**“TECHNICAL SPECIFICATION”**

**T.S. 2329300**

**Final reduction unit for digital networks from road pipes with upstream pressure between 0.5 and 5 bar**

|  |  |  |
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# PRELIMINARY INFORMATION

## Reason for issue

The issue of this T.S. 2329300 was required as a result of:

1. updating of meter type related to DFRU 6 plants, related positioning of upstream-downstream straight sections and insertion of flow rectifier
2. adaptation of single-row diagram for DFRU 6 plants

## Company departments mentioned in the document

* + - * PROMA-CMMAT = Procurement and Material Management-Category Manager Materials
      * ATECH-NORM = Technical Services-Technical Standards

## definitions

Unless otherwise specified the flow rates are in Sm3/h , with gas at 15 °C and 1.013 bar (absolute pressure).

***Cabinet:***

Stainless steel/galvanised steel or plastic construction (see T.S. 9991310, point 4.1, letter a), soundproofed, for the containment of the equipment constituting the pressure control system and the measuring system, entirely above ground.

***Housing:***

A normally soundproofed construction for containment of the equipment constituting the pressure control and measuring plant, of reduced dimensions, inside which there is no personnel access.

***Main circuit:***

The main gas circuit consists of pipes, valves, filters, special parts, regulators, gas meters, in which the gas flows from the pipeline upstream of the control system to the downstream pipeline.

***Gas meter:***

An instrument designed to measure, store and display the amount of combustible gas (volume or mass) passing through it.

***Reduction unit:***

An assembled set of pressure reducers-regulators of the ancillary equipment, special parts and pipes connecting them, having the essential function of decompressing a ducted gas from a variable upstream pressure to a regulated downstream pressure at a fixed value.

***Gas control and metering system (plant):***

An assembly consisting of a pressure control system and a metering system. It includes:

* apparatus such as pressure vessels, valves, pressure regulators, safety devices, gas meters, etc. (equipment capable of performing a regulating and metering function).
* ancillary elements such as pressure gauges, thermometers, sensors, intake taps, etc. (elements able to record individual data ancillary to the regulation and metering functions);
* connection pipes for various equipment, dielectric and expansion joints;
* housing and/or cabin.

***Regulation accuracy class required (AC):***

Maximum deviation, both positive or negative, of the regulated pressure from the pressure OPd, which must be guaranteed, without changing the calibration of the regulating devices, over the entire range of pressure variation Opu  of the pressure control system and for flow rates varying between Qnom and 0.1\*Qnom , both upwards and downwards. It is expressed as a percentage of OPd pressure.

***Closing accuracy class (SG):***

Maximum permissible positive difference between actual closing pressure and set point expressed as a percentage of OPd pressure.

***Blocking device intervention accuracy class (AG):***

Absolute maximum permissible value of the trigger pressure deviation expressed as a percentage of the set value.

***Atmospheric release device (relief valve):***

A device which remains in the closed position under normal operating conditions which is able to release gas into the atmosphere following an increase in pressure relative to a pre-set trigger value and able to stop the release when the pressure returns below the pre-set maximum pressure value.

***Pressure control system:***

Combined system comprising the pressure regulation system, pressure safety system, and possibly also the pressure recording and alarm systems.

***Pressure regulation system:***

A system that ensures the maintenance of a given pressure, within set limits, downstream of the regulating equipment.

***Pressure safety system:***

A system that, independently of the pressure regulation system, ensures that the outlet pressure of that system does not exceed the safety limits.

***Upstream manifold:***

Assembled set of special parts (bends, tees, etc.) and connecting pipes upstream of the shut-off valves of the reduction line and the emergency line, excluding the latter.

***Downstream manifold*:**

Assembled set of special parts (bends, tees, etc.) and connecting pipes downstream of the shut-off valves of the reduction line and the emergency line, excluding the latter.

***Reduction line:***

An assembled set of the pressure reducers-regulators, safety devices, auxiliary equipment (pilots, pressure intakes) special parts and connection fittings between the shut-off devices located upstream and downstream of the regulating equipment (the latter included).

***Measuring system:***

A complete set of measuring instruments and other devices assembled to perform specific measurements.

***Remote Control System:***

Set of components installed in a gas system to be remotely controlled.

***Remote control system:***

System enabling remote control of the gas distribution system by an Integrated Supervision Centre.

***RTU (Remote terminal unit)***

Remote Terminal Unit, i.e. the peripheral remote control equipment.

***Metering unit:***

Part of the system used to measure the gas flow rate. The metering unit consists of one or more units which, regardless of the technology used, are able to measure, convert and communicate the values measured.

***Conversion device:***

A device constituting a sub-unit of the metering unit installed downstream of a gas meter that automatically converts the quantity measured at the measuring conditions into a quantity at basic conditions. The conversion device can be incorporated into the RTU.

***Temporary operating pressure (TOPu upstream, TOPd downstream):***

Maximum effective pressure at which the system can temporarily operate, under the control of the safety device (monitor) for DFRUs 1 to 6.

***Test pressure (Pcol):***

Pressure at which the mechanical strength test of the "main gas circuit" is performed.

***Delivery flow rate of the plant:***

Maximum flow rate to be ensured by the reduction unit at predetermined supply pressure values.

***Nominal flow rate of the plant:***

Flow rate that can be delivered by the reduction unit at the nominal pressure for geometric sizing, and minimum guaranteed upstream pressure (1.5 bar relative in standard situation), with the required regulation pressure. In particular cases, values of 1 and 0.5 bar relative are envisaged.

***Maximum flow rate (Qmax)***

Maximum effective flow rate that the control system must be able to deliver, at maximum upstream supply pressure.

***Minimum flow rate (Qmin)***

Minimum flow rate that the control system must be able to deliver at minimum supply pressure.

***Maximum upstream operating pressure (MOPu):***

Maximum upstream pressure at which the plant can be used continuously and under normal operating conditions.

***Maximum downstream operating pressure (MOPu):***

Maximum downstream pressure at which the plant can be used continuously and under normal operating conditions.

***Maximum pressure in case of failure (MIPu upstream and MIPd downstream):***

Maximum pressure that the system can reach for a short period, limited by the safety devices.

***Design pressure (DP):***

Pressure value which design calculations are based on. This must be greater than or equal to the maximum pressure possibly present, even in a fault situation.

***Geometric sizing pressure:***

Pressure value to be referred to for the geometric sizing of the control system; this value must be less than or equal to the minimum operating pressure.

***Required regulation pressure (OPd):***

Regulated pressure which the control system, operating within the required range of inlet pressure variation, must provide downstream with the required accuracy class AC.

***Upstream operating pressure (OPu):***

Pressure present in the system under normal operating conditions. In this specification, this is the pressure value used for the selection of the specific Digital FRU for the maximum flow rate required by the system (flow rate that can be delivered by the plant). This value may coincide with but not exceed the minimum operating pressure of the road pipe at or near the point of supply of the plant. The following OPu values are envisaged for the application of this specification: 1.5 bar (in standard situations); 1 bar and 0.5 bar (relative).

***Minimum upstream pressure (OPumin):***

Lower limit of the plant supply pressure.

For the other technical definitions contained in this specification, please see the standards listed in point 14 “Reference standards”.

# PURPOSE AND FIELD OF APPLICATION

## Purpose

The purpose of this specification is to define:

* the design criteria considered by Italgas Reti for the sizing of Digital FRUs to be installed on its distribution networks;
* the supplier qualification criteria;
* supply and testing criteria;
* flow diagrams and plant components;
* the range of use of standardised Digital FRUs in relation to specific supply conditions (upstream pressure).

## Field of application

This specification applies whenever the opportunity arises to purchase a Digital FRU designed and manufactured by a potential supplier in accordance with the requirements and indications contained in this specification.

This specification is also applicable, as far as design criteria and equipment components are concerned, for the replacement of existing FRUs.

# Specifications

1. These technical specifications must be understood as an integral part of the “ASSESSMENT AND QUALIFICATION SYSTEM FOR SUPPLIERS OF ITALGAS”.
2. This specification contains the minimum technical requirements demanded by Italgas Reti based on the reference Legislative and Technical Standards.
3. It is the Supplier's responsibility to ensure that the products supplied fully comply with the provisions of this technical specification and the applicable standards.
4. If the products in question are supplied by an installer, the installer must document their compliance as required under “Documentation required from the Supplier”.
5. It is the Supplier's responsibility, during the product design, production and control process, to verify that there are no construction faults in the finished products (e.g. sharp edges or incorrect directions for use and maintenance), which may jeopardise the health and safety of the Client's workers in relation to the provisions of Italian Legislative Decree no. 81/08, as amended.
6. For any technical and operational aspects that conflict with or are not mentioned in this technical specification but that nevertheless pertain to the design, installation, maintenance and use of the products themselves, it is the Supplier's responsibility to refer to the regulations in force.

