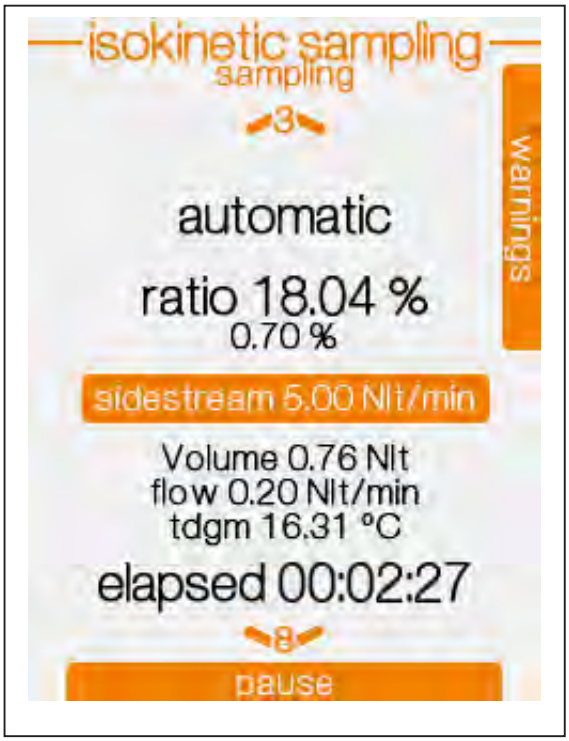
In the sidestream page the automatic label shows that ADS is connected and running.

Some sidestream data are showed:

- calculated sidestream ratio
- actual ratio
- nominal sidestream setpoint linked to the ratio
- sidestream Volume at normal conditions
- sidestream flow at normal conditions
- sidestream dry gas meter temperature
- elapsed time with sidestream active

Press ENTER on “sidestream” button to specifiy the sidestream setpoint

Set the sidestream flow setpoint selecting “sidestream 5.00 Nlt/min” and pressing ENTER key.



Before starting sampling process, set the sidestream nominal flow that the ADS must follows.

When the sampling starts, the ST5 commands the ADS to follow the nominal flow. As soon as the ST5 reach the isokinetic condition, the ST5 flow and ADS flow ratio is calculated. From now on, the ratio is granted; when ST5 flow increase due to different duct velocity conditions, ADS also increase the sidestream flow.

7 Constant flow

This operative mode turn the isokinetic sampler into a constant flow sampler with automatic regulation.

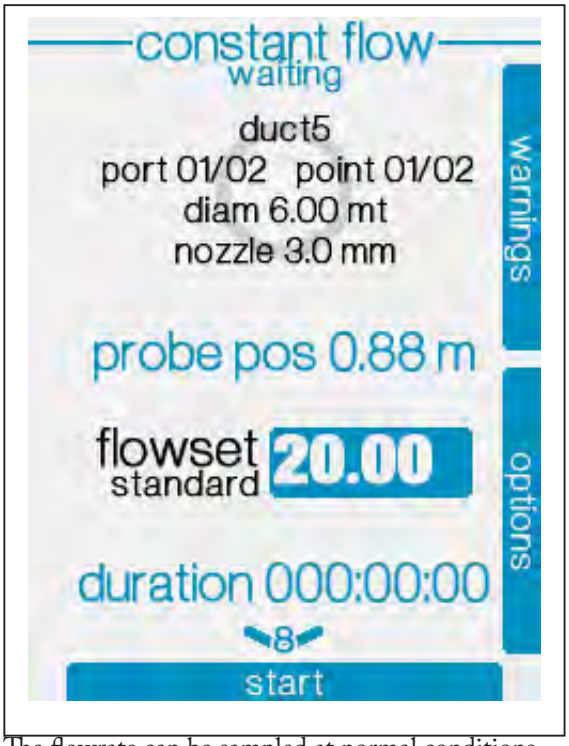
This mode is used to sample with multistage impactor or stack cyclones but could be also used to sample using ambient impactors.

During the sampling operation, the instrument measures and logs all the parameters and calculates the isokinetic deviation.

The isokinetic deviation is used also for the acceptability criteria for the sampling when impactors are used.

The operations are identical the the isokinetic sampling ones.

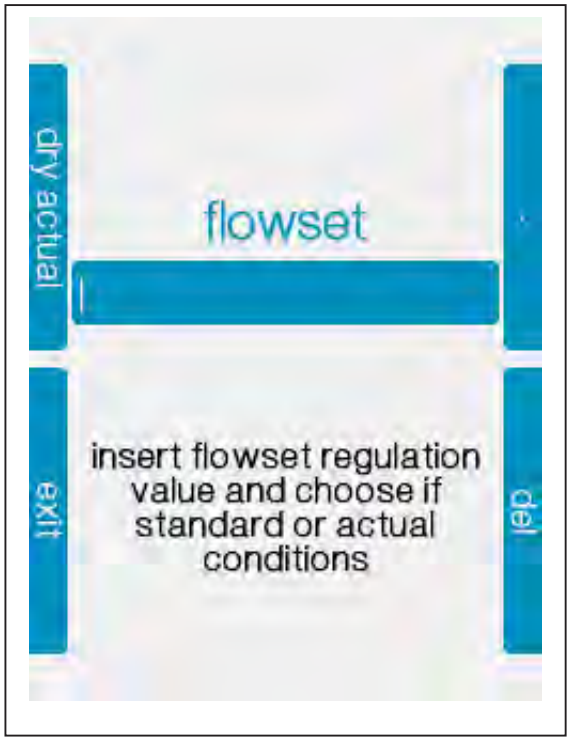
Press **START** to begin a sampling.



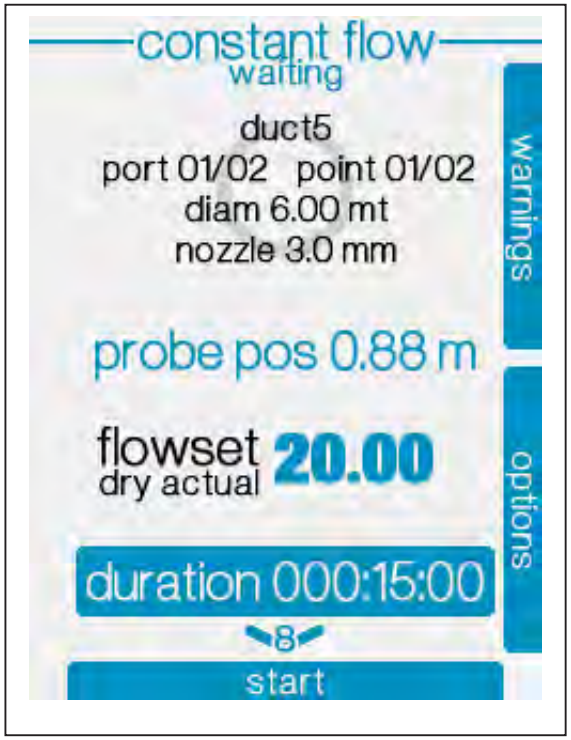
The flowrate can be sampled at normal conditions (0°C @ 1013 kPa) or to actual ones.

