Pietro Fiorentini

Fio 2.2

Smart add-on for gas pressure Regulators

Fio 2.2

Classification and Field of Application

Fio 2.2 is a modular system that allows to remotely control a pressure reduction station of a natural gas distribution network.
The system **Fio 2.2** is composed by a battery-operated Electronic Control Unit with 2G modem and antenna including two pressure sensors and one gas temperature sensor.
On request the system can be equipped with 2 auxiliary pressure sensors, displacement transducers and a pilot control system for pressure regulators.

FEATURES

Functional features:

Ambient temperature:	Standard version -20°+60°
Protection Rating:	IP 65
Power Supply:	Non rechargeable battery or rechargeable battery connected with 24V DC, 110-220V AC or Solar power supply modules, to be integrated in RTU by the customer or provided already in pre-wired boxes.
Display:	128x464 pixels B & W with green background. Visible area 71x39mm.
Keyboard:	24 keys membrane keyboard + Emergency button
Remote Communication:	GSM / GPRS quad band modem - Bluetooth 2.1 - 868Mhz RF optional module
Local communication:	Two RS485 and Bluetooth
CPU:	Twin Arm Cortex CPU
Memory:	fflash: 2MB + 2MB (Additional) - RAM: 64KB + 32 KB
Electrical connections:	Quick spring-cage connection terminal block
Certifications:	ATEX, Ⓔx II 2 G Ex ib IIB T3 Gb (Tamb -20÷+60°C) CEC15ATEX054X Certificate n° 15/2020-AET1449

Materials:

Container:	High resistance plastic material with transparent cover.
Material:	ABS for container, polycarbonate for transparent cover.

NOTA: The indicated materials refer to standard executions.
Different materials can be provided upon request.

Fio 2.2

PILOT 201\E\FIO

The current range of pilots for the **FIO** system is now available with a new version, the pilot **201\E\FIO**.

This new pilot allows to control the downstream pressure through an electric motor positioned on the lower part that will act directly on the setting screw.

The movement of the screw will be controlled through an electric motor complete with a gear, without an external power supply but activated directly by **FIO**, which there is full compatibility with.

Features:

Full interchangeability with pilot 201/A/2/CS FIO. The outputs of the F.I.O. can indifferently operate the solenoid valves or the electric motor.

- Retrofitting on the field with standard pilots: is enough to replace the lower part of the pilot, without changing brackets and connecting pipes. .
- You can order the complete pilot system or just the kit to upgrade it on the field.
- Does not modify the standard pilot 201/A performances, since the pneumatic part remains unchanged.
- High resolution, you can control very small pressure variations.
- It able to set the minimum pressure limit switch.
- Available for low / medium downstream pressures.
- Temperature range -20°C-60°C.
- Fail-freeze function. In case of failure, maintains the last setting pressure.
- ATEX approved with **FIO2.2**
- Available with shielded cable for **FIO2.2** connection, length 3 and 5 mt.