# Technical characteristics

Digital final reduction units[[1]](#footnote-2) are plants that allow:

* the supply of LP networks (type 7 pipelines) taking gas (natural gas) from road pipes operated in MPB (type 4 and 5 pipelines) and in MPA (type 6 pipelines);
* the measurement, remote control and reading of the main parameters of the plant including the gas flow in transit through a suitable metering unit.

The DFRUs consist of two automatically operating reduction lines, referred to as main line and emergency line respectively, where a gas meter is installed on the upstream manifold, for DFRUs 1 to 6, and downstream manifold for DFRU 0, able to measure the gas volumes to the reduction unit.

The DFRUs are also equipped with a remote control system to allow monitoring of the quantities measured in the field and transmission of the data to Italgas Reti's SCADA, indicating any alarms set to the Integrated Supervision Centre.

For the proper functioning of the remote control system and the electrically powered equipment, as an alternative to the power supply from the electricity distribution network, a third line containing the micro-turbine for recharging the general plant batteries may be installed by Italgas. For this purpose, DFRUs sizes 1 to 6 must be equipped with two special branches from the pipes, to be used as "in-out" couplings of the line containing the micro-turbine.

## Sizing criteria

### General considerations

The sizing criteria below are based on the following assumptions:

* the natural gas and its additives, if any, are non-corrosive;
* the system is subjected to stresses due to gas pressure and the effect of temperature variation;
* the design temperature is between –10°C and +60°C;
* the plant is designed to simultaneously ensure:
  + maintenance of the required regulation pressure at values compatible with the proper functioning of the user equipment.
  + adequate measurement of the gas delivered in the range of the pre-set flow rates;
  + continuity of delivery up to a flow rate equal to 70% of the delivery flow rate, with automatic intervention of the emergency line in the event of a failure of the main line.

Each plant must:

1. be designed and constructed with materials suitable to withstand the maximum operating pressure (MOP), in compliance with the Ministerial Decree of 16 April 2008, i.e:
   * 5 bar in the part affected by upstream pressure, not including the shut-off valve downstream of the pressure reducers-regulators;
   * 40 mbar for the part downstream of the reduction lines;
2. function correctly, guaranteeing the regulated pressure and flow rate required in relation to predetermined upstream operating pressure values (OPu) within the range 0.5 ÷ 5 bar (relative). As can be seen from the note on the required regulation accuracy class (AC), the size of the DFRUs must be chosen so that the flow rate delivered is within the range between the nominal flow rate ±10% of the same. Any deviations from the indicated flow rate range must be of very short duration.
3. be equipped with pressure-reduction equipment, a safety device, a pressure reducer-regulator with an emergency function (monitor) and a valve to block delivery in the event of an increase in regulated pressure. The integrated design and assembly of regulation and safety equipment in a single valve body are permitted, in compliance with the relevant standards.
4. be designed taking into account the necessary maintenance cycles and with particular reference to load handling (assessing the need for the insertion of hoisting eyes).

The pressure equipment, together with the filters and shut-off valves provided on the system, must be of the approved, EC-marked type in accordance with the PED Directive (2014/68/EU) and must also comply with the requirements of the ATEX Directives 2014/34/EU and 1999/92/EC.

Electrical/Electronic equipment must be installed in accordance with the provisions of CEI 64-8. If such equipment is installed in places at risk of explosion, the requirements of CEI EN 60079-14 (CEI 31-33) must also be complied with.

For the sizing and choice of safety devices, reference must be made, unless otherwise specified, to standard UNI 8827 and the Ministerial Decree of 16 April 2008.

With regard to the sizing of the individual sections constituting the system, please refer to the following points.

### Geometric sizing pressure

Except in specific cases, the pressure value for geometric sizing to be referred to when designing the system and selecting pressure reducers-regulators is 1.5 bar.

### Diameters

Main line

The plant must be sized so that under the operating conditions defined in Table 1, maintenance of the regulated pressure is guaranteed at the set value within the required accuracy class.

The gas speed must be kept within 30 m/s for the upstream part of the pressure reducer-regulators and 20 m/s for the downstream part, with a maximum tolerance of +10%.

Note:

In the upstream section of the pressure reducer-regulator with service function, a pressure drop of no more than 150 mbar is permissible with clean filter and at design pressure.

Emergency line

The emergency line is sized with the same criteria as the main line with the exception of the flow rate, which is reduced to 70% of that of the main line.

Micro-turbine line preparation

The micro-turbine line, if present, will supply energy to the plant's remote control system and must guarantee gas delivery as the main operating line.

It should have the following dimensions:

* Micro-turbine line inlet from MP: ND 1”;
* Micro-turbine line outlet in LP: ND 1”1/2.

## Standard plants

Depending on the criteria for sizing the individual components and the range of nominal plant flow rates, seven standardised reduction units have been defined.

The use of each unit is foreseen for different flow rates depending on the minimum upstream pressure OPumin of the unit, as shown in Table 1 below:

|  |  |  |  |
| --- | --- | --- | --- |
| ***Plant name*** | ***Nominal flow rate of the plant***  ***(Sm3/h)*** | ***Delivery flow rate of the plant***  ***(Sm3/h)*** | |
| **OPu = 1.5 bar** | **OPu = 1 bar** | **OPu = 0.5 bar** |
| **DFRU 0** | 100 | 100 | 80 |
| **DFRU 1** | 150 | 140 | 100 |
| **DFRU 2** | 250 | 250 | 200 |
| **DFRU 3** | 650 | 550 | 330 |
| **DFRU 4** | 1500 | 1300 | 790 |
| **DFRU 5** | 2500 | 2100 | 1300 |
| **DFRU 6** | 4000 | 3300 | 2000 |

**Table 1:flow rates**

With reference to Figure , the following are the results of analyses for the various standard plants, in compliance with the rules and requirements set out in point 4 of this T.S.:

* nominal diameters of the upstream/downstream manifolds;
* general structure of the plant with reference to the constituent elements as in point 5 below. “CONSTITUENT ELEMENTS”.