When sampling at actual conditions (like when using the ambient impactors) it's necessary to plug in the stack fumes thermocouple in order to supply the temperature for the flowrates and volumes normalization. Also, in the duct specifications, modify the gas composition and humidity.

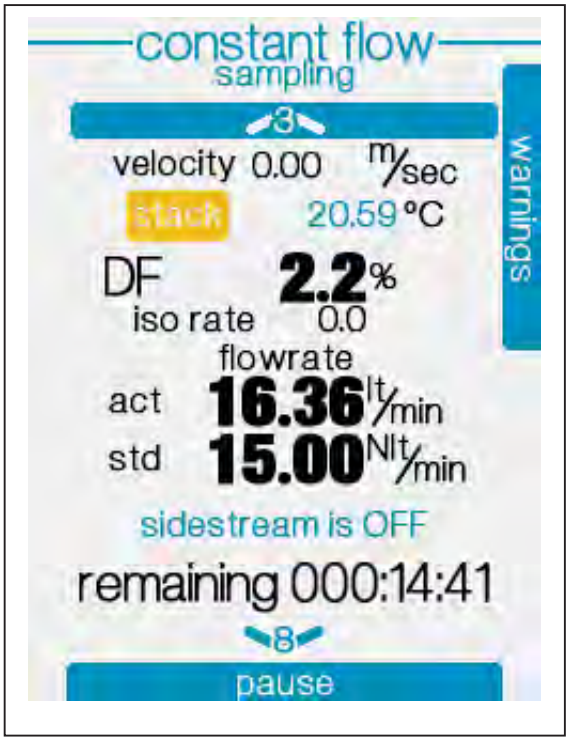
In the constant flow screen, select **dry actual** or **standard.**



Then set the desired duration and press **START.**



During the sampling, flowrate at both standard and actual condition is displayed.



DF is the flow deviation % from the set point.

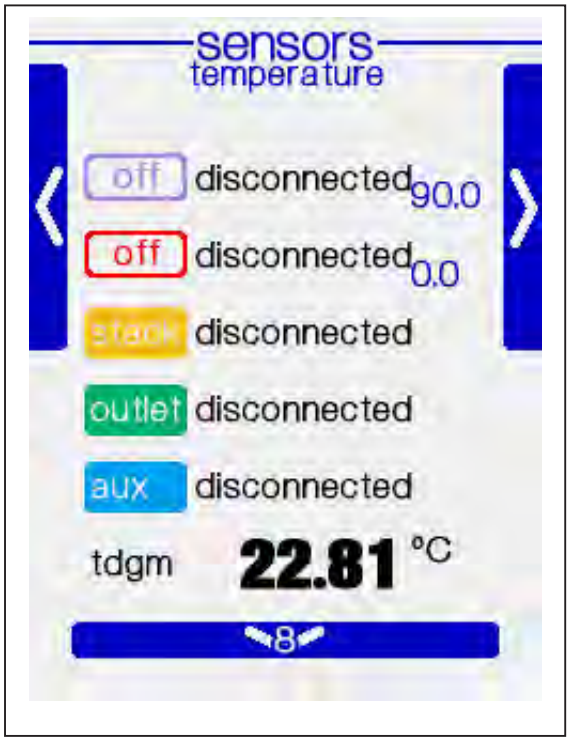
8 sensors - flow check

This mode allows you to test the flow of the ST5 instrument and the correct operation of the pump.

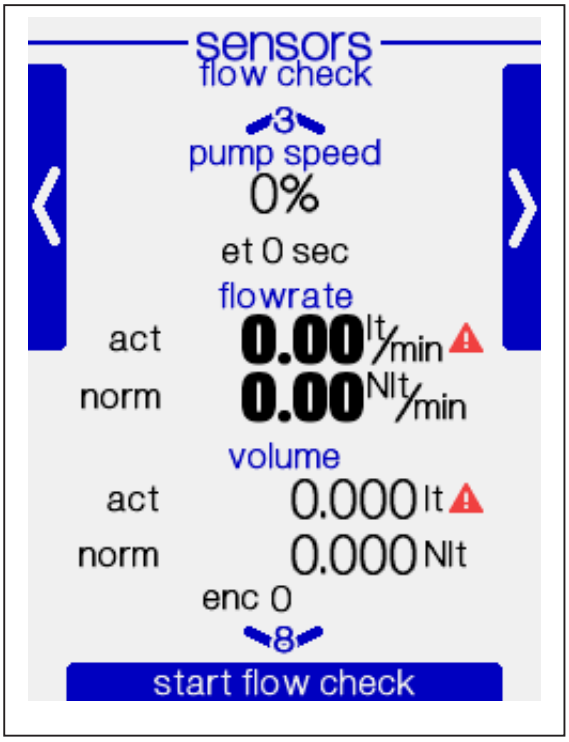
For a more accurate reading of flowrate, keep the instrument ON a few hours to stabilize the sensors.

If you want to verify the flowrate, connect a reference CF1 instrument on the suction quick connector.

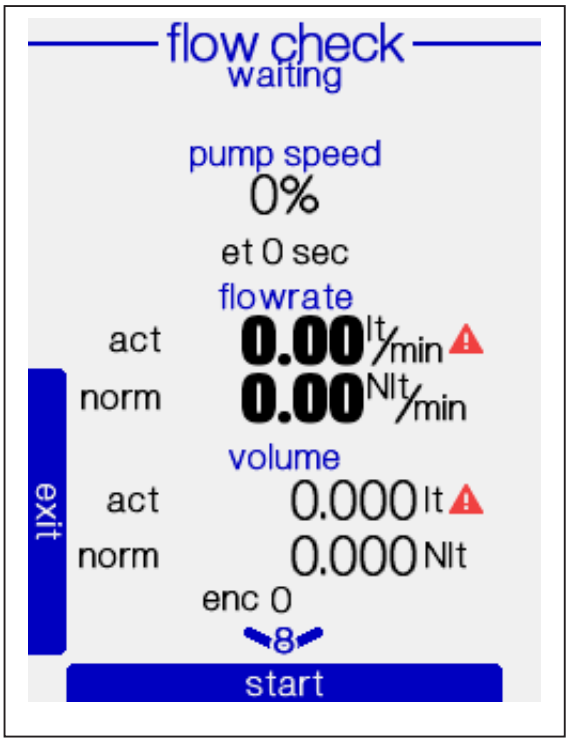
To access “flow check” navigate with F1-F3 keys to “sensors” page.