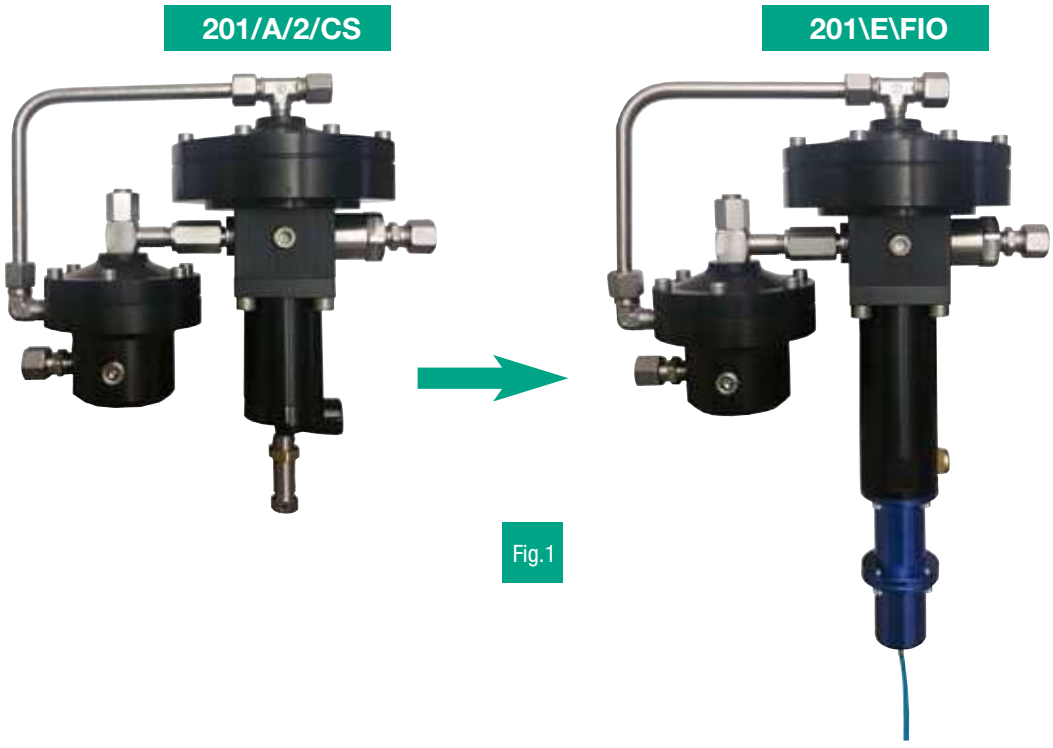


Fig.1

Five functions in a single device

The peculiar characteristic of **Fio 2.2** is the integration of 5 functions in a single device.

[IFM] > **Indirect Flow Measurement**, differently from traditional flow measurement systems, it realizes the flow measurement in a non-intrusive manner, by means of correlation calculations based on measured pressures and meaningful plug displacement.

[OPC] > **Outlet Pressure Control**, that is the regulator outlet pressure control, made remotely or locally, in agreement with a daily / weekly schedule or to compensate for demand load.

[FL] > **Flow rate Limitation**, flow limitation modifying the outlet pressure to keep the flow below of a configurable threshold; it allows to replace the traditional invasive mechanical systems for limitation, without pressure drops under standard operating conditions.

[RM] > **Remote-Monitoring** of key parameters for safety management of the station (inlet and outlet pressure, safety valve and monitor intervention, filters status check, intrusion, gas leakage).

[EUM] > **End User Management**, that is the interruption of supply to a user in case of emergency or of late payments.

Fio 2.2 can be powered by long life Batteries, solar panels or line power (24 volt, 120 volt or 220 volt).

When **Fio 2.2** is battery-operated, and if the outlet pressure modulation function is not active, control units and communication are both kept in a low consumption state (sleep mode) to increase battery life. When an alarm condition is detected, the control unit wakes up from low power and activates the communication unit to make a call to the remote control center (watchdog function). In any case, the unit periodically exits the low-consumption state to verify for the receipt of any messages.

SCHEMES OF APPLICATION

Indirect Flow Measurement [IFM]

