

Electronics



Portable differential pressure gauge

ESA DPG-E (E7220 rev. 02 - 02/10/2015)

GENERAL WARNINGS:



■ All installation, maintenance, ignition and setting must be performed by qualified staff, respecting the norms present at the time and place of the installation.

■ To avoid damage to people and things, it is essential to observe all the points indicated in this handbook. The reported indications do not exonerate the Client/User from observing general or specific laws concerning accidents and environmental safeguarding.

■ The operator must wear proper DPI clothing (shoes, helmets...) and respect the general safety, prevention and precaution norms.

■ To avoid the risks of burns or high voltage electrocution, the operator must avoid all contact with the burner and its control devices during the ignition phase and while it is running at high temperatures.

■ All ordinary and extraordinary maintenance must be performed when the system is stopped.

■ To assure correct and safe use of the combustion plant, it is of extreme importance that the contents of this document be brought to the attention of and be meticulously observed by all personnel in charge of controlling and working the devices.

■ The functioning of a combustion plant can be dangerous and cause injuries to persons or damage to equipment. Every burner must be provided with certified combustion safety and supervision devices.

■ The burner must be installed correctly to prevent any type of accidental/undesired heat transmission from the flame to the operator or the equipment.

■ The performances indicated in this technical document regarding the range of products are a result of experimental tests carried out at ESA-PYRONICS. The tests have been performed using ignition systems, flame detectors and supervisors developed by ESA-PYRONICS. The respect of the above mentioned functioning conditions cannot be guaranteed if equipment, which is not present in the ESA-PYRONICS catalogue, is used.

DISPOSAL:



To dispose of the product, abide by the local legislations regarding it.

GENERAL NOTES:



■ In accordance to the internal policy of constant quality improvement, ESA-PYRONICS reserves the right to modify the technical characteristics of the present document at any time and without warning.

■ It is possible to download technical sheets which have been updated to the latest revision from the **www.esapyronics.com** website.

■ The products manufactured by ESA-PYRONICS have been created in conformity to the **UNI EN 746-2:2010** Norms: Equipment for industrial thermal process - Part 2: Safety requirements for combustion and the movement and treatment of combustible elements. This norm is in harmony with the Machine Directive **2006/42/CE**. It is certified that the products in question respect all the requirements prescribed by the above mentioned Norms and Directives.

■ Certified in conformity with the **UNI EN ISO 9001** Norm by DNV GL.

CERTIFICATIONS:



ESA DPG-E is in compliance with European Union directives **89/336/CEE** with reference to standards: **EN61000-4-2** (immunity electrostatic discharge), **EN5008-1** (emission of electromagnetic compatibility), **EN50082-1** (electromagnetic immunity compatibility).



The products conform to the requests for the Euroasia market (Russia, Belarus and Kazakhstan).

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ESA DPG-E is a microprocessor portable differential pressure gauge that has a liquid crystal display. Its ergonomic design was intended to facilitate measuring operations in the field of industrial plants.

APPLICATIONS

- Differential pressure measurement.
- Relative pressure measurement.
- Flow measurements for calibrated flanges with temperature compensation (target temperature).
- Draft measurement in chimneys.
- Speed measurement in the ducts through "pitot tube".

CHARACTERISTICS

GENERAL:

- | | |
|--------------------------------|--|
| ■ Measurable fluids: | all non-aggressive gases |
| ■ Nominal range: | -100 mbar ÷ +200 mbar |
| ■ Precision: | see sensor characteristics |
| ■ Maximum applicable pressure: | 500 mbar |
| ■ Pressure connections: | flexible rubber hoses 11x9 |
| ■ Supply: | 3 Vdc from 1,5V (LR6 AA) batteries |
| ■ Low battery indication: | present ("Lo b") |
| ■ Operating temperature: | 0÷50 °C |
| ■ Storage temperature: | -10÷60 °C |
| ■ Input fluid temperature: | 5÷45 °C |
| ■ Protection degree: | IP40 |
| ■ Working environment: | unsuitable for explosive or corrosive environments |
| ■ Maximum size: | 155X122X29 mm |
| ■ Mass: | 350 g |

CHARACTERISTICS

SENSOR CHARACTERISTICS

ESA DPG-E has a differential pressure sensor with the following features:

DESCRIPTION	VALUE
Nominal range	-100 ÷ 200 mbar
Maximum pressure related to applicable input atmospheric pressure	500 mbar
Maximum applicable differential pressure between the two inputs (+ / -)	500 mbar
Measurement accuracy: within range 0 ÷ 30 mbar within range 30 ÷ 100 mbar within range 100 ÷ 200 mbar within range 0 ÷ - 30 mbar within range -30 ÷ -100 mbar	<1% F.S. ± 0,1 mbar ± 1 digit ± 0,2 mbar ± 1 digit ± 0,3 mbar ± 1 digit ± 0,2 mbar ± 1 digit ± 0,4 mbar ± 1 digit

DESCRIPTION

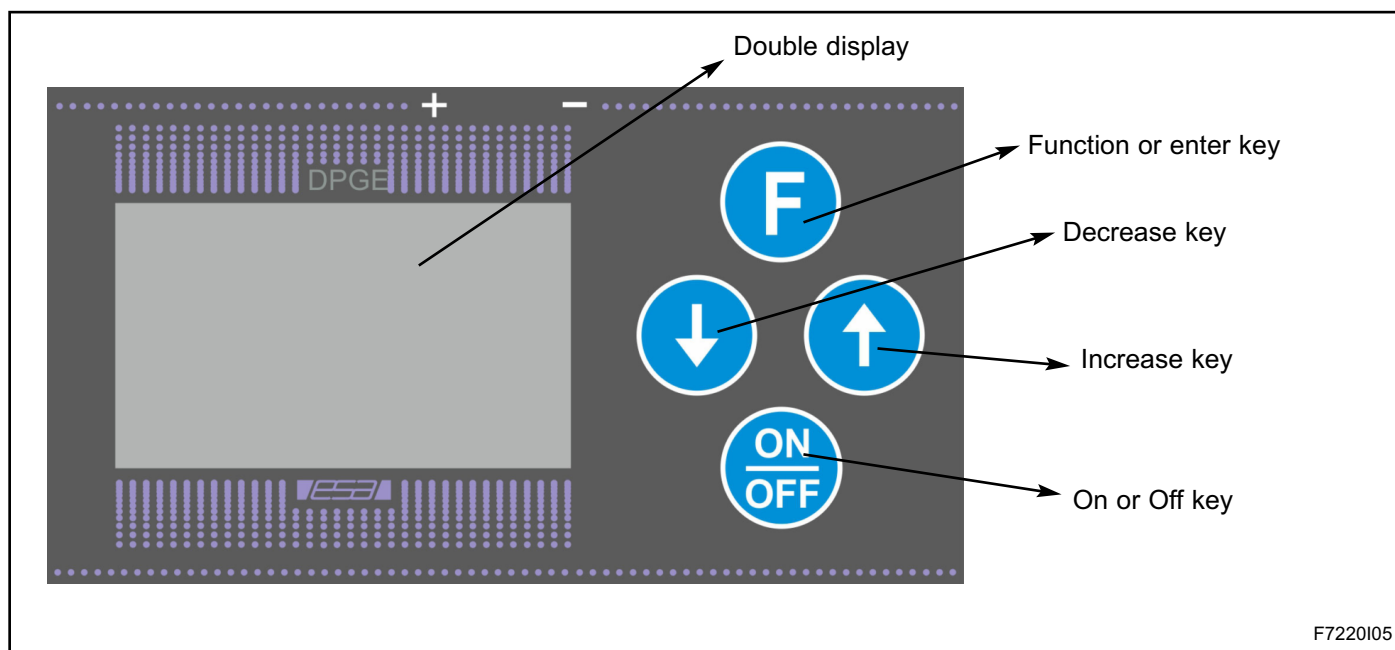
The ESA DPG-E differential pressure gauge has a liquid crystal display on which two value levels are displayed as well as four buttons for the function selection. The pressure reading takes place continuously and is indicated on the display with the option of setting the unit measurement in mbar, kPa, mmH₂O or inH₂O. The instrument also allows to set reference values until a maximum of four calibrated orifices. This makes it possible to display the flow value on the pressure acquired for each of the