Press the “down” 8 key to “flow check” page.

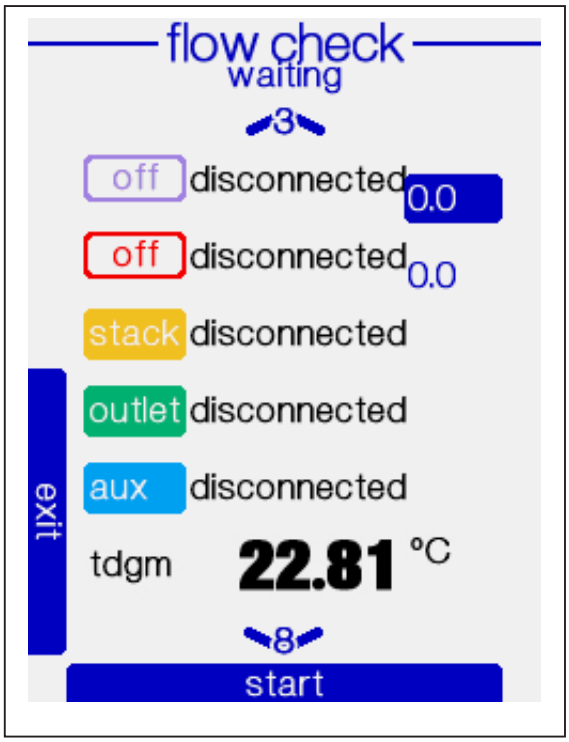


Press START/STOP key to enter “flow check” mode. It may be required to perform a zero of the differential pressure sensors. Accept and continue.

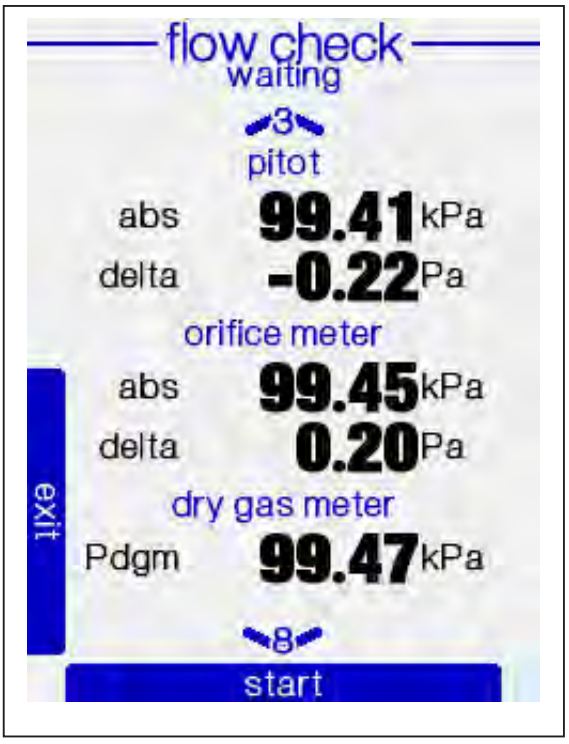


From now on, you can start a flow check. You can navigate in the available pages with 8 and 3 keys.

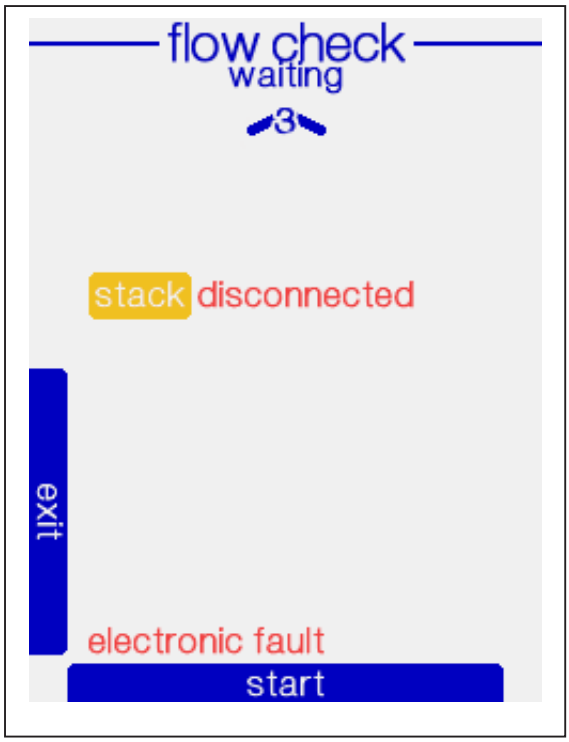
The red signals next to the flowrate act and volume act indicate that a stack thermocouple is not connected, so the flow at the stack conditions are not reliable. Connect a stack thermocouple.