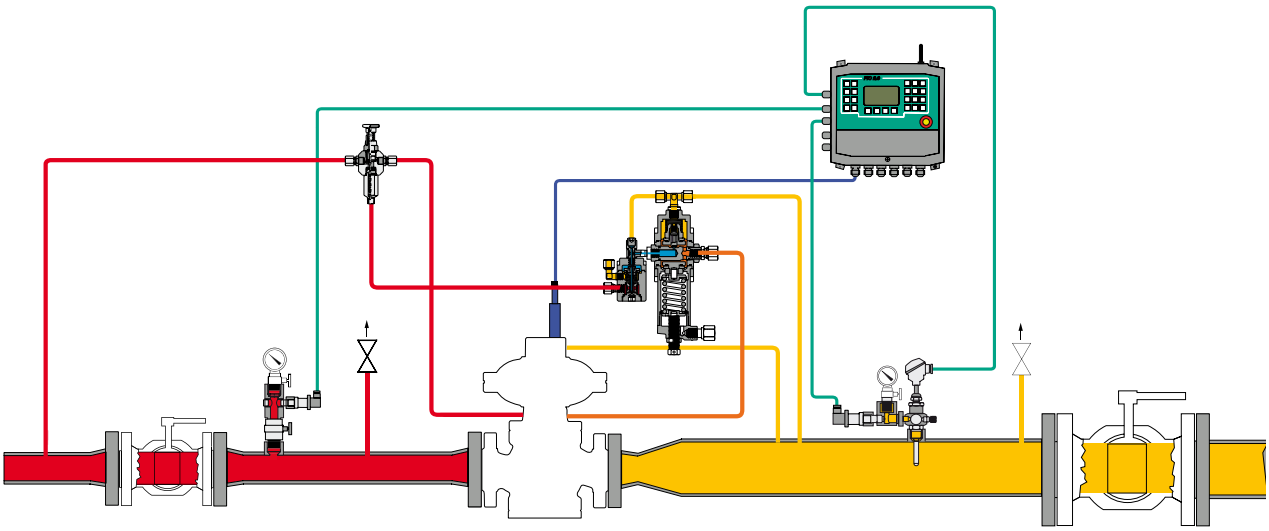


Fig.2

Knowing the quantity of gas flowing through a regulator station of a gas system allows you to achieve accurate load balancing in your system.

Existing flow measurement at stations is achieved by means of meters or orifice plates, requires the modification of the station layout and in some cases the availability of a significant source of power supply (ultrasonic, turbines, etc…) and, in any case, costs are high that the investment sometimes isn't justified.

The principle of operation of indirect measurement is based on the assumption that for each model of regulator there is a relationship between the instant flow at standard conditions, the orifice & valve displacement and the values of inlet and outlet pressure.

The calculation of flow value is carried out at predetermined intervals of time, with a maximum frequency of 1 time per second (1Hz).

The accuracy of indirect flow measurement IFM vary according to the graph Fig.3 is inside the limits highlighted with the lines red, yellow and green depending on the regulator opening.
In the graph is reported indicatively the error% of the indirect flow IFM with different regulator opening%.

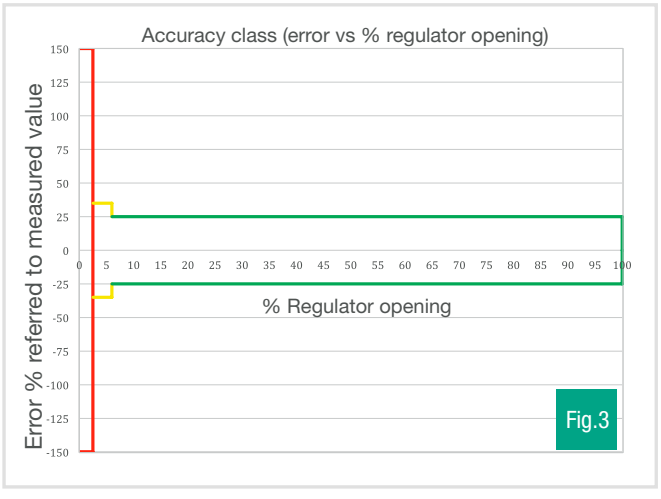


Fig.3

Flow Rate Limitation [FL]