four orifices. For one of the four pressures acquired the temperature compensation is also available.

The instrument has two function modes; the first is defined as Automode and the second one Program. In Automode (automatic) the instrument displays the acquired pressure and the four calculated flow values whilst the Programming mode, the operator can set the functioning parameters.

DISPLAY AND LOCAL CONTROL SECTION

ESA DPG-E has, on the front part, the operator interface consisting of a double display and four buttons.



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FRONT KEYBOARD

OPERATION	MODE	DESCRIPTION
↑ o ↓	Automode	Displays the scanning pressure and the four calculated flows.
F	Automode	While viewing the pressure it activates the zero pressure function.
↑ + F	Automode	Activates the programming activity.
↑ o ↓	Program.	Displays scanning menus available and programmable parameters. When changing the parameters varies the value of the parameters displayed.
F	Program.	It allows you to access the menu that appears. In the menus it enables you to change the parameter and stores the value following the change.
↑ + F	Program.	Goes back to Automatic mode. During the phase in which the parameter value is changed it exits the Programming mode without storing.
ON / OFF	Instrument off	Allows to switch on the instrument as soon as it is pressed.
ON / OFF	Instrument on	Switches off the instrument is pressed for more than three seconds.

DISPLAY AND LOCAL CONTROL SECTION

DISPLAY

ESA DPG-E has a double liquid crystal display:

■ Upper display (7 segment 4 digits): in Automatic mode (Automode) displays the value of the actual size whilst in programming mode (Program) it displays the name of the menu selected or the current parameter.

■ Lower display (alphanumeric 8 digit): in Automatic mode (Automode) displays the value of the actual size whilst in programming mode (Program) it displays the name of the menu selected or the current parameter.

During the display of the sizes in Automode or of the parameters in Program mode, the position of the decimal point is not constant and depends, due to pressure, on the type or measuring unit selected; meanwhile for flow, it disappears with flow values higher than 999.9 Nm³/h (o cfm).

Specifically for pressure measurements, for readings in millibars (mbar) and inches in the water column (incWC), there is one decimal place and for the readings in kilopascals (kPa) two decimal places and no decimal places for readings in millimeters water column (mmH₂O).

FUNCTIONING

ON / OFF

To switch on the pressure gauge press the **ON/OFF** button. During the initialization operations, the lower display will indicate “**ESA DPGE**” topped by a sequence of null numbers “8.8.8.8.” After this the software version will be shown composed of a number in the upper display followed by “**REL_SE**” in the lower one.

At the end of the initializing phase the instrument will pass

directly to Automode.

To switch the device off just press the **ON/OFF** button for three seconds. At this point ESA DPG-E indicated the null values “8.8.8.8.” accompanied by “**PWR OFF**” and will switch off. Furthermore you have the possibility of setting the automatic shut down after a personalized time lapse (see AUTO OFF parameter in programming mode).

AUTOMODE

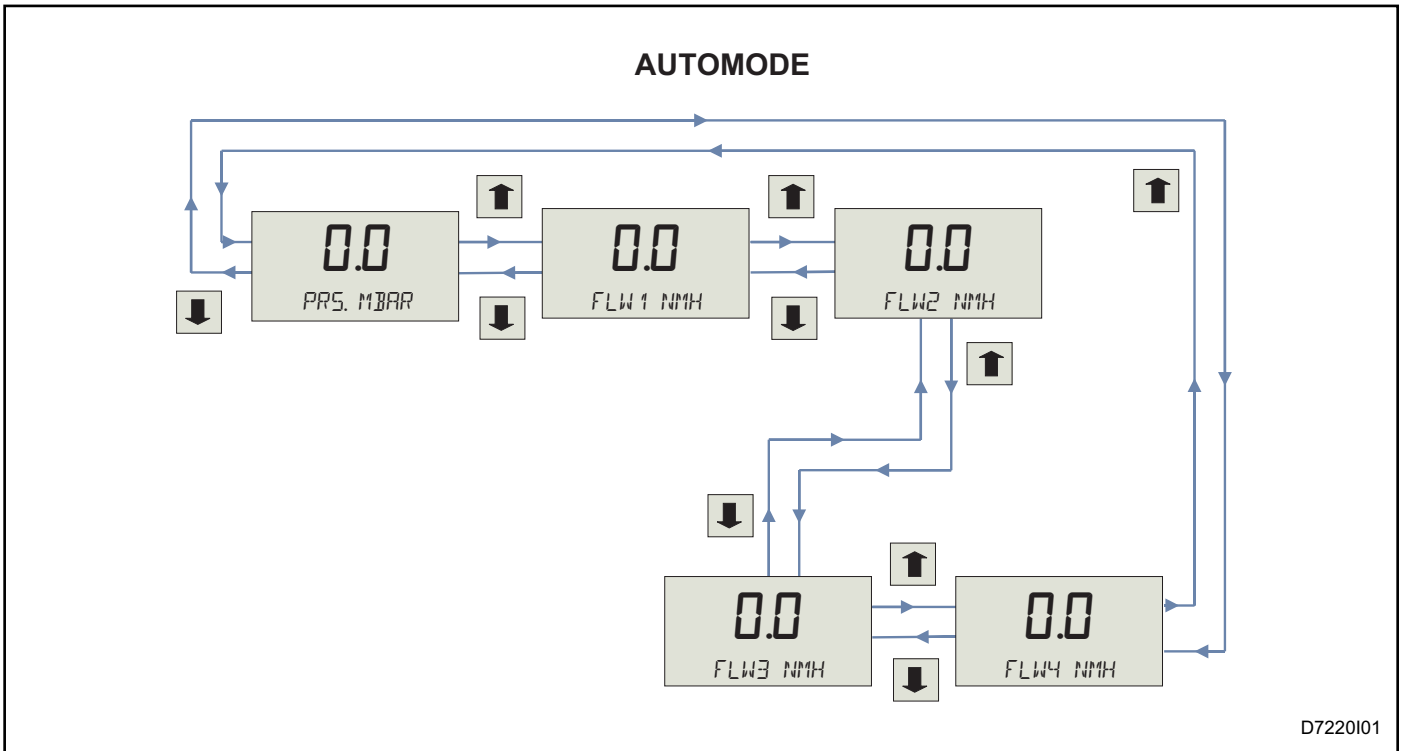
Automode is activated after the switching on and initialization of the device or when the device exits the Programming mode. In Automatic mode it is possible to see differential pressure value detected or the value of the four calculated orifices. Furthermore you can reset the pressure reading to cancel possible sensor drifts.