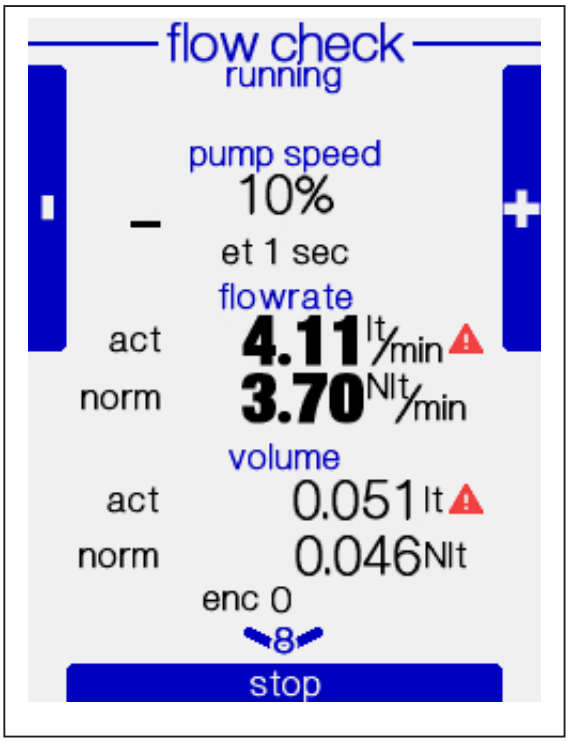
Temperature page



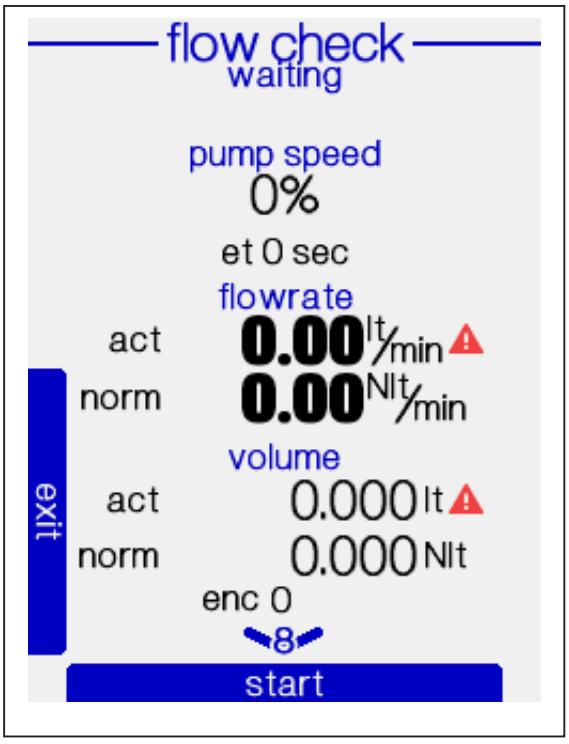
Pressure page



Alarms page



With + e - keys (F1 & F3) you can adjust the pump flow. Press START/STOP key with pump on, will turn off the pump.



Press START/STOP key to turn on the pump.

The flowrate is measured on orifice meter.

The volume is measured on dry gas meter.

The actual conditions are stack thermocouple temperature and ambient pressure.

The normal conditions are 0°C and 101.32kPa.

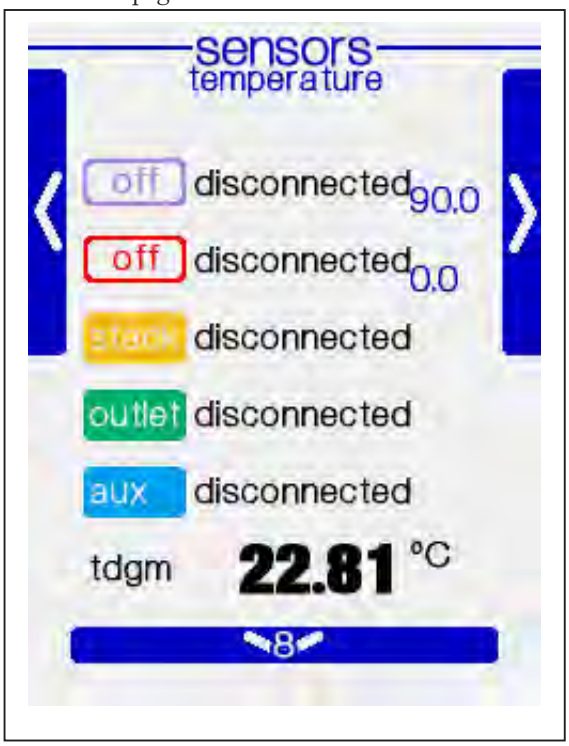
Press the exit key (F2) to return to “sensors” page and to normal functioning mode.

9 sensors - volume check

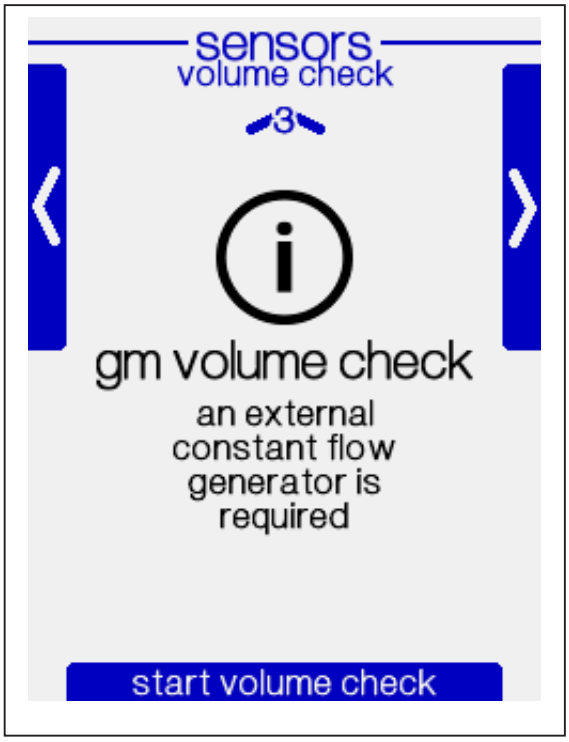
This mode allows you to test the dry gas meter volume using an external flow generator, bypassing the internal ST5 instrument pump.

For a more accurate reading of flowrate, keep the instrument ON a few hours to stabilize the sensors.

To access "volume check" navigate with F1-F3 keys to "sensors" page.



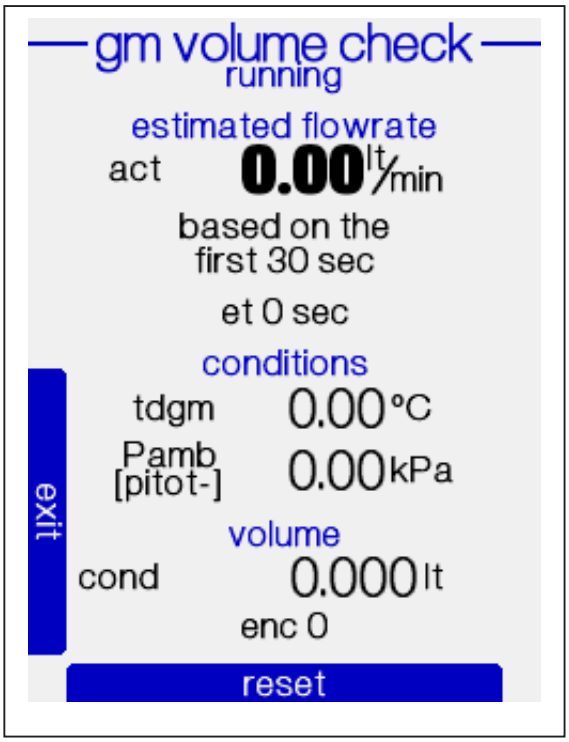
Press the "down" 8 key to "volume check" page.