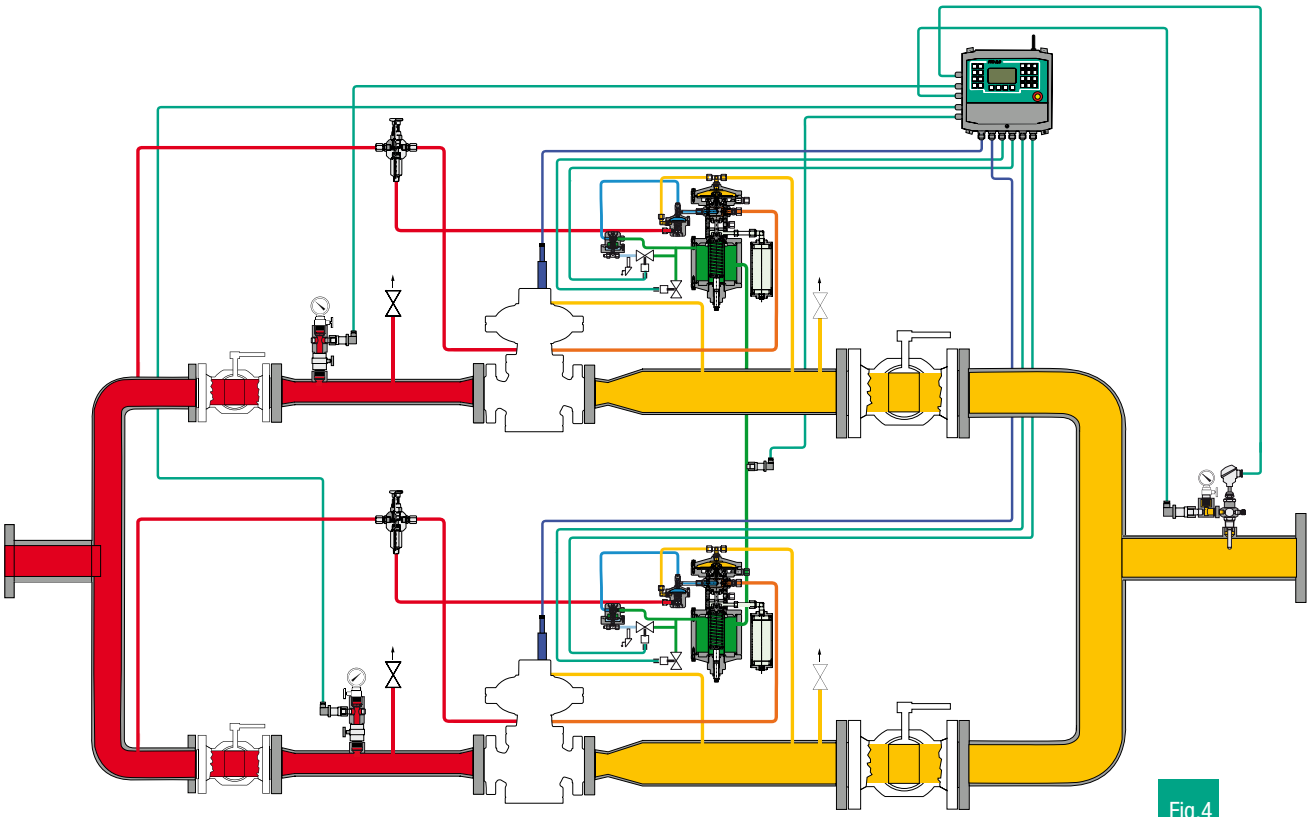


Fig.4

Flow limitation allows to ensure that you agree to the contractual terms for the amount of gas allocated for the station In respect to the project specifications, and ensuring at same time an adequate level of safety to the system.

This function can be used to achieve the balancing between the stations feeding your system.

The “Flow limitation “ function is activated only if there is provision for the pressure modulation function and if it’s Available the (direct or indirect) flow measurement.

When the flow measurement value at reference conditions, calculated by means of indirect flow measurement or derived from a meter or a converter, reaches or exceeds a configurable limit, **Fio 2.2** starts to modulate the outlet pressure with the purpose of reducing the load. The pressure reduction happens ensuring a configurable minimumSet point value.

Outlet Pressure Control [OPC]