## Digital Final Reduction Unit DFRU 0 (downstream measurement)

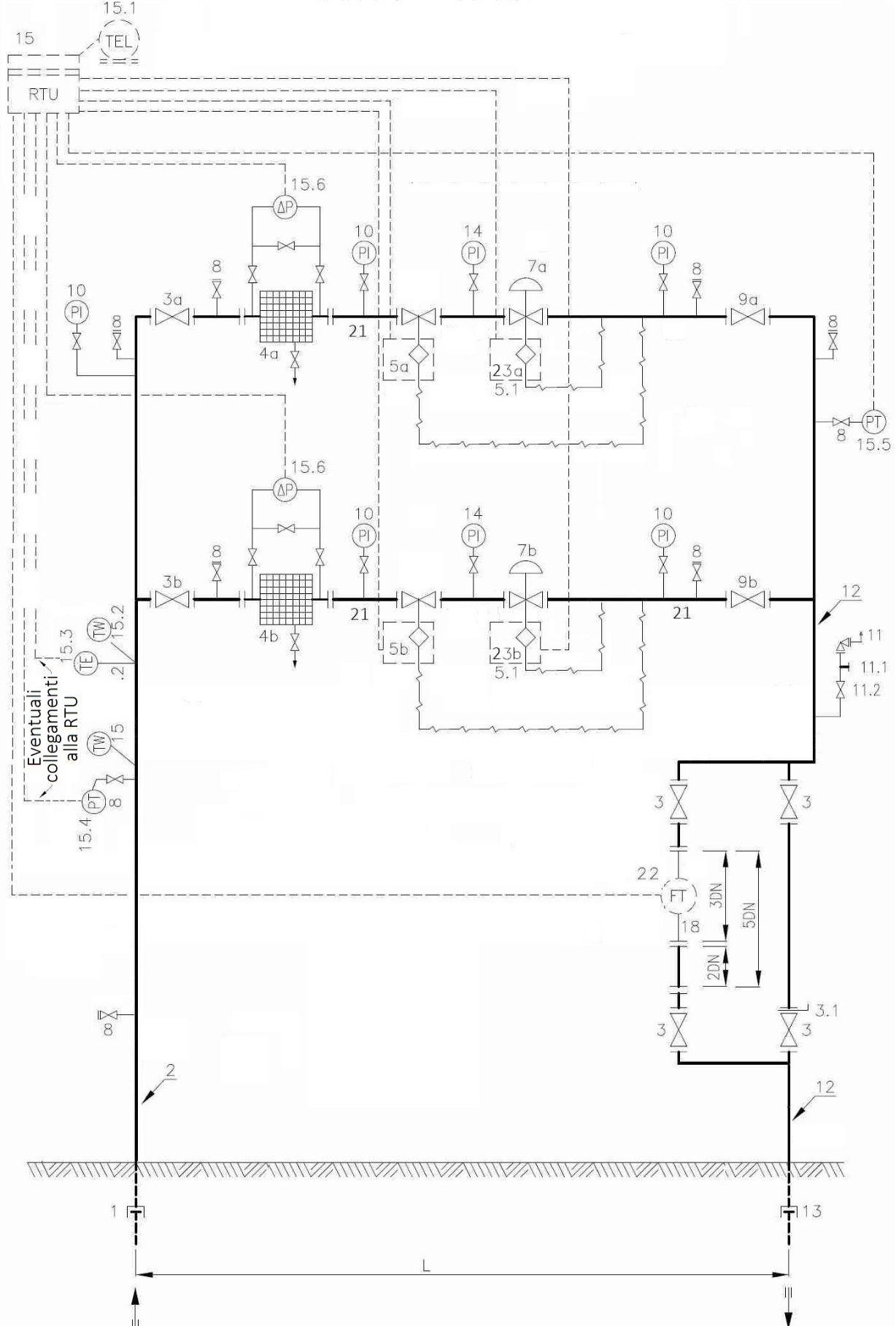


Figure 1: Digital Final Reduction Unit DFRU 0 (downstream measurement)

Points 15 and 15.1 are located in the same cabinet as DFRU 0

## Digital Final Reduction Unit DFRU 1 to 5 (upstream measurement)

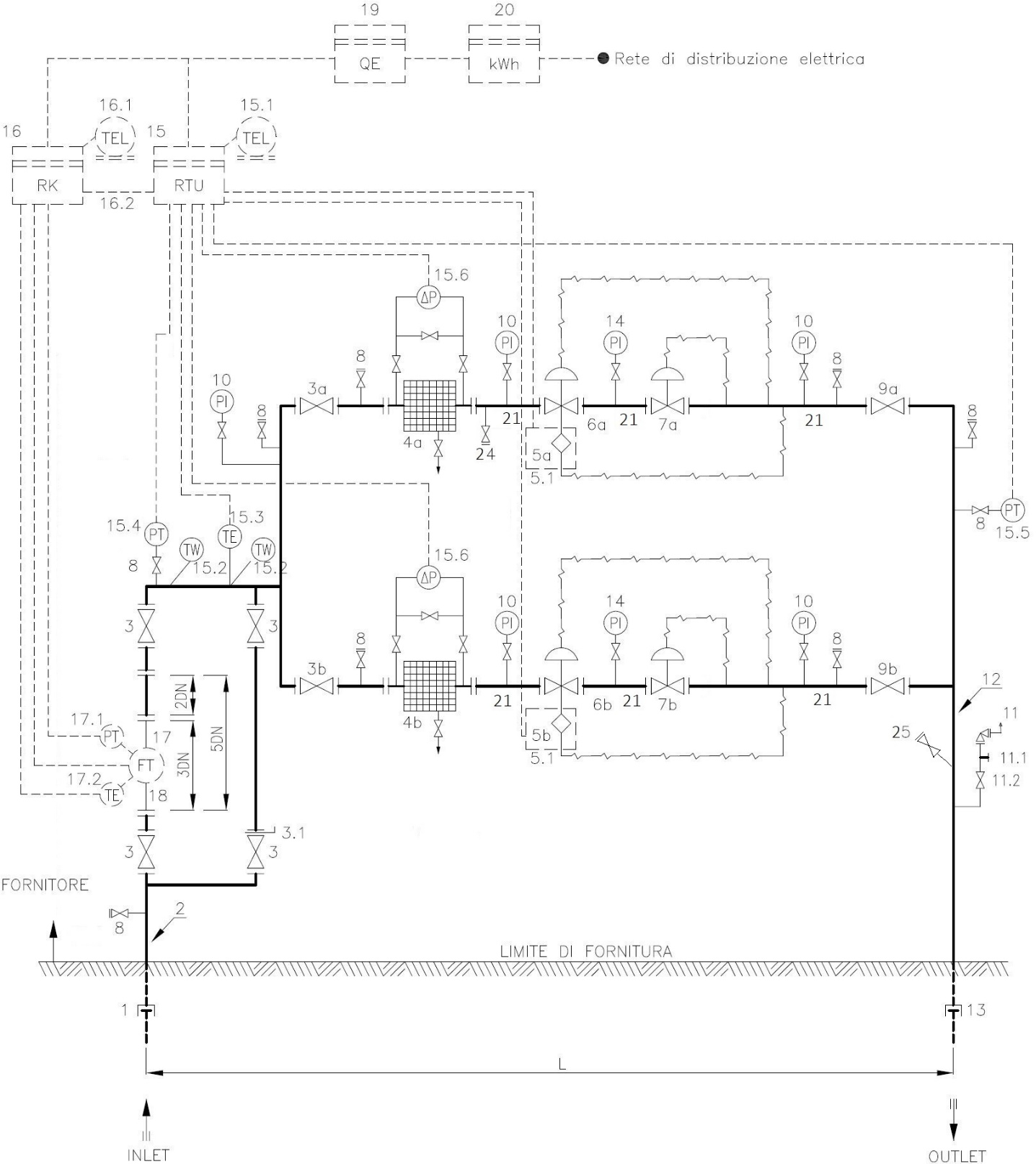


Figure 2: Digital Final Reduction Unit DFRU 1 to 5 (upstream measurement)

Points 15 (and 15.1), 16 (and 16.1, 16.2), 19 and 20 are placed in the fibreglass road cabinet as per point 5.7