Press START/STOP key to enter "volume check" mode.

Disconnect the dry gas meter air tubes. Connect to the dry gas meter inlet an external stable flow generator. Left the outlet disconnected (in ambient).

Press START/STOP button.



During running phase, the instrument shows:

- estimated flowrate based on dry gas meter
- time elapsed
- dry gas meter temperature condition
- ambient pressure (measured on pitot - input) condition
- corrected volume at conditions / gamma

Every time the "reset" (START/STOP) button is pressed the instrument restart flowrate evaluation for 30 seconds.

This flowrate is used to calculate the correction gamma value (see "sensor correction curves" in Configuration chapter) used to correct the volume.

At the end of the volume check, stop the external stable flow generator and press "exit" (F2) button.

Connect the dry gas meter air tubes correctly inside the instrument.

10 Data download

The instrument allows the data and report download only when not in sampling.

In order to download data and reports, you need an empty USB dongle key, FAT32 formatted. Insert the key into the instrument.

After a couple of seconds, the instrument shows the download report menu.

Select “new only” and press ENTER to download only the newest reports never downloaded before.

Select “today’s only” and press ENTER to download only the today’s report.

Select “last week’s only” and press ENTER to download the reports of the last 7 days.

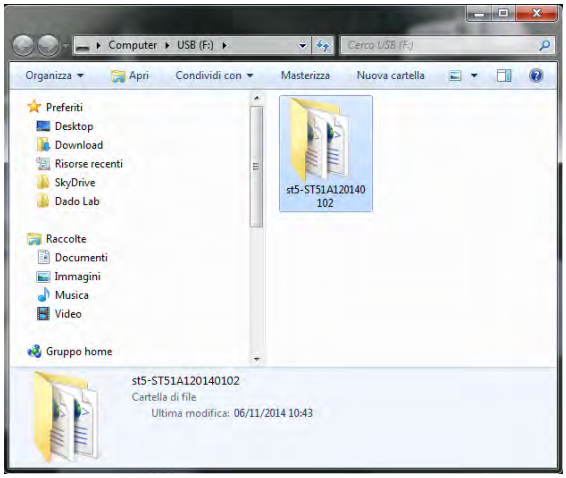
Select “all reports” and press ENTER to download all the reports from the instrument

Please wait the end of the export report process before unplug the usb key.

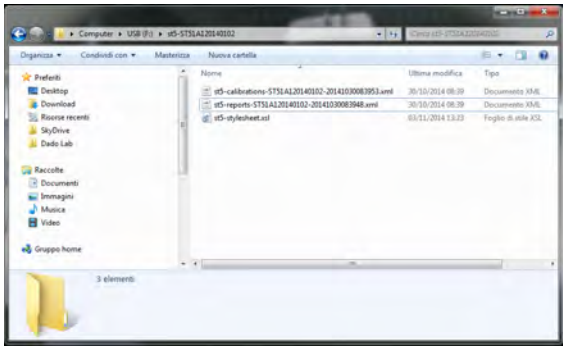
Report displaying

When the usb key is inserted onto a PC you can see a report folder created by the instrument.

THe name of the folder is the instrument serial number.



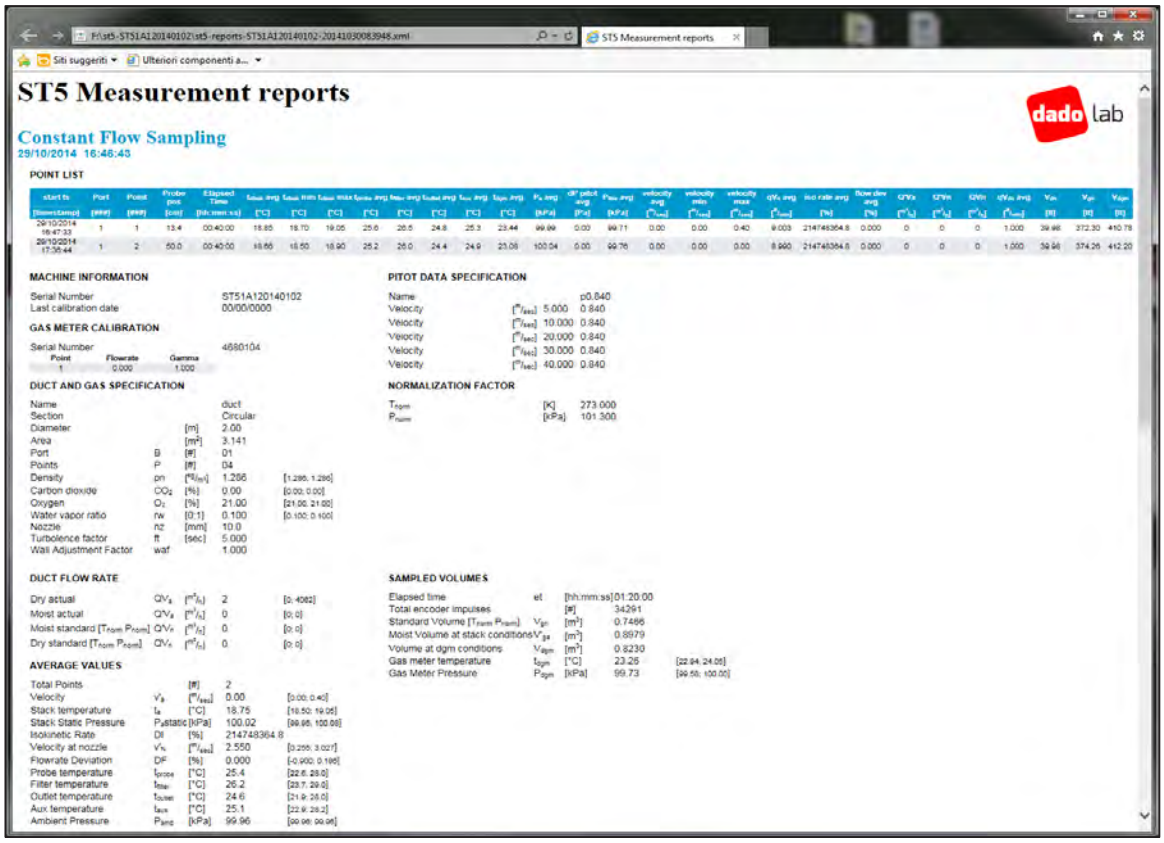
Inside the folder you’ll find the exported reports:



calibration - #serialnumber #datetime.xml

reports - #serialnumber #datetime.xml

stylesheet.xsl



Open report with internet browser

Double clicking on the report file opens it with the default internet browser.