After initialization ESA DPG-E indicates the last size acquired in Automatic mode before the switching off. Whilst exiting the Programming mode it always indicates the pressure. Scrolling the **↑** or **↓** keys all the sizes in sequence can be seen.

OPERATION	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
On (ON/OFF)	8.8.8.8.	ESA DPGE	Initialization
None	8.88	REL_SE	Instrument software version
None	888.8	PRS. MBAR	Displays differential pressure value
↑ or ↓	888.8	FLW1 NMH	Displays flow 1 value
↑ or ↓	888.8	FLW2 NMH	Displays flow 2 value
↑ or ↓	888.8	FLW3 NMH	Displays flow 3 value
↑ or ↓	888.8	FLW4 NMH	Displays flow 4 value
Off (ON/OFF)	8.8.8.8.	PWR OFF	Disconnection

FUNCTIONING

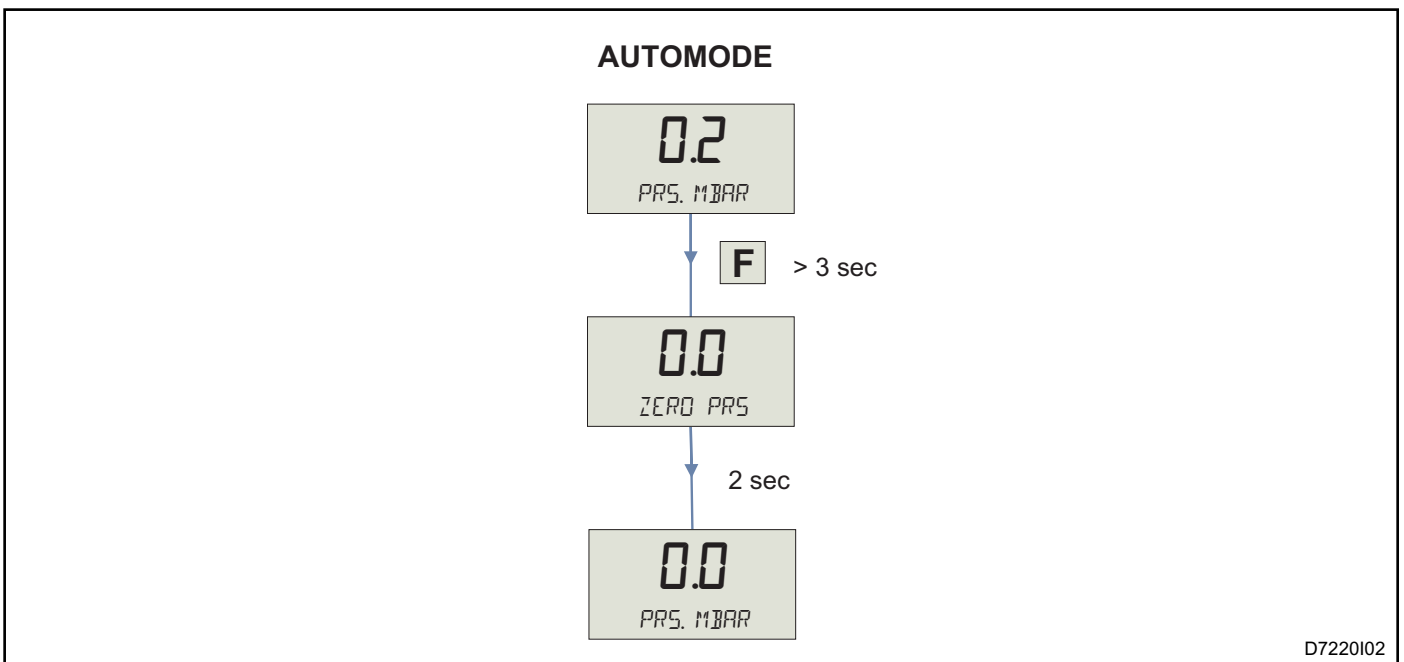
AUTOMODE



PRESSURE RESET

Resetting the pressure reading is meant to compensate the sensor drift (time or temperature). Before resetting we recommend you keep the instrument on for at least one minute and make sure that the rubber pipes are disconnected from the measuring element and that they are both