## Digital Final Reduction Unit DFRU 6 (upstream measurement)

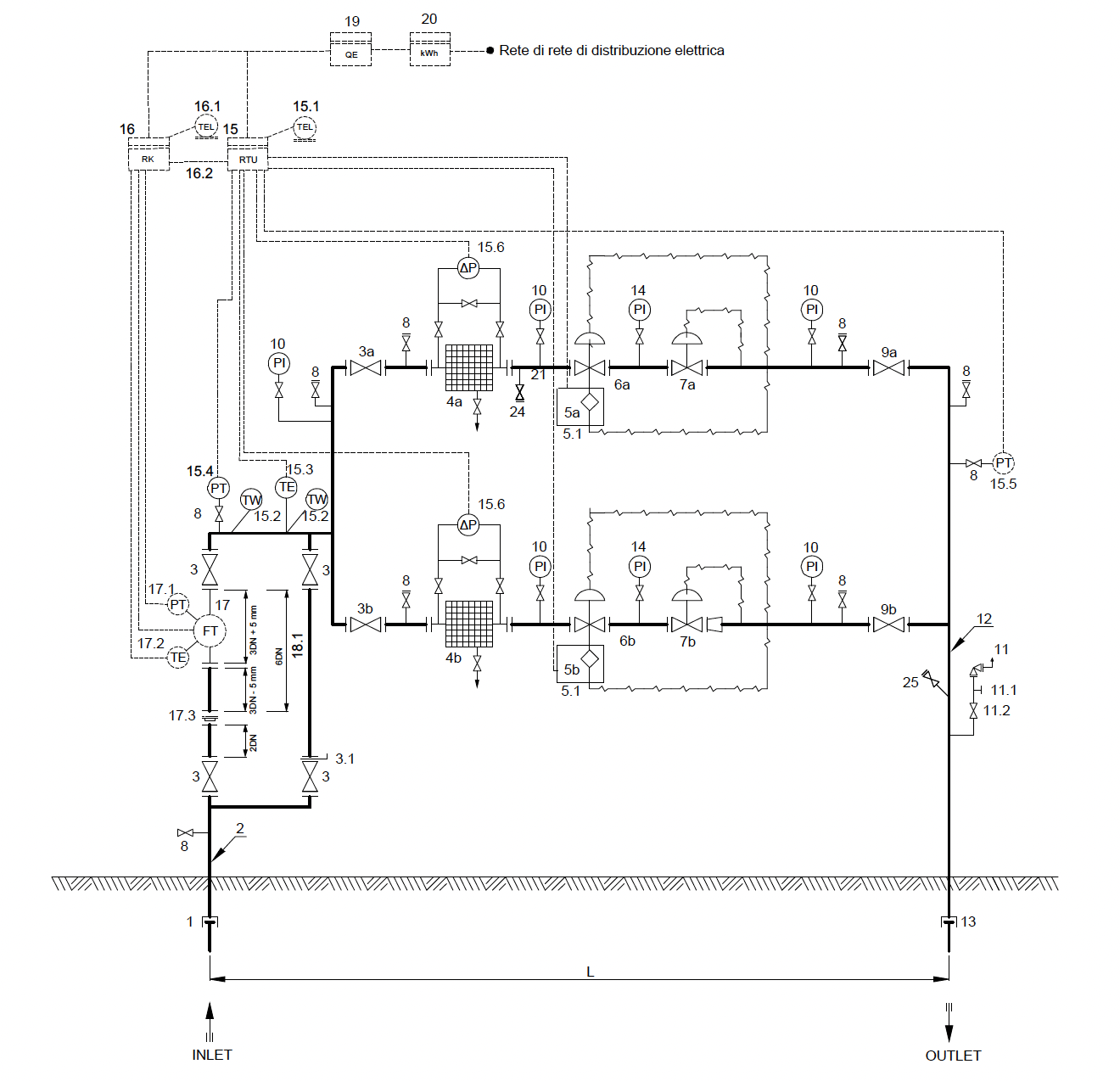


Figure 3: Digital Final Reduction Unit DFRU 6 (upstream measurement)

Points 15 (and 15.1), 16 (and 16.1, 16.2), 19 and 20 are placed in the fibreglass road cabinet as per point 5.7

Table 2-Materials included in the DFRU supply

|  |  |  |
| --- | --- | --- |
| **Pos.** | **Description** | **Q.TY** |
| **1** | PE/steel transition or insulating joint | - |
| **2** | Upstream manifold | 1 |
| **3** | Upstream/downstream shut-off valve and meter by-pass | 4 |
| **3a** | Upstream shut-off valve (service line) | 1 |
| **3b** | Upstream shut-off valve (emergency line) | 1 |
| **3.1** | Figure-8 blind disc | 1 |
| **4a** | Filter (service line) | 1 |
| **4b** | Filter (emergency line) | 1 |
| **5a** | Blocking valve (service line) | 1 |
| **5b** | Blocking valve (emergency line) | 1 |
| **23a** | Blocking valve for DFRU 0 (service line) only | 1 |
| **23b** | Blocking valve for DFRU 0 (emergency line) only | 1 |
| **5.1** | Status sensor for the reducer blocking valve (optional) | 2 |
| **6a** | Pressure reducer-regulator with monitor function (service line) | 1 |
| **6b** | Pressure reducer-regulator with monitor function (emergency line) | 1 |
| **7a** | Pressure reducer-regulator with service function (service line) | 1 |
| **7b** | Pressure reducer-regulator with service function (emergency line) | 1 |
| **8** | Pressure gauge intake tap | 9 |
| **9a** | Downstream shut-off valve (service line) | 1 |
| **9b** | Downstream shut-off valve (emergency line) | 1 |
| **10** | Pressure gauge intake tap with dial gauge | 5 |
| **11** | Atmospheric release device (relief valve) | 1 |
| **11.1** | Atmospheric release device calibration control valve | 1 |
| **11.2** | Atmospheric release device shut-off valve | 5 |
| **12** | Downstream manifold | 1 |
| **13** | PE/steel transition or insulating joint | - |
| **14** | Pressure gauge intake tap with dial gauge indicating minimum pressure | 2 |
| **15.2** | Thermowell | 2 |
| **15.6** | Differential pressure gauge clogging indicator | 2 |
| **18** | Straight flanged section, total length L=5ND[[2]](#footnote-3) (for DFRU 0 to 5) | 1 |
| **18.1** | Straight flanged section, total length L=6ND[[3]](#footnote-4) (for DFRU 6) | 1 |
| **21** | Flanged horizontal straight sections, for connection of service filter/regulators and downstream monitor/manifold of the unit, made of steel piping (possibly connected with increase/reduction to equipment) | 1 … 3 |
| **24** | Provision for possible MP gas inlet to the micro-turbine line - ND 1" (including valve and cap), see point 5.3.8 | 1 |
| **25** | Provision for possible LP gas outlet from the micro-turbine line - ND 1" 1/2 (including valve and cap), see point 5.3.8 | 1 |

**Materials not included in the DFRU supply**

|  |  |  |
| --- | --- | --- |
| **Pos.** | **Description** | **Q.TY** |
| **15** | Remote Terminal Unit (RTU) | 1 |
| **15.1** | RTU data transmission module | 1 |
| **15.3** | Temperature sensor (connection to RTU) | 1 |
| **15.4** | Pressure transmitter with appropriate scale for upstream pressure (RTU connection) | 1 |
| **15.5** | Pressure transmitter with appropriate scale for downstream pressure (RTU connection) | 1 |
| **16** | Type 1 gas volume conversion device | 1 |
| **16.1** | Converter Data Transmission Module | 1 |
| **16.2** | Alarm converter connection to RTU | - |
| **17** | Gas meter (DFRU 1 to 6) | 1 |
| **17.1** | Pressure transmitter with appropriate scale for upstream pressure (connection to Converter) – intake on back of meter | 1 |
| **17.2** | Temperature sensor (connection to Converter) – intake on back of meter | 1 |
| **17.3** | Flow rectifier and seal | 1 |
| **19** | Electrical Panel | 1 |
| **20** | Electric Meter | 1 |
| **22** | Gas meter (DFRU 0) with built-in converter and battery operation | 1 |

Table 3 - Geometric sizing of DFRUs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Code**  **FRU** | **Code**  **Material**  dB = 45 | **Flow rate**  **Nominal**  **(Sm3/h)** | **UND**  **(mm)** | **DND (mm)** | **L**  **(m)** |
| **DFRU 0** | **48002329250** | 100 | 25 | 50 | 0.80 |
| **DFRU 1** | **48002329251** | 150 | 50 | 50 | 1.0 |
| **DFRU 2** | **48002329252** | 250 | 50 | 65 | 1.0 |
| **DFRU 3** | **48002329253** | 650 | 80 | 100 | 1.0 |
| **DFRU 4** | **48002329254** | 1500 | 100 | 150 | 1.5 |
| **DFRU 5** | **48002329255** | 2500 | 150 | 200 | 1.5 |
| **DFRU 6** | **48002329256** | 4000 | 150 | 250 | 1.8 |

**UND:** Nominal diameter of the upstream manifold (see also details in point 5.2)

**DND:** Nominal diameter of the downstream manifold

## Technical assessment

In relation to Legislative Decree no. 81/08, as amended, Italgas Reti reserves the right, in its evaluation of the use of the proposed products, to consider the operational consequences deriving from the conditions of use of the equipment as prescribed by the Supplier in the "Use and Maintenance Manual".

# CONSTITUENT ELEMENTS

## Circuit breakers

### Electric circuit breakers

These are designed to electrically insulate the DFRU from the underground steel pipe, cathodically protected.

Where provided, these consist of single-piece steel insulating joints with smooth ends to be butt-welded in accordance with UNI 10285 and Table M. 17850.. "Steel dielectric joint, NP 16, butt-weld ends".

**Note:** Electrical circuit breakers do not constitute part of the supply of the DFRUs covered by this specification.

### PE/steel transition joints

These are used to connect the polyethylene road pipes with the upstream and/or downstream manifolds of the plants, complying with T.S. 1800300 “Polyethylene fittings and special pieces for methane gas pipelines”. They must be of the weld-on type on both materials and comply in particular with the standards:

* UNI EN 1555-2 for the polyethylene part;
* UNI EN ISO 3183 Grade PSL1 (L210 or qualitatively better) for the steel part.

**Note:**

Transition joints do not constitute part of the supply of DFRUs covered by this specification.