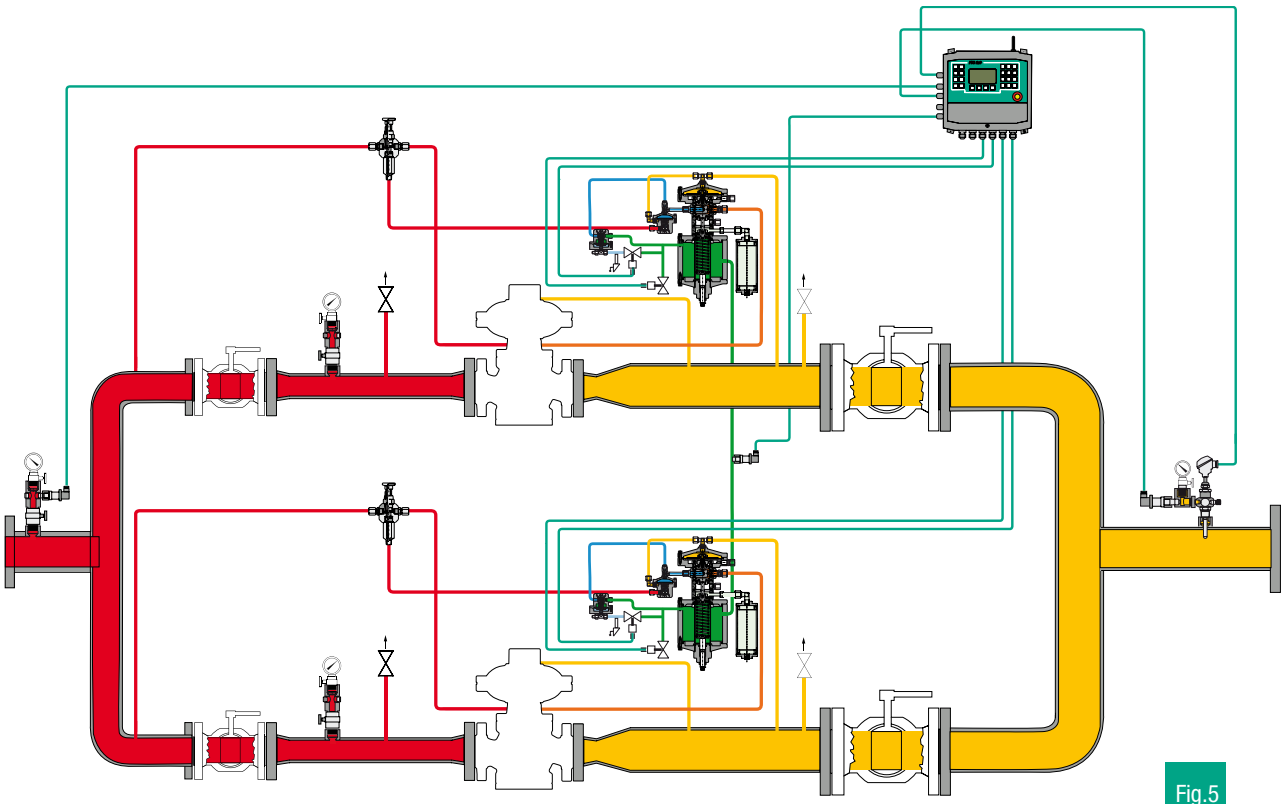


Fig.5

To increase or decrease the outlet pressure of a regulator, it is necessary to decrease or increase the motorization force of the pilot. The increase or decrease of motorization can be obtained increasing or reducing gas pressure or the pressure of the air injected inside the spring chamber (“Motorization Pressure“). The calibration spring must be set up to get the minimum set point value of pressure regulator.
Changing the pressure set point of a regulator, without the intervention of an operator, is helpful in all those cases in which the pressure in the system is highly variable during the day, due to varying load conditions, to ensure an adequate gas supply to all the users of your system.
The goal of reducing gas leaks in a system can be obtained by maintaining the pressure to the minimum possible value when there isn’t demand load from the users.
The system is able to drive up to 10 lines of regulation, maintaining the specified intervention ΔP between lines
The “Pressure profiling “ function carries out an automatic control to change the outlet pressure to a value specific to the period of the day. It is possible to configure up to 7 different pressure set points for each day of the week. The ECU module stores a weekly active schedule and a further future schedule.
If flow measurement is available (computed with indirect method or directly detected from a meter or corrector), the “Pressure compensation “ function can be activated as an alternative to “Pressure profiling “. This function allows to automatically correlate the inlet pressure with the instant flow. The modulation accuracy is better than 1% of the nominal full range pressure value.