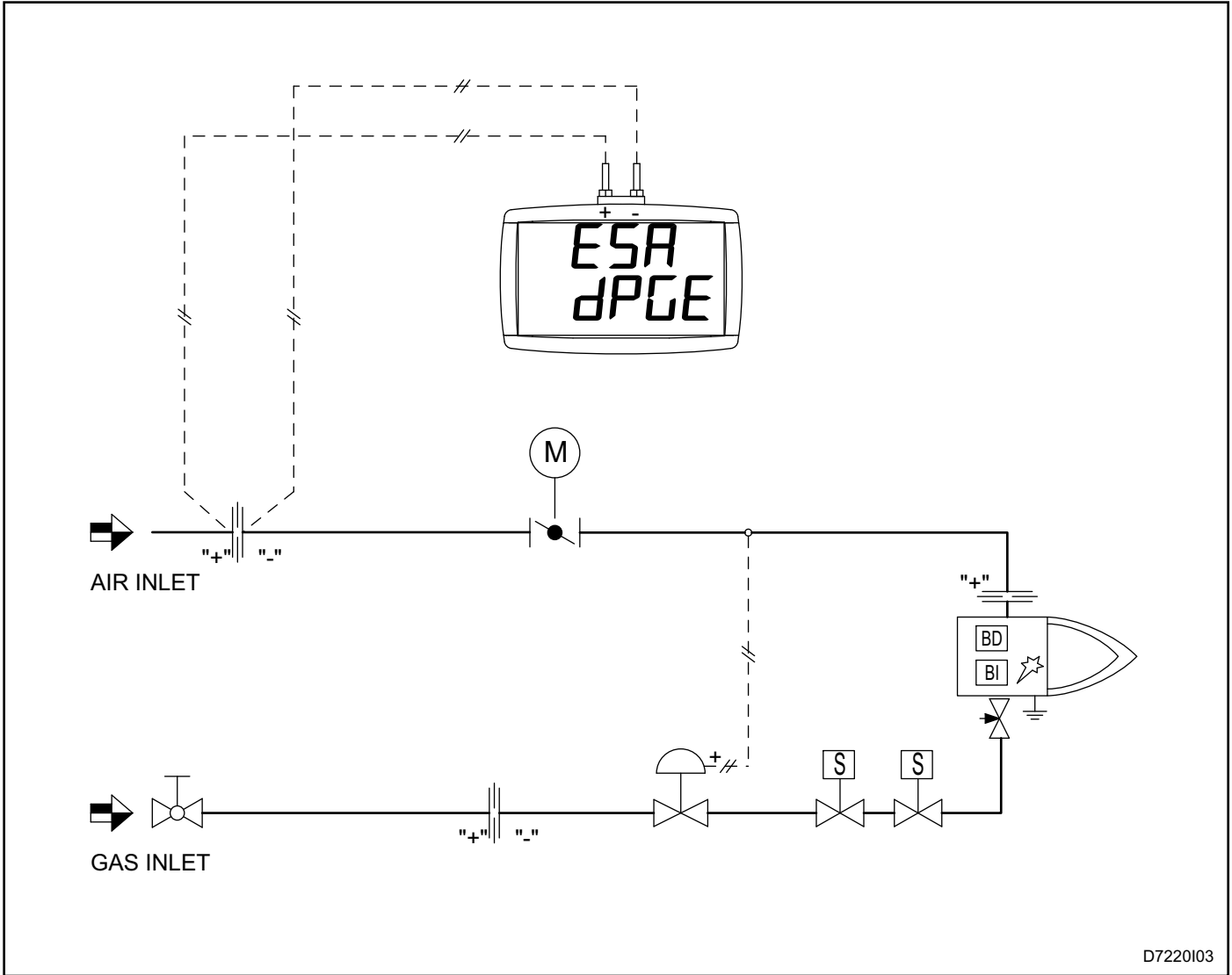
in atmospheric pressure conditions. This is accomplished in Automode by pressing the **F** Function key for at least 3 seconds while the pressure value is being displayed.



APPLICATION EXAMPLE 1 - ESA DPG-E

ESA DPGE is used for measuring differential pressure. Having properly configured the parameters with the characteristics of the calibrated orifice, the instrument instan-

taneously displays the fluid flow value flowing through the measuring element.

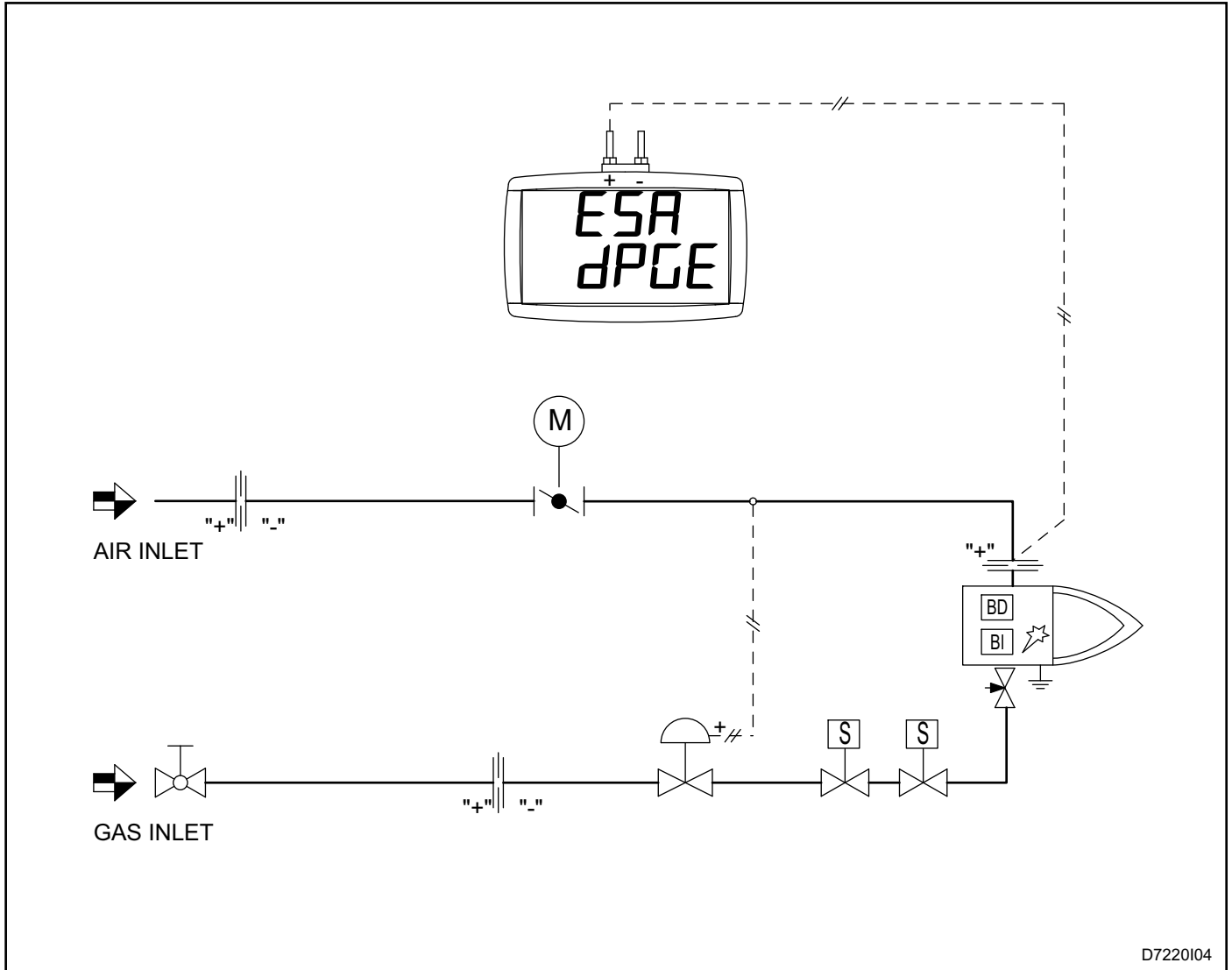


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APPLICATION EXAMPLE 2 - ESA DPG-E

ESA DPGE is used to measure relative pressure. Having properly configured the parameters with the characteri-

stics of the calibrated orifice of the burner, the instrument instantaneously displays the fluid flow passing through it.