## Metering unit

The Metering unit in the upstream manifold for DFRUs 1 to 6, and downstream for DFRU 0 consists of the following devices and equipment:

* Upstream/downstream gas meter shut-off devices and related by-pass (point 5.2.1);
* Blind disc (point 5.2.2);
* Gas meter (point 5.2.4);
* Flow rectifier and seal (point 5.2.5).

Metering units must comply with the current legislative framework, for the uses and purposes for which they are intended.

The flanged inlet and outlet connections of the meter and the connection pipes must comply with the international standard e.g. ANSI/ASME (Class 150) for pressure class 5 bar.

### Shut-off devices upstream/downstream of the gas meter and related by-pass

These consists of a shut-off valve with the following features:

* butterfly type in accordance with UNI 11354 or ball type in accordance with UNI 9734. The use of grey cast iron as a material is not permitted;
* steel or spheroidal cast iron body;
* flanged connections;
* minimum mechanical strength class: NP 16 / ANSI 150;
* direct control with removable lever;
* fast operation by 90° rotation of the obturator with end stops in fully open and fully closed position and indication of position reached.

### Blind disc

A blind "figure-8" disc must be provided and installed immediately downstream (gas direction) of the gas meter by-pass line valve. It consists of two steel discs, one blind and one through, joined in the form of glasses, and with a handle, suitable for mounting between flanges, and with mechanical resistance class ANSI 150 / NP 16.

### Straight section

A straight flanged section with minimum length of 5ND will be provided in place of the meter (see Tab. 2, pos. 18), for DFRUs 0 to 5. The section will be positioned so that it can be easily removed and the meter installed subsequently. The section will be of the same material and size as the DFRU's upstream manifold. Flanged connections will comply with the international standard, e.g. ANSI/ASME (Class 150), for pressure class 5 bar.

The same construction method also applies to the straight flanged section with minimum length of 6ND (see Tab. 2, pos. 18.1), for DFRU 6.

### Gas meter (not part of DFRU supply)

The gas meter envisaged for installation in the metering unit will be either an ultrasonic gas meter or a thermal mass gas meter of the type approved for company use[[4]](#footnote-5). Ultrasonic gas meters must be compliant with T.S. 9995303, where possible, taking into account the above-mentioned requirements and should be combined according to the various DFRUs as per Table 4:

**Table 4 - DFRU association and ultrasonic meter**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Code**  **FRU** | **UND**  **(mm)** | **DND**  **(mm)**  **See note “1”** | **Ultrasonic meter** | | | | | | | | |
| **Model** | **Caliber** | **Rangeability** | **Measuring range (m3/h)** | **Overall dimensions (mm)** | | | | |
| **b** | **h1** | **h2** | **l1** | **l2** |
| **DFRU 0** |  | 50 | ND50/2” | G100 | 1:160 | 1.0 – 160.0 | 3ND | 272 | 71 | 153 | 78 |
| **DFRU 1** | 50 |  | ND50/2” | G100 | 1:160 | 1.0 – 160.0 | 3ND | 272 | 71 | 153 | 78 |
| **DFRU 2** | 50 |  | ND50/2” | G100 | 1:160 | 1.0 – 160.0 | 3ND | 272 | 71 | 153 | 78 |
| **DFRU 3** | 80 |  | ND80/3” | G250 | 1:160 | 2.5 – 400.0 | 3ND | 417 | 94 | 194 | 121 |
| **DFRU 4** | 100 |  | ND100/4” | G400 | 1:160 | 4.0 – 650.0 | 3ND | 476 | 108 | 231 | 159 |
| **DFRU 5** | 150 |  | ND150/6” | G650 | 1:250 | 4 – 1000.0 | 3ND | 476 | 143 | 232 | 158 |
| **DFRU 6** | 150 |  | ND150/6” | G1600 | 1:156 | 16 – 2500.0 | 3ND | 400 | 140 | 140 | 140 |
| Notes: | | | | | | | | | | | |
| 1: For DFRU 0, the meter will be located downstream of the regulation line, and fitted with a volume converter (PTZ), with internal probes, powered by a battery with a minimum life of 5 years. | | | | | | | | | | | |
| b: assembly length (flange-to-flange distance) | | | | | | | | | | | |
| h1: height from pipe centreline to top of meter | | | | | | | | | | | |
| h2: height from pipe centreline to bottom of meter | | | | | | | | | | | |
| l1: length from pipe centreline to front extrados of meter | | | | | | | | | | | |
| l2: length from pipe centreline to the rear extrados of meter | | | | | | | | | | | |

The thermal mass meter must comply with T.S. 9995304 on static meters for process measurement on digital networks. The ultrasonic gas meter as well as the thermal mass meter must have at least the following inputs/outputs:

* Input for DC power supply[[5]](#footnote-6);
* Digital outputs (configurable) for LF/HF pulses proportional to gas volumes.

### Flow rectifier and seal (not part of DFRU supply)

For DFRU 6 only, the addition of a flow rectifier consisting of the rectifier itself (3 mm) and its seal (2 mm) is envisaged, as shown in Tab. 2, pos. 17.3.

* 1. **Service reduction line**

This consists of the devices and equipment listed in the following paragraphs.

### Upstream shut-off device

It allows manually operated exclusion of the reduction line, particularly during control and maintenance operations. It consists of a shut-off valve with the following features:

* butterfly type in accordance with UNI 11354 or ball type in accordance with UNI 9734. The use of grey cast iron as a material is not permitted;
* steel or spheroidal cast iron body;
* flanged connections;
* minimum mechanical strength class: NP 16 / ANSI 150;
* direct control with removable lever;
* fast operation by 90° rotation of the obturator with end stops in fully open and fully closed position and indication of position reached.

### Filter

It protects the downstream regulation and safety devices from solid particles that may be present in the gas and prevents transfer of the same from the upstream pipeline to the downstream pipeline.

The filter must be equipped with an easily removable cartridge filter element, arranged so that, during operation and maintenance operations, the solid particles retained by it are prevented from falling into the DFRU pipes.

The filtering capacity must be such as to ensure the correct functioning of the regulation and safety device and in any case such as to ensure that solid particles larger than 50 µm are stopped with filter cartridges complying with T.S. 9991300 - "Cartridge filter elements for filters of gas reduction and metering units and plants".

It consists of a device with the following features:

* cylindrical body with horizontal axis;
* material: steel or aluminium alloy;
* minimum mechanical strength class of the filter body: NP 6
* flanged connections: NP16 / ANSI 150;
* maximum pressure drop with clean filter element as indicated in UNI 8827.

The filter must be equipped with:

* differential manometer clogging indicator, fitted with graduated scale for direct reading of the pressure drop from upstream to downstream of the filtering element, electric reed contact as per SPDT, with storage of maximum Δp indicative of the clogging level reached and fitted with manifold, pursuant to T.S. 9991308;
* pressure intake on the filter outlet section, equipped with a pin pressure gauge holder tap and dial gauge, in accordance with T.S. 9991308 "Measuring and precision indicating instruments for plant installations", Bourdon spring type, metal case, watertight for assembly in the field, with threaded "gas" connection UNI EN 10226 ND 1/2", (NPT threaded not permissible), dial diameter 100 mm, with adequate full scale to allow easy and accurate reading of OPu, which must be between 25% ÷ 75% of full scale value, and maximum error not greater than 2.5% of full scale value;
* ball vent valve diameter ≥ 1/2" threaded "gas" UNI EN 10226 ND 1/2" (NPT threaded not permissible), with conveyable release fitted with steel blind cap, connected by means of a chain.

Particular care must be taken when designing the positioning of the filtration system, so that during periods of inactivity of the emergency line, there is no accumulation of solid particles such as to clog it, jeopardising the automatic start-up of the line in case of need.

### Connecting sections

The horizontal connection line between the filter, the pressure reducers/regulators (and if necessary between these), as far as the downstream manifold, must be made of flanged sections. The connection section between the service reducer/regulator and the downstream manifold must have a diameter ≥ the diameter of the upstream section. In the event that it should be necessary to construct the sections with diameters different from the inlet/outlet of the equipment to be connected, in order to comply with the regulations in force, in particular the maximum flow speed, and so as to maintain the required flow rate, they must be connected to the flanges with special parts to increase/reduce the diameter.

The materials must comply with the provisions of point 5.7, and be tested/verified as described in point 12.

### Blocking valve

This remains in the open position under normal operating conditions and stops the gas flow automatically and completely only in the event of an increase in the required regulation pressure above the permissible limit.

The DFRU 0 will be equipped with two blocking valves per line, in accordance with standard UNI 8827-2.