Multi Drop Modular System

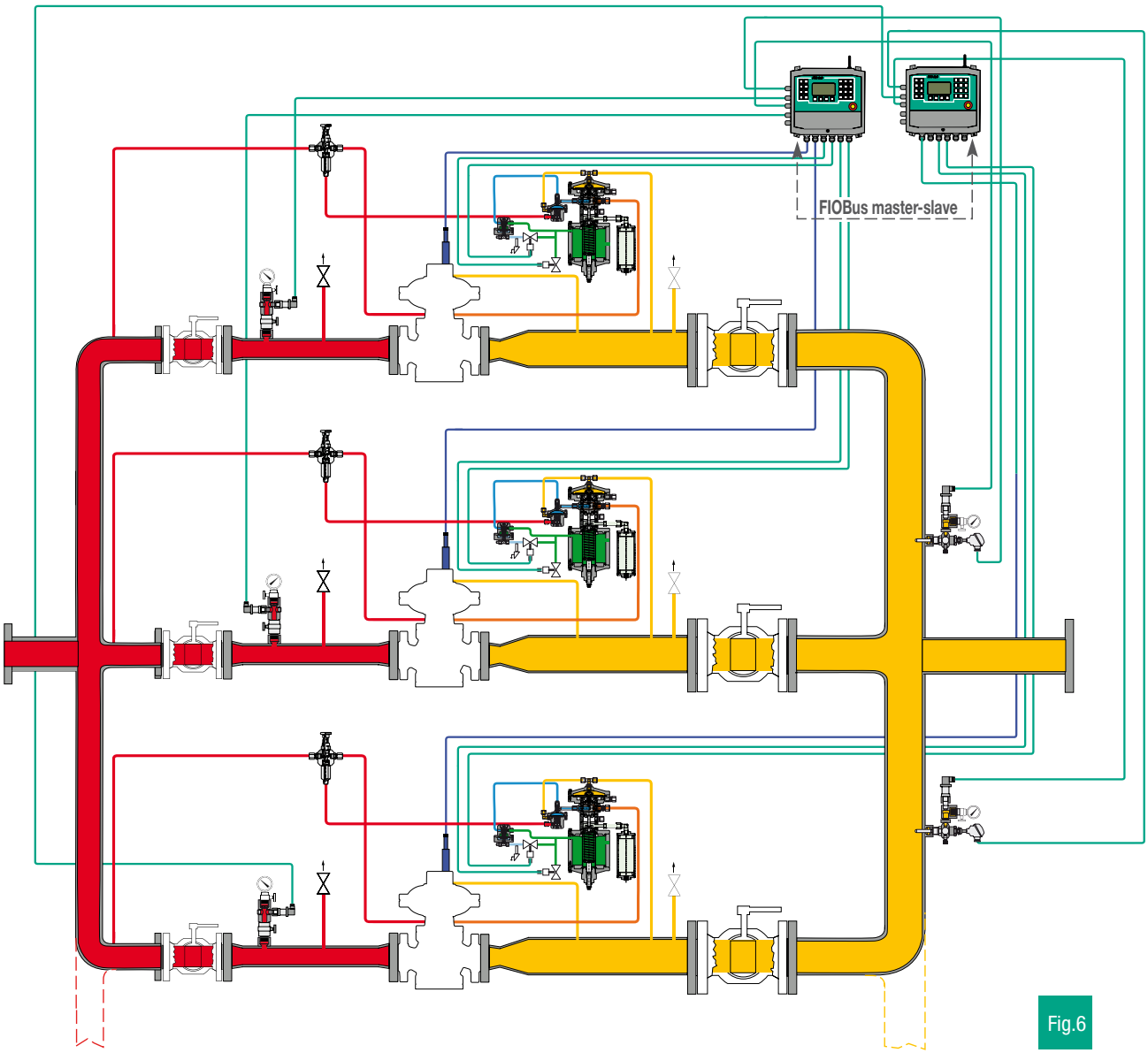


Fig.6

Each **Fio 2.2** unit is able to control up to 2 lines.
If there is the need of controlling more than 2 lines (and up to 10), it is possible to interconnect via bus several **Fio 2.2** units.
All remote connections, such as RTU, modem, etc., are interfaced jointly with the main **Fio 2.2**,to who all secondary units are connected.