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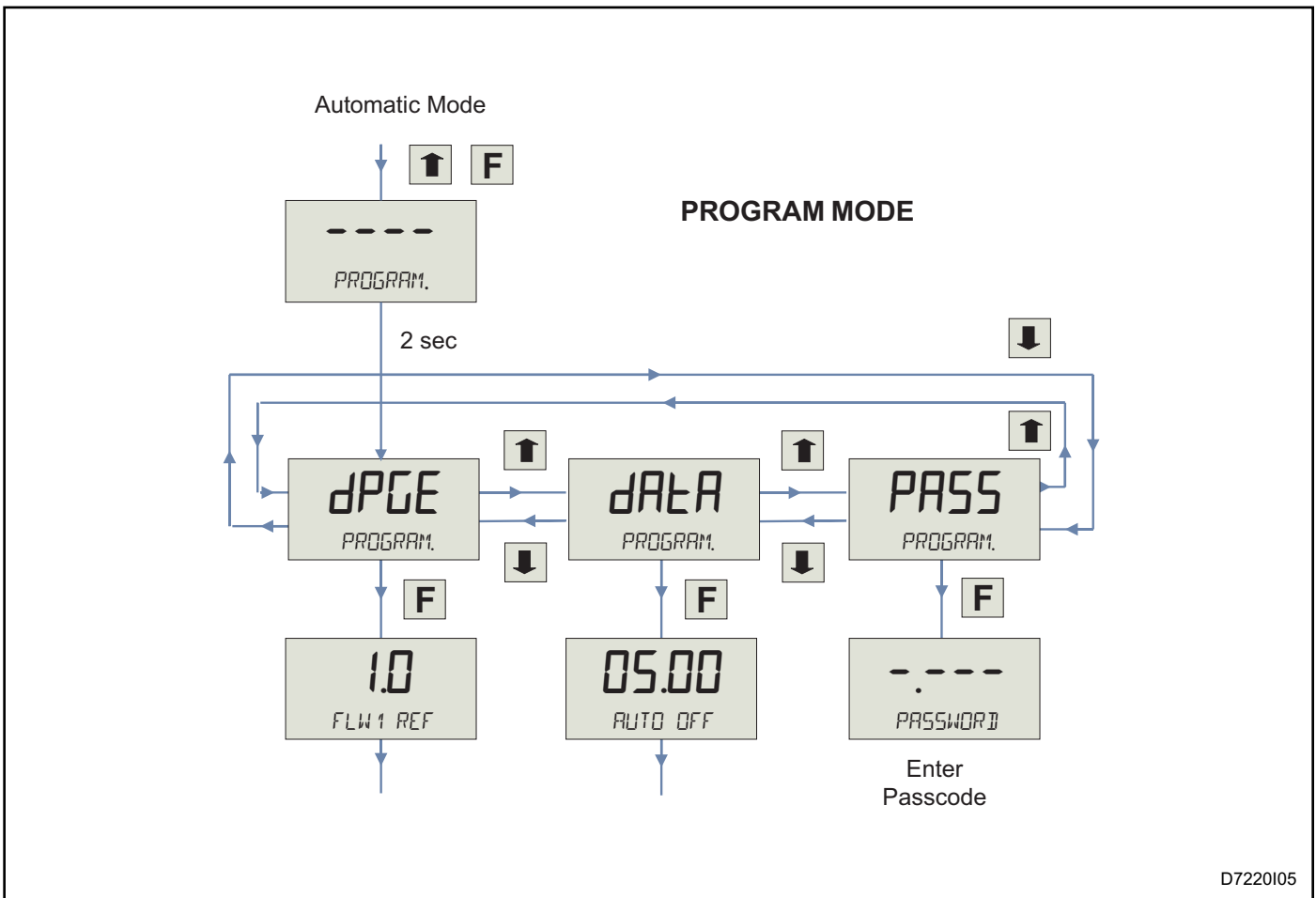
CONFIGURATION PARAMETERS

ACCESS TO THE PARAMETERS

To enter the Programming (Program) mode to be able to set the parameters with values related to the plant, simultaneously press the **↑** and **F** keys from Automatic mode. After a preliminary phase of initialization the instrument will indicate to the operator which functioning mode is on displaying “Program” on the lower display and the name of the menu on the upper one. To exit the Programming mode and return to Automatic mode simultaneously press the **↑** and **F** keys again. At this

point the display will show “Automode” for a couple of seconds. In Programming mode there are three menus: **dPGE**, **dAtA** and **PASS**. They can be found by scrolling the **↑** or **↓** keys. To select the menu you wish to enter press the **F** key. After this choose the parameter you would like to change. Once the parameter has been set scrolling the **↑** or **↓** keys, it is stored by pressing the **F** key again. To exit the menu select the appropriate **EXIT DPG** button or if you access the **PASS** menu and the password section is activated by mistake, press the **↑** and **F** keys together to return to Automode.

MENU	DESCRIPTION
dPGE	Menu that has all the parameters regarding flow calculations.
dAtA	Menu that has the parameters regarding device functioning and display of the sizes.
PASS	Calibration menu with access protected by password.



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CONFIGURATION PARAMETERS

CHANGE PARAMETER

In programming mode (Program) to change the value of a parameter in the menu, carry out the following procedure:

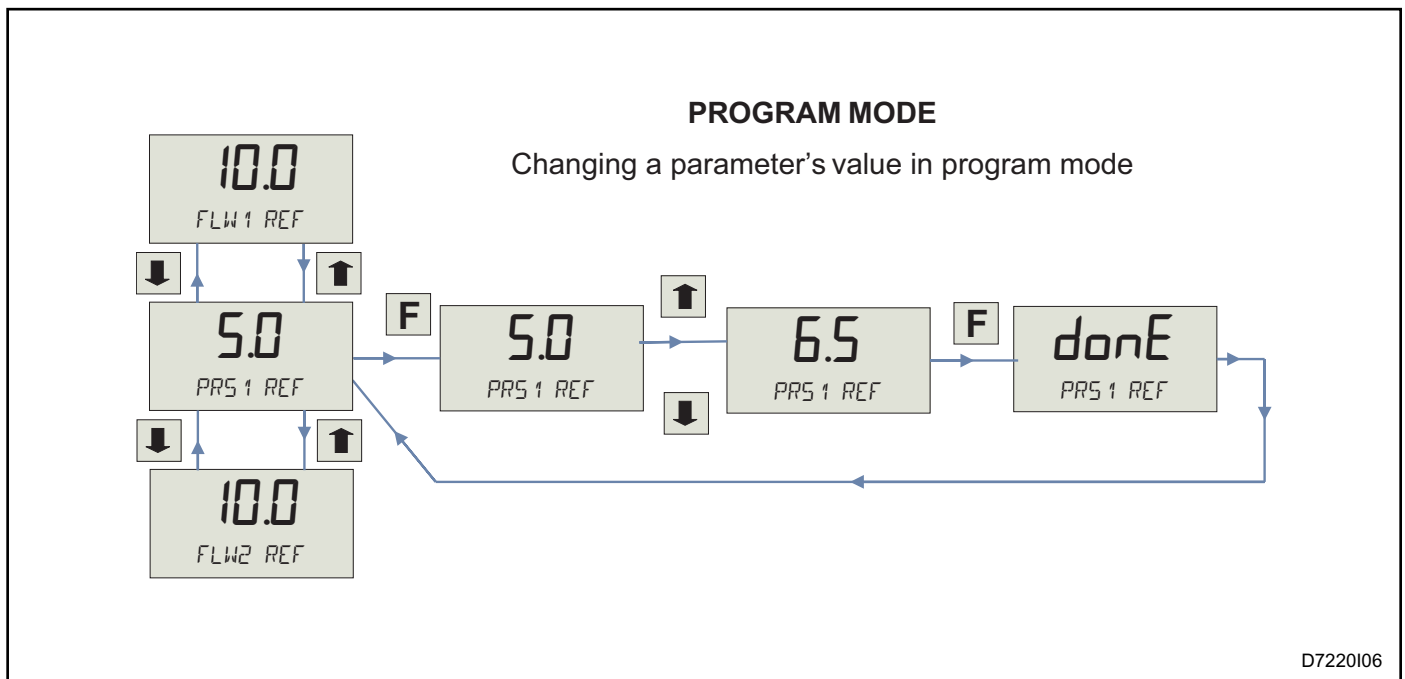
- 1 - From the menu, select the desired parameter scrolling with the **↑** and **↓** keys. In this phase, the lower display will show the name of the parameter whilst the upper one will show the actual value of the parameter.
 - 2 - Press the **F** key to enable the value change: at this point the letters on the lower display will start flashing.
 - 3 - Using the **↑** and **↓** keys change the value indicated on the upper display until reaching the desired value.
- N.B.: In this phase the value stored has not yet been

changed, so the operator can avoid storing the change (for example, if he realizes that he has selected the wrong parameter) exiting from the Programming mode pressing the **↑** and **F** keys together.

4 - Press the **F** key to store the new value allocated to the parameter: the storage of the new value will be confirmed by the message “**done**” that will appear on the upper display for a few seconds.

5 - Once storage has taken place the message on the lower display will stop flashing.

6 - Using the **↑** and **↓** keys select another parameter you wish to change or else exit the menu or the Programming mode.



PARAMETER CONFIGURATION

MENU DPGE

PARAMETER	LOWER DISPLAY	DEFAULT VALUE	MINIMUM VALUE	MAXIMUM VALUE
Reference flow rate (Nm ³ /h) of the calculation of the orifice 1	FLW1 REF	10	00	6553
Reference pressure (mbar) of the orifice calculation 1	PRS1 REF	100	00	200
Reference flow rate (Nm ³ /h) of the calculation of the orifice 2	FLW2 REF	10	00	6553
Reference pressure (mbar) of the orifice calculation 2	PRS2 REF	100	00	200
Reference flow rate (Nm ³ /h) of the calculation of the orifice 3	FLW3 REF	10	00	6553
Reference pressure (mbar) of the orifice calculation 3	PRS3 REF	100	00	200
Reference flow rate (Nm ³ /h) of the calculation of the orifice 4	FLW4 REF	10	00	6553
Reference pressure (mbar) of the orifice calculation 4	PRS4 REF	100	00	200
Temperature reference (°C) of the orifice calculation 4	TMP4 REF	20	- 100	1000
Real Temperature (°C) of the fluid during measurement	TMP REAL	20	- 100	1000
Exiting the dPGE menu	EXIT DPG	YES	YES	YES

The DPGE menu has the following parameters. Their function is described below:

■ **FLW1 REF**: setting of the calculation flow value of orifice 1; together with the parameter "PRS1 REF" allows the instrument to calculate the instant flow "FLW1".

■ **PRS1 REF**: setting of the differential (or relative) pressure value of the calculation of orifice 1; Together with the "FLW1 REF" parameter allows the instrument to calculate the instant flow "FLW1".

■ **FLW2 REF**: setting of the calculation flow value of orifice 2; together with the parameter "PRS2 REF" allows the instrument to calculate the instant flow rate "FLW2".

■ **PRS2 REF**: setting of the differential (or relative) pressure value of the calculation of orifice 2; Together with the "FLW2 REF" parameter allows the instrument to calculate the instant flow rate "FLW2".

■ **FLW3 REF**: setting of the calculation flow value of orifice 3; together with the parameter "PRS3 REF" allows the instrument to calculate the instant flow rate "FLW3".

■ **PRS3 REF**: setting of the differential (or relative) pressure value of the calculation of orifice 3; Together with the "FLW3 REF" parameter allows the instrument to calculate the Instant flow rate "FLW3".

■ **FLW4 REF**: setting of the calculation flow value of orifice 4; together with "PRS4 REF", "TMP4 REF" and "TMP

REAL" parameters it allows the instrument to calculate the instant flow rate "FLW4".

■ **PRS4 REF**: setting of the differential (or relative) pressure value of the calculation of orifice 4; Together with the "FLW4 REF", "TMP4 REF" and "TMP REAL" parameters it allows the instrument to calculate the instant flow rate "FLW4".

■ **TMP4 REF**: setting of fluid temperature reference value for which the calculation of orifice 4 was performed; together with the "FLW4 REF", "PRS4 REF" and "TMP REAL" allows the instrument to calculate the instant flow rate "FLW4".