The calibration value must be greater than the calibration pressure of the atmospheric release device and ≤ of the MIPd from which the positive value, relative to the accuracy class (AC) of the blocking valve, must be subtracted.

It consists of a device with the following features:

* steel or spheroidal cast iron body;
* minimum mechanical strength class: NP 16 / ANSI 150;
* flanged in-line connections;
* manually adjustable automatic intervention device (diaphragm pressure switch with contrast spring and threaded connection for impulse tap connected on LP section downstream of the pressure reducer-regulators, adjustable in the range 20 ÷ 50 mbar);
* blocking valve closing indicator, fitted with electric reed contact according to SPDT, for connection to the remote control system.

The blocking valve must meet the following requirements:

* the maximum calibration value of the pressure relief valve must be less than or equal to the maximum pressure that the system can achieve for a short period minus the positive tolerance corresponding to the accuracy class of the safety device;
* compliance with UNI EN 14382 and accuracy class at least AG 10 according to table 3 of UNI 8827-2;
* in the event of being triggered, the blocking valve must remain in the closed position and must only be reopened by manual operation.

The delivery blocking valve can be incorporated into the pressure reducer-regulators. In this case, it must be mechanically independent of the pressure reducer-regulator; in particular, it must have its own closing seat and obturator and its own measuring element (a device that is directly sensitive to gas pressure).

### Pressure reducer-regulators

Pressure reducer-regulators must be of the type approved for company use, as per Appendix 1 - T.S. 23273. "List of pressure reducers-regulators approved for company use”.

#### Pressure reducer-regulator with emergency function (monitor) only for DFRU 1 to 6

This intervenes to regulate the outlet pressure of the reduction line in the event of downstream overpressure due to failure of the pressure reducer-regulator with service function. During normal operation, the obturator is in the fully open position.

It consists of a "piloted” type reducer-regulator device with fail-to-close function, with the following characteristics:

* diaphragm type with spring-loaded contrast and pilot operation;
* steel or spheroidal cast iron body;
* minimum mechanical strength class: NP 16 / ANSI 150;
* flanged connections;
* perfect closure with zero flow;
* manual adjustment, from the outside, of the calibration pressure in the range 15 ÷ 35 mbar;
* pilot powered by a stabiliser unit with filter having suitable characteristics for correct operation and meeting the following requirements:
  + upstream pressure range: 0.3 ÷ 5 bar;
  + pressure stabiliser able to maintain constant operating pressure upstream of the pilots (can be built into the pilots);
  + service releases must be routed to the downstream LP pipe through the impulse tap;
* indicator of the change in the defined aperture cross-section in the event of being triggered (expressed as a percentage), fitted with electric reed contact according to SPDT, for connection to the remote control system.

The pressure reducer-regulator with emergency function (monitor), will be fitted with a quick release device of the motorisation pressure (accelerator valve), directly conveyed to the atmosphere, by means of the same tube used for the atmospheric release device.

The monitor can be incorporated into the pressure reducer-regulator with service function. In this case, the two pressure reducer-regulators must be mechanically independent; in particular, they must have their own measuring, loading and choking elements (seat and obturator).

The pressure reducer-regulator with emergency function (monitor) must fulfil the following requirements:

* the calibration value must be chosen so that the temporary operating pressure cannot be exceeded;
* any failure of the pressure reducer-regulator with active service function must not jeopardise the proper functioning of the pressure safety system;
* compliance with UNI EN 334 and accuracy class AC 5 according to table 2 of UNI 8827-2.

#### Pressure reducer-regulator with a service function

This regulates the outlet pressure of a reduction line under normal operating conditions.

For DFRUs 1 to 6, it consists of a "self-activated" or "piloted" type reducer-regulator with fail-to-open function, without the quick release device, having the following characteristics:

* diaphragm type with spring-loaded contrast;
* steel or spheroidal cast iron body;
* minimum mechanical strength class: NP 16 / ANSI 150;
* flanged connections;
* perfect closure with zero flow;
* manual adjustment, from the outside, of the calibration pressure in the range 15 ÷ 35 mbar;
* possible pilot powered by a stabiliser unit with filter having suitable characteristics for correct operation and meeting the following requirements:
  + upstream pressure range: 0.3 ÷ 5 bar;
  + pressure stabiliser able to maintain constant operating pressure upstream of the pilots (can be built into the pilots);
  + service releases must be routed to the downstream LP pipe through the impulse tap;
* aperture cross-section indicator (expressed as a percentage), equipped with electric reed contact according to SPDT, for connection to the remote control system.

For DFRU 0, the pressure reducer-regulator with service function consists of a pressure reducer-regulator apparatus of the "self-activated" type with fail-to-open function, with the following characteristics:

* diaphragm type with spring-loaded contrast;
* steel or spheroidal cast iron body;
* minimum mechanical strength class: NP 16 / ANSI 150;
* flanged connections;
* perfect closure with zero flow;
* manual adjustment, from the outside, of the calibration pressure in the range 15 ÷ 35 mbar.

**Notes:**

The combination of the two pressure reducer-regulators and related accessories must guarantee the following performance requirements for the reduction unit during its operation with an upstream operating pressure (OPu) in the range of 0.5 ÷ 5 bar (depending on the maximum upstream operating pressure MOPu):

* the pressure regulation system must keep the pressure within certain acceptable limits for the downstream system. The calibration value must not be greater than the maximum downstream operating pressure MOPd;
* be compliant with UNI EN 334;
* regulation accuracy class (AC):
* ± 5% of the calibration value of the regulated pressure, for pilot-operated reducer-regulators;
* ± 10% of the calibration value of the regulated pressure, for self-activated reducer-regulators,

in the range 10 ÷ 100 % of the unit’s nominal flow rate;

* closing accuracy class (SG):
* + 10% max. of the calibration value of the regulated pressure, for pilot-operated reducer-regulators;
* + 20% max. of the calibration value of the regulated pressure, for self-activated reducer-regulators.

the closing accuracy class (SG) must be chosen so as not to interfere with the normal operation of the pressure control system.

To further clarify the above and for brevity’s sake, a summary of the types of regulation and safety equipment approved on the various standardised systems is given in Table 5 . The devices used must have been previously approved for company use, see the list provided for by T.S. 23273…

Table 5 - Type of regulation and safety equipment.

| **Plant name** | **Nominal flow rate** | **Blocking valve** | **Pressure reducer-regulator with a monitor function** | **Pressure reducer-regulator with a service function** |
| --- | --- | --- | --- | --- |
| DFRU 0 | 100 | Yes, no. 2 | ----------------- | Self-activated |
| DFRU 1 | 150 | Yes | Piloted | Self-activated/Piloted |
| DFRU 2 | 250 | Yes | Piloted | Self-activated/Piloted |
| DFRU 3 | 650 | Yes | Piloted | Self-activated/Piloted |
| DFRU 4 | 1500 | Yes | Piloted | Self-activated/Piloted |
| DFRU 5 | 2500 | Yes | Piloted | Self-activated/Piloted |
| DFRU 6 | 4000 | Yes | Piloted | Self-activated/Piloted |

### Atmospheric release device (relief valve)

This keeps the regulated pressure below the trigger values of the blocking valve in the event of small leakages due to imperfect closing of the pressure reducer-regulators at zero flow. It is positioned on the outlet column of the DFRU downstream of the shut-off valves of the pressure regulation lines.

The calibration value must be <MIPd and >TOPd.

It has the following characteristics:

* diaphragm type with contrast spring and internal impulse tap;
* steel or light alloy die-cast body;
* "gas" threaded connections (NPT threaded not permitted) UNI EN 10226;
* pressure release manually calibrated, from the outside, in the range 20 ÷ 40 mbar, in accordance with the requirements of UNI 8827-1;
* perfect seal on closing for return of pressure to less than 95% of release pressure.

Upstream of the atmospheric release device, in order to allow calibration and maintenance operations on the same, a shut-off valve must be installed, sealed in the open position, which complies with the requirements of T.S. 2000300 “Steel valves for gas pipelines”. A pressure intake must be inserted between the shut-off valve and the atmospheric release device for the calibration of the atmospheric release device, consisting of the same elements as indicated in the following point.

The atmospheric release device must be connected to the pipe conveying the gas to the atmosphere, fitted with a terminal vent to prevent obstruction of the outlet due to the ingress of foreign matter (e.g. water, dirt, insects).

The diameter of the conveying pipe must not be smaller than that of the release device.