Digital Inputs

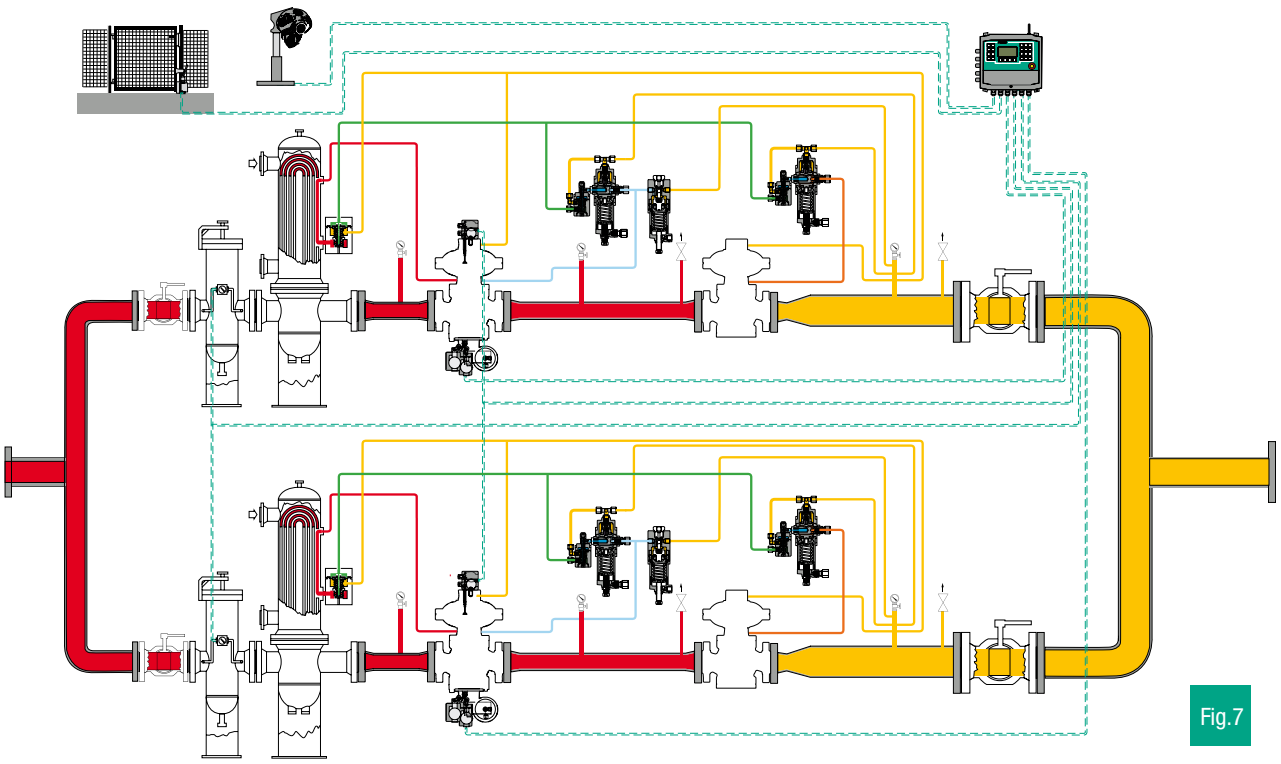


Fig.7

Besides pressure and temperature control, the **Fio 2.2** system offers there option of using up to 6 digital inputs to monitor some or all of the following on-off states:

- filters clogging
- monitor intervention
- safety valves intervention (slam shut, relief, etc.).
- intrusion alarm for Entrance gate
- gas presence detector
- flood detector
- flame detector

Remote monitoring [RM]

The remote monitoring of a reducing station is really important for the safety and the network management

Fio 2.2 keeps the performance of remote monitoring currently implemented in the devices of the EXPLORER family.

In detail, the control unit, at its maximum expansion, is able to monitor:

- Inlet and outlet pressure of the station with stability and accuracy better than 0.25% of full range
- Gas temperature, measured by means of a PT1000 transducer
- Flow value calculated by means of an meter or volume converter and transmitted by means of a LF or HF pulse emitter
- 6 digital inputs, the state (ON-OFF) of as many operating conditions, such as clogging of filters, safety valves tripping, monitor regulator takeover, intrusion, etc

End-user management [EUM]

We offer the feature to remotely disconnect from a system (interruptible). In case of particular condition that could compromise your system, increasing the speed of intervention, to help reduce the operating costs. In addition it can be an alternative to optimize the system when it is necessary to manage random situations.

Supply interruption can be activated such as releasing a the slam shut valve or reducing the outlet pressure o a safe minimum value; restoring the operating condition is usually requires an operator or technician find the source of the problem, then acknowledgement can be generated by **Fio 2.2** or it can be required that manual restoration of the safety valve be taken care of.

The reset can be enabled by means of a specific command from a remote center or on site, inserting a password.

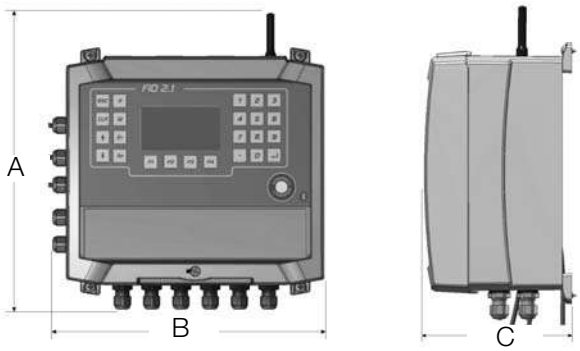
Modalità d'installazione

Fio 2.2 wall mounted by means of an adapter kit provided with the unit

Fio 2.2 pole mounted by means of a back plate, mounting vertically or horizontally

Fio 2.2 application on pipe by means of a back plate, Mounted vertically or horizontally

DIMENSIONS



	A	B	C
Dimensions (mm)	260	240	117
Pollici	10.24	9.45	4.61

www.fiorentini.com

The data are not binding. We reserve the right to make changes without prior notice.

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