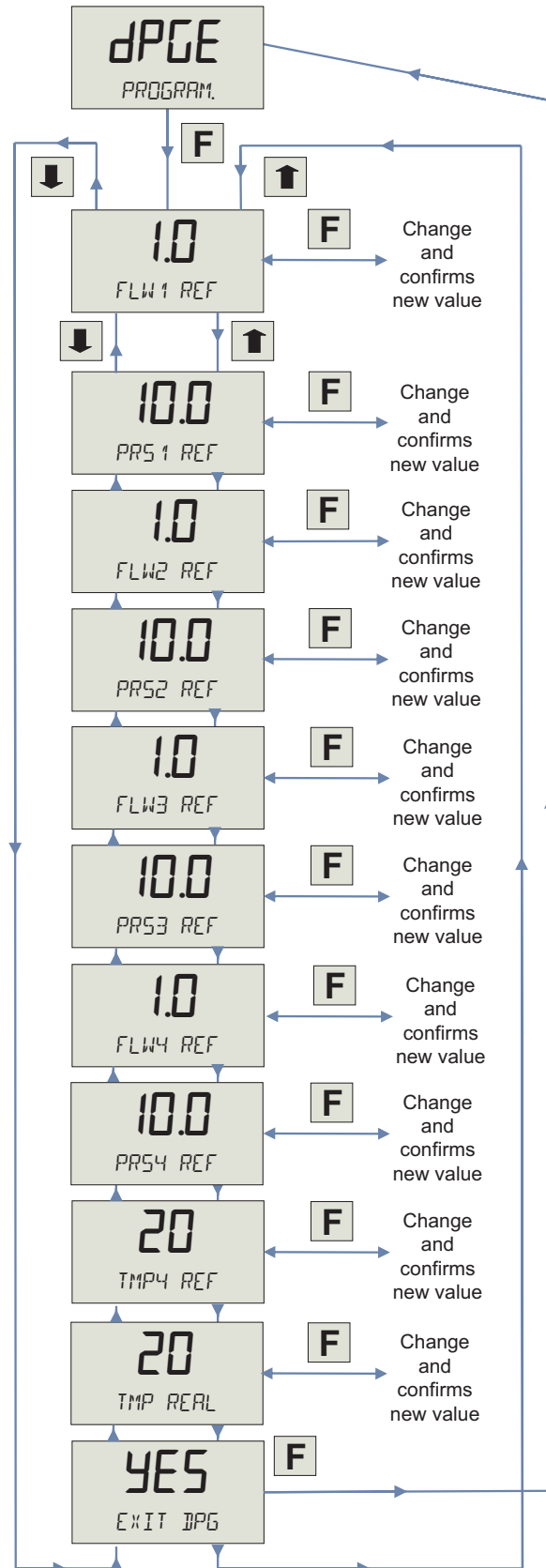
■ **TMP REAL**: setting of the fluid real temperature value at the time in which measuring takes place; together with the "FLW4 REF", "PRS4 REF" and "TMP4REF" allows the instrument to calculate the "FLW4" instant flow rate performing temperature compensation.

■ **EXIT DPG**: command for exit the dPGE menu when indicated by pressing the **F** key the instrument goes back to displaying the main menu in programming mode
NB: the orifice calculus values must be set in the "FLW REF" in normalized cubic meters / hour (Nm³/h); in the "PRS REF" parameters in milibar (mbar); in the "TMP4 REF" and "TMP REAL" parameters in centigrade (°C).

CONFIGURATION PARAMETERS

MENU DPGE

PROGRAM MODE



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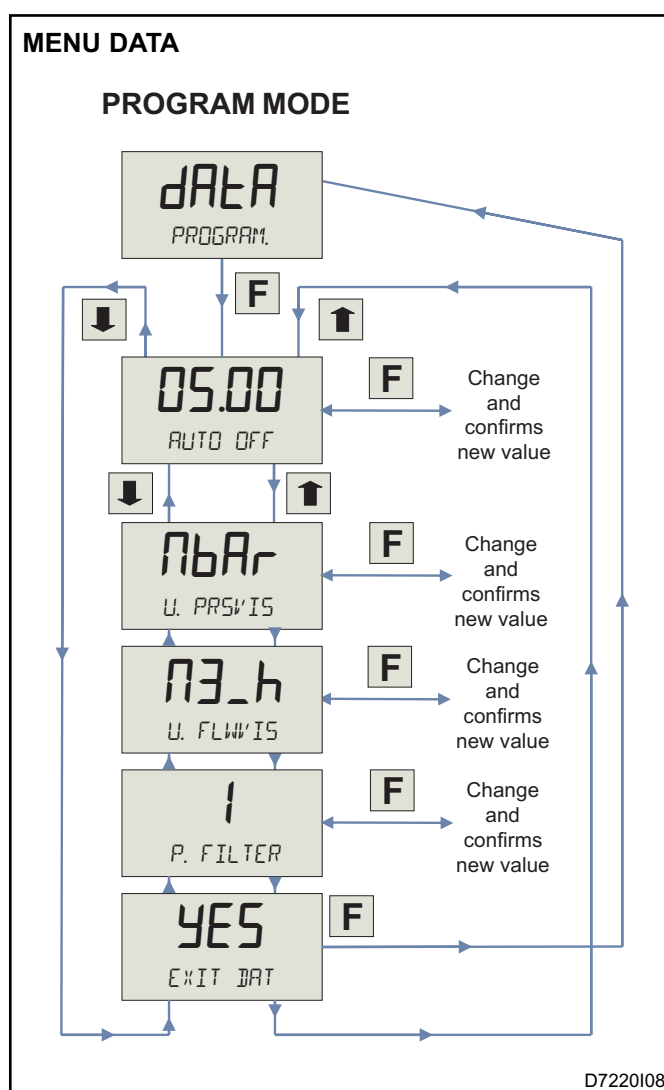
CONFIGURATION PARAMETERS

MENU DATA

PARAMETER	LOWER DISPLAY	DEFAULT VALUE	MINIMUM VALUE	MAXIMUM VALUE
Automatic power off (minutes/seconds).	AUTO OFF	5.00	0.00	20.00
Unit of measure for the pressure display.	U. PRSVIS	mBar	mBar	inCu
Unit of measure for the flow rate display.	U. FLWVIS	m ³ _h	m ³ _h	_CFM
Filter attenuation of the pressure reading.	P. FILTER	1	0	3
Exit menu dAtA.	EXIT DAT	YES	YES	YES

The DATA menu has the following parameters. Their function is described below:

- **AUTO OFF:** setting for automatic power off in minutes.seconds. The function is on only in Automatic mode whilst the programming mode it is disabled. Setting the time at 0.00 seconds power off is disabled.
- **U. PRSVIS:** selection of the measuring unit to display the pressure in Automatic mode. The choice can be made between the following measuring units: millibar (mBar), Kilopascal (kPa), millimeters water column (mmH₂O) or inches of water column (inCu).
- **U. FLWVIS:** selection of measuring unit to display the flow rate in automatic mode choosing from the nominal cubic meters/h (m³_h) or cubic ft/min (_CFM).
- **P FILTER:** setting of an attenuation index for software filtering of the pressure signal, the higher the value of this parameter, the lower the influence of small variations in instantaneous differential pressure on the value displayed. Setting the value to 0 disables the function.
- **EXIT DAT:** exit command from the dAtA, menu when indicated, by pressing the F key the instrument goes back to displaying the Programming mode.



CONFIGURATION PARAMETERS

PASS MENU

The **PASS** menu is a calibration menu with access protected by a password and reserved for ESA technicians. If you enter by mistake, you will see the message requi-

ring a password. To exit and return to Automatic mode press the **↑** and **F** keys together.