### Downstream shut-off device

This allows manually operated exclusion of the reduction line, particularly during control and maintenance operations.

It consists of a shut-off valve with characteristics corresponding to those listed in point 5.3.1 for the upstream shut-off device.

### Micro-turbine line provision in DFRUs 1 to 6

Downstream of the filter and before the pressure reducer-regulator with emergency function (monitor), the inlet connection (position 24 in the single-line diagram) to the line containing the micro-turbine, if any, must be fitted, consisting of:

* pipe section 50 mm long, ND 1", with one end edge-welded to the pipe, in a vertical position on the lower generatrix of the main line pipe, and the other end butt-weld or "gas" threaded UNI EN 10226, NPT threaded not permissible;
* full bore ball valve, complying with UNI 9734:
* steel or spheroidal cast iron body;
* connections one butt or pocket -welded (section side), the other threaded, or both "gas" threaded UNI EN 10226, NPT threaded not permissible;
* minimum mechanical strength class: NP 16/ANSI 150;
* direct control with removable lever, connected with chain to valve body;
* fast operation by 90° rotation of the obturator with end stops in fully open and fully closed position and indication of position reached.
* end cap connected to valve body with chain.

In the single-line diagrams 4.4 and 4.5, the arrangement is shown in the service line by way of example; it will however still be the Supplier's choice to place it either on the service line or on the emergency line. Such choice should take into account the dimensions of the micro-turbine line, if any, in order to avoid interference with the DFRU equipment and allow operation and maintenance of the system.

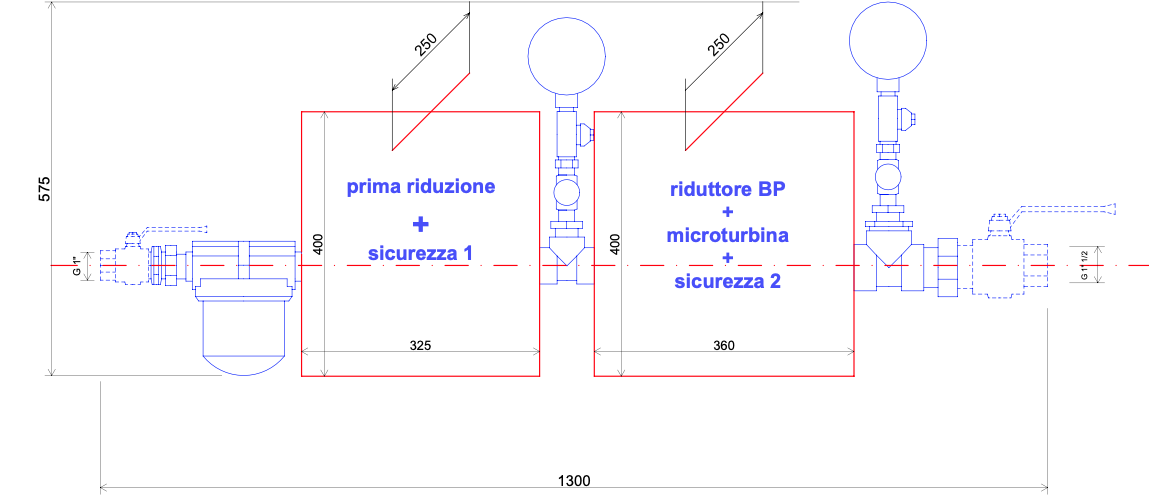
On the outlet column and before the atmospheric release device (relief valve), provision must be made in output (position 25 of the single-line diagram) for the line containing the micro-turbine, if any, consisting of:

* a section of pipe 50 mm long, ND 1"1/2, in a 45° inclined position on the inner generatrix of the pipe of the unit outlet column, with one end edge-welded to the pipe and the other end butt-weld/”gas” threaded according to UNI EN 10226, NPT threaded not permissible;
* full bore ball valve, complying with UNI 9734:
* steel or spheroidal cast iron body;
* connections one butt- or pocket-weld, the other threaded, or both “gas” threaded UNI EN 10226, NPT threaded not permissible;
* minimum mechanical strength class: NP 16/ANSI 150;
* direct control with removable lever, connected with chain to valve body;
* fast operation by 90° rotation of the obturator with end stops in fully open and fully closed position and indication of position reached.
* end cap connected to valve body with chain.

The materials must comply with the provisions of point 5.7, and be tested/verified as described in point 12.

A single-line diagram of the micro-turbine line is shown by way of example, showing the main components and the overall dimensions.

### Single-line diagram for micro-turbine



## Emergency reduction line

This consists of the same components as the service reduction line. Particular care must be taken when designing the positioning of the filter, so that during periods of inactivity of the line, there is no accumulation of solid particles such as to clog it, jeopardising the automatic activation of the line in case of need.

## Calibration of regulation and safety device trigger values

Tables 6 and 7 below show the trigger pressure values normally used of the various devices constituting the reduction unit.

The aforementioned values may be changed to address specific operating needs of both the network and the unit in compliance with national laws/regulations.

It is understood that the calibration values must be obtained by acting solely on the reducer calibration devices, without dismantling the reducers, changing the components of the same, etc.

**Table 6 – Calibration values for DFRUs 1 to 6**

|  |  |  |
| --- | --- | --- |
|  | Regulation and/or trigger pressure DFRUs 1 to 6 | |
| APPLIANCE | Units with piloted reducers  (mbar) | Units with self-activated reducers  (mbar) |
| Service line service regulator | A1 = 23 (max 25) | A2 = 23 (max 25) |
| Service line monitor regulator | B1 = A1 + 20 % = 28 | B2 = A2 + 30 % = 30 |
| Emergency line service regulator | C1 = A1 - 3 = 20 | C2 = A2 - 5 = 18 |
| Emergency line monitor regulator | D1 = B1 = 28 | D2 = B2 = 30 |
| Fast release device (accelerator valve) | E1 = B1 + 10 % = 31 |  |
| Release device (relief valve) | F1 = 35 | F2 = 35 |
| Service line blocking device | G1 = 40 | G2 = 40 |
| Emergency line blocking device | H1 = 43  (max. 43.5 with AG 10) | H2 = 43  (max. 43.5 with AG 10) |

**Table 7 – calibration values for DFRU 0 equipment**

|  |  |  |
| --- | --- | --- |
| APPLIANCE | Line A  (mbar) | Line B  (mbar) |
| Service regulator | A1 = 23 | A2 = 19 |
| Release device (relief valve) | B1 = 30 |  |
| 1st blocking device | C1 = 35 | C2 = 43 (max. 43.5 with AG 10) |
| 2nd emergency line blocking device | D1 = C1 + 10 % = 39 | D2 = C2 = 43 (max. 43.5 with AG 10) |

All the control devices must be positioned so as to be easy to read by personnel operating and/or carrying out inspections of the DFRUs:

1. **Mains pressure intake**

Allows the pressure of the gas entering the reduction lines to be measured. It is placed upstream of the shut-off valve of the service line (on the upstream manifold), is made of a section of quality steel pipe or sleeve, normally not smaller than ND ½", with one end edge-welded to the pipe, in a front or side position and not at the rear, and the other end "gas" threaded in accordance with UNI EN 10226 (NPT threaded not allowed).

It is fitted with a pin stopcock, also "gas" threaded UNI EN 10226 (NPT threaded is not permitted), at both ends, with a closing cap connected to it by means of a chain.

1. **Inlet pressure control intakes**

These allow the pressure of the gas entering the reduction lines to be measured. They are made as described in point a) and positioned:

* upstream of the service line shut-off valve (on the upstream manifold), and fitted with:
* pin stopcock threaded as in point a);
* a dial pressure gauge, in accordance with T.S. 9991308 "Measuring and precision indicating instruments for plant installations", Bourdon spring type, metal case, watertight for assembly in the field, with threaded "gas" connection UNI EN 10226 ND 1/2", (NPT threaded not permissible), dial diameter 100 mm, with adequate full scale to allow easy and accurate reading of OPu, which must be between 25% ÷ 75% of full scale value, and maximum error not greater than 2.5% of full scale value;
* upstream of the service line shut-off valve (on the upstream manifold), and fitted with:
* pin stopcock threaded as in point a) and closing cap connected to it by means of a chain (only for DFRUs 1 to 6);
* downstream of the service and emergency line shut-off valves, upstream of the filters, and fitted with:
* pin stopcock threaded as in point a) and closing cap connected to it by means of a chain.