The calibration file contains the calibration information of the instrument.

If the usb key is used to download reports without deleting the old ones, new data will be recorded in new files, with different datetime. The files on the usb key aren't deleted by the instrument.

The reports displayed on the browser includes all the measured and calculated parameters logged during sampling.

The table shows the single points averages.

The following data show the sampling conditions (duct data, use pitot, etc.) and the average values of the measurement.

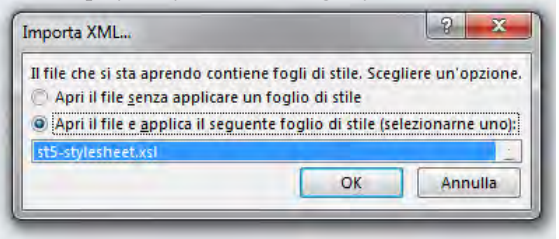
Open report with Excel

The reports are Excel compatible.

To display correctly the data, it's important to set in the OS - international settings, as decimal separator, the "."

Once opened, Excel will ask for a stylesheet. Choose the one suggested by excel and confirm with OK.

Data displayed by Excel are slightly different from



the same on browser, since not all stylesheet decors (eg. dadolab logo) are supported by Excel itself.

Be sure to store a copy of the original downloaded files, since it's the only reliable copy

The spreadsheet can modify values of some cells in relation toe thge OS settingssu cui si sta operando.

11 Alarm warnings

The alarm page "warnings" is always available in any operation mode.

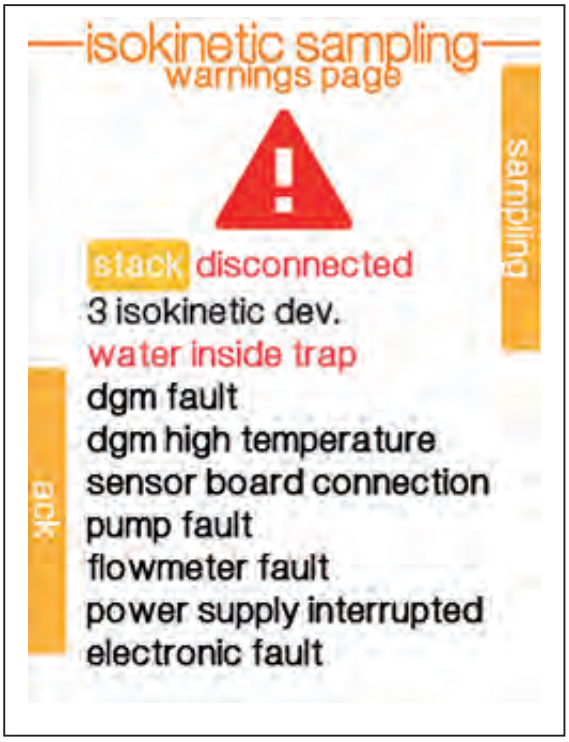
The alarms can be divided into :

1. **Operational alarms**
2. **Fault Alarms**

Operational alarms can be caused by events such as absence of velocity in the duct or problems in the sampling line (filter clogged).

Fault alarms indicate a problem with the instrument.

The screen on the right shows all the possible alarms.



RED indicates the alarm is stil active

BLACK indicates the alarma expired

ack confirm the user is aware of the alarm

Actions to be taken in case of an alarm can be chosen by the user.

To do this, the administration USB key, supplied with the instrument, is necessary. Use of this USB key is described in the Ch. 9.

Before any modification of the behaviour of an alarm, always refer to your local distributor or to the technical service.

In the next page there is a table summarizing the alarms and the possible solution.

ALARM	DESCRIPTION	SOLUTION
Stack disconnected	Thermocouple measuring the stack gases temperature is disconnected.	- Connect the thermocouple - Enter the temperature value manually
3 isokinetic dev	Indicates the alarm for isokinetic deviation took occured for the maximum number of attempts (3 time by default	- Check for the process operating status (eg. gases velocity) - Check the sampling line is not blocked.
water inside trap	Liquid reached the water sensor.	Check for the condensation unit. Empty the trap (see picture in ch. 2). Press ack to restart.
dgm fault	Problem with DGM, not working correctly	Verify if volume is measured.
dgm high termperature	Sampled gas or area temperature is too (over 60°C). Temperatures higher than 60°C may damage the DGM and may affect the measure.	- Lower the sampled gas temperature - Check the cooling/condensing device - Move the instrument to a more cool place.
sensor board connection	indicates a problem on the signals of the sensors board	Try to turn off and on again.
pump fault	Fault on the sampling pump	Check for any obstruction on the suction line Contact service.
flowmeter fault	Fault on the mass flow meter	Check for any obstruction on the suction line Contact service.
power supply interrupted	Power interruptions occured during the sampling	Check if the problem is related to a bad power supply or if the plant power supply isn't supplying enough power.
electronic fault	Indicates an anomaly on the electronic boards	Try to turn off and on again. Contact service.

12 Configuration

To access to the configuration menu, the administration USB key, supplied with the instrument, is needed.

Plug the administration usb key in the instrument and, after a couple of seconds, the following menu is displayed.

This allows to increase the quality assurance and control over the unit by the quality responsible for:

- Update the firmware
- Sensor calibration curve
- Internal measuring device correction curve (mass flow meter and DGM)
- Operative alarms mode
- Volume normalization values etc.
- Set date and time.
- clear instrument report memory

Set date and time

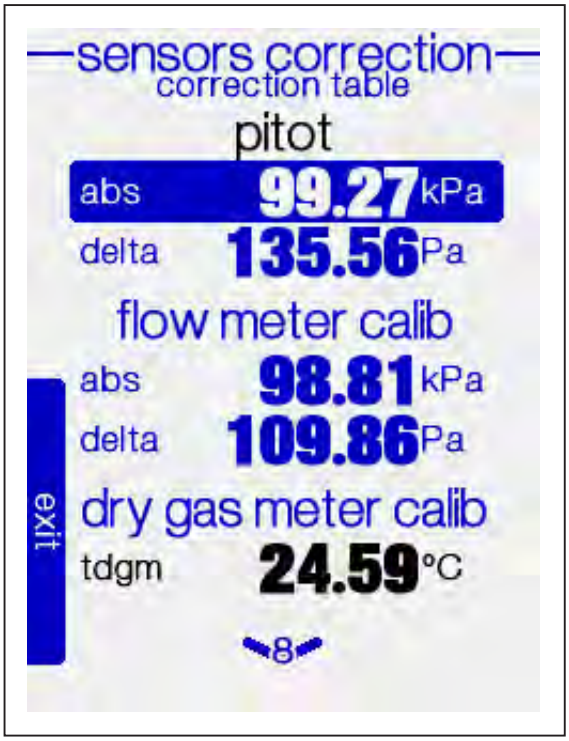
Select date and time menu to access to the "time date settings" menu.