WARNINGS

■ ESA DPG-E is a measuring device used for the control and regulation on combustion plants. It is thus not to be understood as device that ensures safety for which there are special dedicated instruments.

■ The use of an ESA DPG-E pressure gauge must occur in an environment with temperature fluctuations within the limits permitted.

■ Avoid placing the instrument near intense magnetic or electric fields as well as in areas subject to vibrations.

■ The instrument must not be exposed to direct heat sources nor come into contact with combustion products such as liquids, solvents or corrosive gases.

■ -When the low battery indication "Lo b" appears on the display, the batteries must be replaced with the same type of batteries indicated in the general characteristics of the instrument.

■ In case of breakage or malfunction ESA DPG-E must be sent to the manufacturer for repair or replacement.

■ Any type of modification or repair done by third parties automatically invalidates the warranty terms and conditions and may compromise the use of the instrument as well as the safety of the operators and plant.

USE

For correct use, the following instructions must be respected:

1 - The pneumatic connections for the input pressure signals (+ and/or -) are performed with rubber hoses included in the supply.

2 - Before carrying out any type of measuring operation check the zero pressure setting, keeping the input hoses disconnected from the measuring element and in atmospheric pressure.

3 - It is advisable to keep the instrument higher than the pressure taps (calibrated flanges, annubar etc...) to prevent dirt or moisture from entering the sensor.

4 - If the instrument is used for relative pressure measurements, the signal must be connected to the positive (+) input, whilst the negative input (-) must be left free, or rather, at atmospheric pressure.

GENERAL MAINTENANCE PLAN

Check	Type	Advised time	Operation
Zero pressure setting	O	each use	Make sure that the instrument with the hoses disconnected from the measuring element indicates zero pressure.
Pressure reading calibration	O	annual	Check the pressure measurement comparing it with a sample instrument.
Battery replacement	S	/	replacement is necessary when the instrument indicates low charge or if it does not switch on.

NOTES

O = Ordinary / E = Extraordinary

ORDINARY MAINTENANCE

ZERO PRESSURE SETTING CHECK

■ Everytime before using, at disconnected inputs, check that the instrument displays zero pressure. If there is a deviation in the reading, follow the indications in the Functioning chapter to reset.

PRESSURE READING SETTING CHECK

■ Checking the setting of the pressure reading is done by applying pressure signals in different points of the measuring range and compare the value indicated on the display with the pressure read by the sample device. If the measurement is particularly incorrect, the instrument must be sent to the manufacturer to be recalibrated.

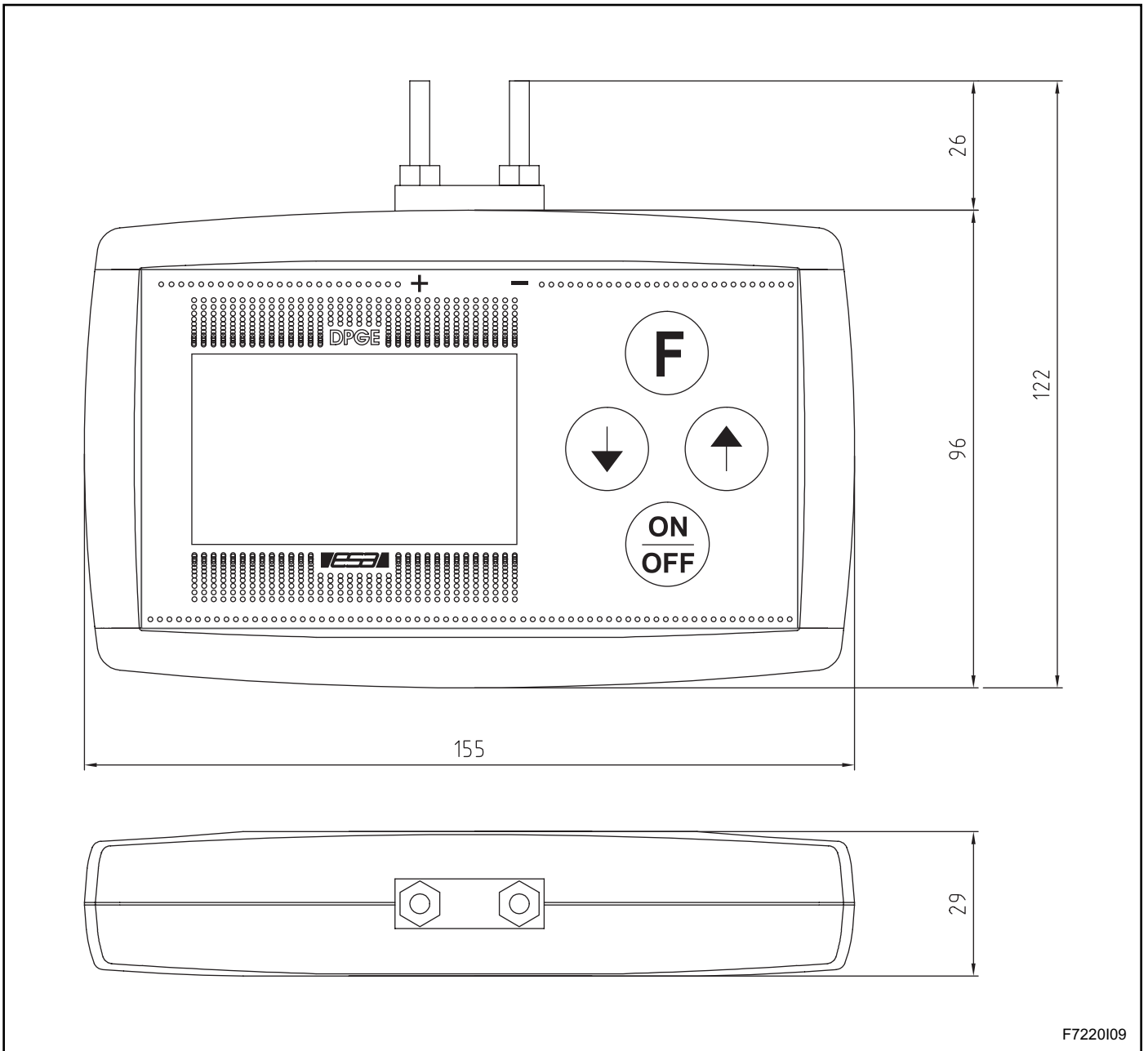
EXTRAORDIANRY MAINTENANCE

BATTERY REPLACEMENT

■ To replace the battery open the special cover on the back of the instrument. Remove the batteries from the

compartment and insert two new batteries paying attention to the polarity. The new batteries must be the same as what is specified in the characteristics.

DIMENSIONS - ESA DPG-E



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ORDERING CODE - ESA DPG-E

ESA DPG-E

NOMINAL RANGE		01
Nominal range	-100 ÷ 200 mbar	