Update the date and time with the correct values.

Then press **"options"** and **"save and exit"**.

Sensor correction curve

Selecting “sensor correction”, you can access to the sensor correction menu.

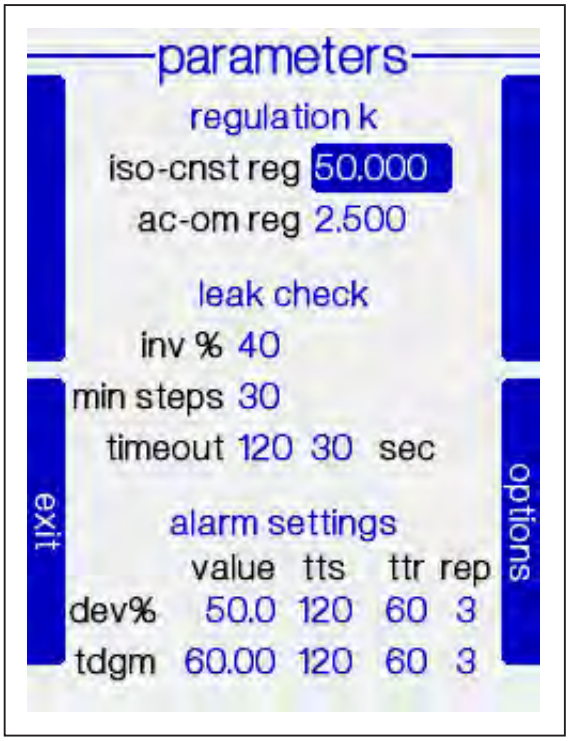


You can introduce a correction curve from 1 to 5 points for each measured parameter.

More details are available in the Calibration appendix.

Parameters

In the “parameters” menu you can change the instrument beaviour:



- flow regulation response time during isokinetic or constant flow
- response time of the regulation flow during the internal mass flow meter calibration
- pump vacuum grade settings during leak test
- leak test duration for each stage

Alarm behaviour

dev% isokinetic deviation alarm

tdgm gas meter temperature alarm

value alarm intervention threshold

tts alarm intervention time

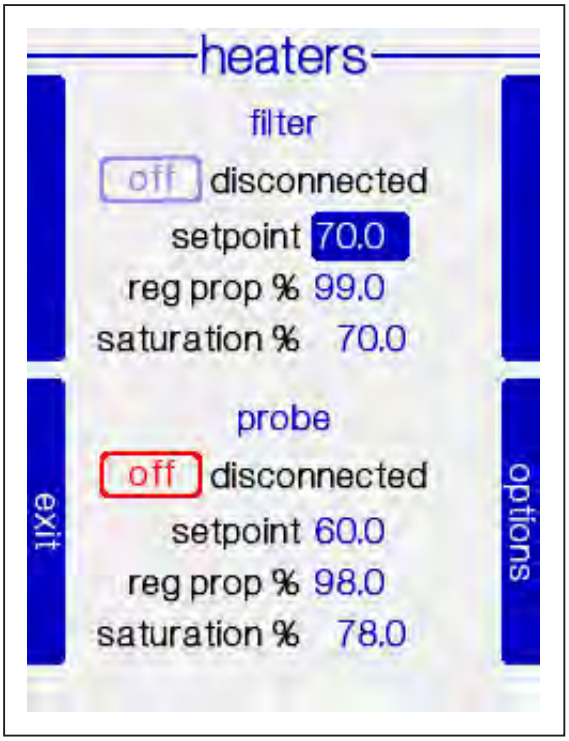
tts alarm reset time

rep alarm repeatitions before sampling stop

It’s strongly suggested to contact dadolab service before modifying any parameters values.

Heated devices management

In this section is possible to access to the setting parameters of the heated devices.



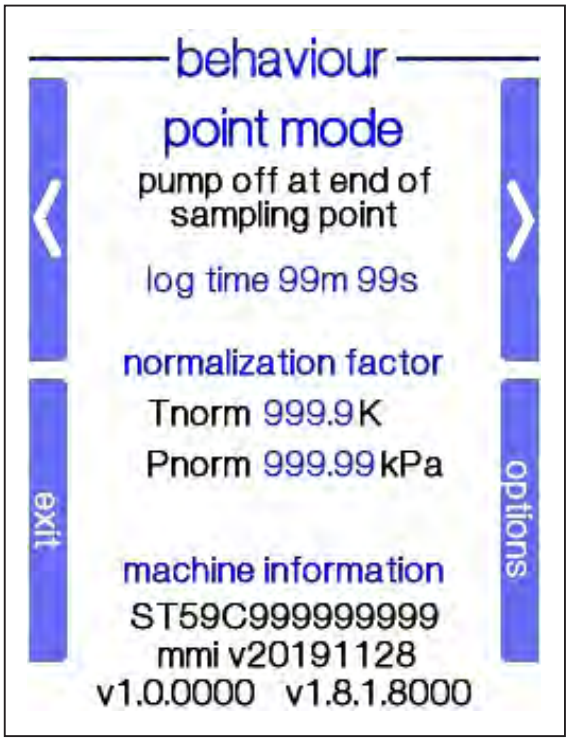
The setpoint is available in any operative mode.

Usually, isn't required to modify those parameters unless special application must be fullfilled.

In case of it's needed to connect a non-Dado lab heated probe or box the ST5 heating control, please contact the service department before apply any modification to those settings.

Behaviour settings

In the section "Behaviour" you can configure:



Point mode

The instrument turn off the pump at the end of each sampling point.

Coutinuous mode

The instrument left the pump turned on during each sampling point in the same traverse

Normalization factor

Those are the normalization parameters for the sampled volumes and duct flowrates.

Factory setting :

273.0 K (0°C) for the temperature

101.32 kPa for the pressure.

Machine information

Shows the unit serial number and firmware version installed on the instrument.

13 Service

Replacing the protection filter

In case liquids or particulate matter are sucked accidentally, replace the protection filter to grant the efficiency of the ST5.

To replace the filter, unscrew the transparent filter cap ofn the inlet (see picture 3)

Remove the filter and clean with a humid towel any trace of humidity and dust.

Do not use solvents or alchols.

In case the filter is exhausted, replace it.

Before reassembling the filter cap, check the sealing o-ring.

Apply a light layer of silicon grease on the thread and o-ring and then close the cap by hand. Rimuovere il filtro e pulire con un panno umido eventuali tracce di umidità e corpi solidi.

Kit *of 10 pcs protection filters Cod. 101 101 3010*

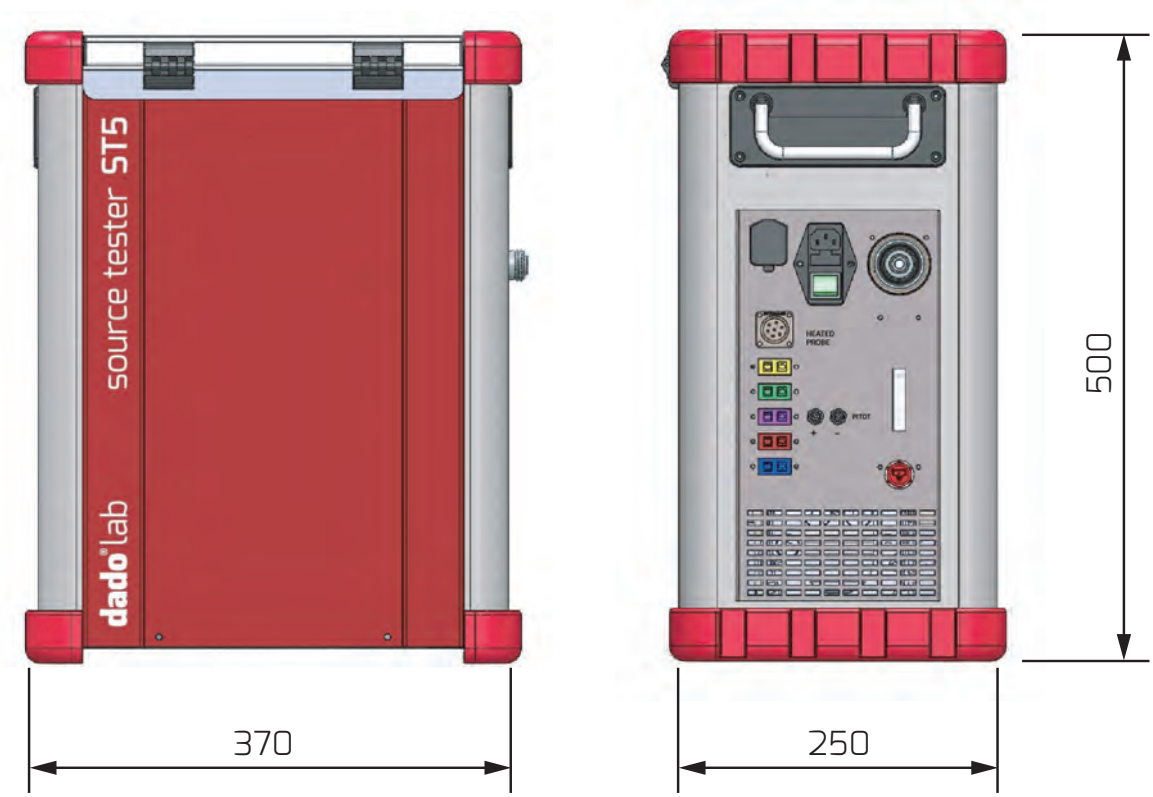
Spare *O-ring* *Cod. PR01 GA 303*

Replacing the protection fuse

In case of power overload or fault, the protection fuses may break and the instrument may stop working.

Open the drawer and check and, in case they are broken, replace them using the model 5x20 6.3A (T)

14 Technical characteristics



Operative conditions

Operative flowrate range	5 - 60 l/min
Sampled gas conditions:	Dehydrated, max temperature 45°C
Gas inlet:	With protection filter for liquids and particulates. Quick connectors fittings
Operating temperature:	-20 ÷ 40°C 95% rH
Stock temperature:	-10 ÷ 50°C 95% rH

Sensors/Measures characteristics and accuracy

Sampled volume

Dry Gas Meter	Certified G4 2004/22/CE and in compliance to EN 1359
Flowrate range	0.4 m3/h ÷ 6.0 m3/h
Accuracy	2% of the measure ± 0.2%
Encoder resolution	0.10 liters

Sampling flowrate

Measure	Mass flowmeter, compliant to UNI EN ISO 5167-2
Range	5 ÷ 60 l/min
Resolution	0.01 l/min
Accuracy	± 1%

Abs pressure [static/barometric]	10 ÷ 105 kPa (1050 mBar)
Linearity and Hysteresis (combined)	0.25 % F.S
Resolution	0.01 kPa (0.1 mBar)
Accuracy	better than 1% of the measure ± 0.25 kPa

Differential Pressure [Pitot]	-100 ÷ 1000 Pa (-10 ÷ 100 mmH2O)
Linearity and Hysteresis	0.25 % F.S
Accuracy	Better than 1% of the measure ± 2 Pa
Resolution	0.05 Pa (0.005 mmH2O)
Max differential pressure.	30 000 Pa (3000 mmH2O)

Thermocouples

[standard programmed curve for type “K” in compliance to ITS 1990]

Range	0 + 1200 ˚C
Resolution	0.01 ˚C
Accuracy	1% of the measure ± 0.4 ˚C

DGM Temperature

[Pt100 Ohm sensor]

Range	-20 +100 ˚C
Resolution	0.01 ˚C
Accuracy	1% of the measure ± 0.2 ˚C

Information on the WEEE (RAEE) symbol

Proper disposal of the product (electrical and electronic waste)

(Applicable in countries with separate collection systems)

The symbol on the product, accessories or documentation indicates that the product and its electronic accessories (such as batteries) must not be disposed of with other waste at the end of its life cycle. To avoid any damage to the environment or to health caused by incorrect waste disposal, the user is invited to separate the product and the above accessories from other types of waste, giving them to the authorized parties according to local regulations.

Users are invited to use the recovery circuits available in the local community. Otherwise, contact your supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories must not be disposed of together with other commercial waste.

The device and accessories shown in this manual may vary depending on the country in which the products are distributed.

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