1. **Pressure transmitter intake for measuring inlet pressure**

Allows the pressure of the gas entering the reduction lines to be measured.

For DFRUs 1 to 6, it is positioned downstream of the gas meter shut-off valve (on the upstream manifold), and is made as in point a).

For DFRU 0 it is positioned upstream of the regulation lines, on the upstream column.

It is fitted with:

* pin stopcock threaded as in point a);
* pressure transmitter as in point 5.7 of this T.S.

1. **Temperature sensor intake for measuring inlet gas temperature**

Allows the temperature of the gas entering the reduction lines to be detected.

For DFRUs 1 to 6 it is positioned downstream of the gas meter shut-off valve (on the upstream manifold).

For DFRU 0 it is positioned upstream of the regulation lines, on the upstream manifold.

It consists of:

* section of gas threaded quality steel pipe or sleeve UNI EN 10226 (NPT threaded not allowed) welded to the gas supply pipe;
* stainless steel thermometer pocket machined from a bar, into which the temperature sensor referred to in point 5.7 of this T.S. can be inserted and removed for temperature measurement without interrupting the gas flow, with outer thread for coupling with the section of tube or sleeve, gas threaded UNI EN 10226 (NPT threaded not allowed) and with threaded ½" gas terminal UNI EN 10226 (NPT threaded not allowed).

The thermometer pockets must be filled with fluid mineral oil, have appropriate mechanical properties and dimensions, and insertion depth at least 1/3 of the nominal pipe diameter.

Thermometer pockets, if without the sensor element, must be fitted with a quality steel plug.

The pockets must be installed on the upper generatrix of the pipe in a vertical position.

For pipes with ND≤100 only, installation at a 90° bend or at an angle of 45° to the pipe axis is allowed.

1. **Pressure gauge intake for pressure control upstream of safety devices**

This is positioned on each reduction line, immediately upstream of the safety devices; it is made as in point a) and may consist of the manometric device in point 5.3.2.

It is fitted with:

* pin stopcock threaded as in point a);
* a dial pressure gauge, in accordance with T.S. 9991308 "Measuring and precision indicating instruments for plant installations", Bourdon spring type, metal case, watertight for assembly in the field, with "gas" threaded connection UNI EN 10226 ND 1/2", (NPT threaded not permissible), dial diameter 100 mm, with adequate full scale to allow easy and accurate reading of OPu, which must be between 25% ÷ 75% of full scale value, and maximum error not greater than 2.5% of full scale value.

1. **Pressure gauge intake for intermediate pressure control between the pressure reducer-regulator with service and monitor function (only for DFRUs 1 to 6)**

This allows measurement of the intermediate pressure between the pressure reducer-regulator with monitor function and the pressure reducer-regulator with service function and has dimensions of at least ½" with "gas" threaded connection UNI EN 10226 (NPT threaded not permissible), positioned in front of the reduction line.

It is fitted with:

* pin stopcock threaded as in point a);
* a dial pressure gauge, in accordance with T.S. 9991308 "Measuring and precision indicating instruments for plant installations", Bourdon spring type, metal case, watertight for assembly in the field, with "gas" threaded connection UNI EN 10226 ND 1/2", (NPT threaded not permissible), dial diameter 100 mm, with adequate full scale to allow easy and accurate reading of OPu, which must be between 25% ÷ 75% of full scale value, and maximum error not greater than 2.5% of full scale value; with minimum pressure index for storing any activations of the pressure reducer-regulator with monitor function.

In the case of a pressure reducer-regulator with monitor function incorporated with the pressure reducer-regulator with service function, this intake need not be provided.

1. **Pressure and impulse taps on the reduction line**

They enable the operation of the line and its control.

* Pressure intake downstream of the pressure reducer-regulators.

Allows the measurement of pressure downstream of the pressure reducer-regulator with service function in the case of line exclusion for function and calibration checks and tests.

It is positioned on the section of pipe, downstream of the pressure reducer-regulator with service function and upstream of the shut-off valve of the reduction line; it is made as in point a) and must not be the impulse tap for operation of the regulation equipment and safety devices.

It is fitted with a pin stopcock threaded as in point a), with closing cap connected to it by means of a chain.

* Pressure gauge intake for pressure control downstream of the pressure regulation system.

It is positioned immediately downstream of the pressure regulation system; it is made as in point a).

It is fitted with:

* + pin stopcock threaded as in point a);
  + a dial pressure gauge, in accordance with T.S. 9991308 "Measuring and precision indicating instruments for plant installations", Bourdon spring type, metal case, watertight for assembly in the field, with "gas" threaded connection UNI EN 10226 ND 1/2", (NPT threaded not permissible), dial diameter 100 mm, with adequate full scale to allow easy and accurate reading of OPu, which must be between 25% ÷ 75% of full scale value, and maximum error not greater than 2.5% of full scale value.
* Impulse tap for pressure reducer-regulators and blocking valve.

Low-pressure impulse taps are provided on the following equipment:

* + pressure reducer-regulator pilot with emergency function (monitor);
  + pressure reducer-regulator pilot with service function (where envisaged);
  + pressure reducer-regulator with a monitor function;
  + pressure reducer-regulator with a service function;
  + blocking valve(s).

1. **Regulated pressure control intake**

Allows the pressure of the gas exiting the reduction lines to be measured. This is positioned downstream of the shut-off valve of the service line (on the downstream manifold) and is made as in point a), it is fitted with a threaded pin stopcock valve as in point a), provided with closing cap connected to it by means of a suitable chain, in a frontal or lateral position and not at the rear of the manifold and has dimensions of not less than ND ½" as a rule.

1. **Pressure transmitter intake for measuring outlet pressure**

Allows the pressure of the gas exiting the reduction lines to be measured. It is positioned downstream of the shut-off valve of the service line (on the downstream manifold), and is made as in point a).

It is fitted with:

* pin stopcock threaded as in point a);
* pressure transmitter as in point 5.7 of this T.S.

## Pipes, joints and special parts

The pipes, with related fittings, special parts and component materials, must comply with the requirements set out in the Ministerial Decree of 16 April 2008 and comply with the following specifications:

* T.S. 15AA300 “Welded steel pipes for natural gas pipelines”;
* T.S. 17AA300 “Steel fittings”.

They must also be suitable for the intended use in accordance with the regulations in force.

### Materials

The materials must be suitable for the intended use. The pipes with related fittings and special parts must be made of steel. The use of spheroidal cast iron is allowed.

Instrument connection tubes and impulse taps may be made of material other than steel, provided they are metallic[[6]](#footnote-7) (e.g. copper); they must be joined by welding or by suitable mechanical couplings.

### Joints

All connecting joints of the pipes with each other and with the equipment constituting the DFRU must be designed and manufactured in such a way as to guarantee a perfect seal over time, even in the presence of vibrations and/or mechanical stresses to which the system elements may be subjected.

The number of threaded joints (which may never be used for pipes with ND50) must be kept to a minimum in order to reduce the possibility of leaks from the system. These joints must comply with UNI EN 10226 (NPT threaded not permitted). To ensure a better seal, hemp with suitable, long-lasting glues, polytetrafluoroethylene tape or other equivalent materials specifically declared suitable according to UNI EN 751-3 may be applied to the ends.

In order to limit micro-dispersion phenomena not detectable by instrumental tests, joints made with compression fittings must have equivalent sealing and reliability characteristics to those of ferrule fittings.

Welded connections must comply with standards and qualified procedures.

Flange joints must comply with applicable laws, directives and standards, taking into account the technical/construction characteristics of the individual piece of equipment.

These characteristics, which must be adhered to when selecting flanges, are indicated, where present, in the various chapters of this Technical Specification.

## Remote control system / remote metering (not part of DFRU supply)

The remote control / remote metering system essentially consists of the equipment located in a classified area inside the DFRU containment cabinet, and the equipment installed in a secure area in a fibreglass roadside cabinet.

Specifically, the description of the remote control/remote metering system and its minimum essential requirements are integrated in the technical note NT20181003, to which reference should be made for further details. The following points are addressed in the above-mentioned note:

* Remote control equipment (RTU);
* Measurable quantities in the field;
* Transmitter instruments;
* Electronic gas volume conversion device;
* Power supply;
* Type of installation of the remote control/metering system.
* Documentation accompanying the installation;
* Initial and periodic checks.

## Electrical systems for DFRUs 1 to 6 (not part of DFRU supply)

The description of the electrical system and its minimum essential requirements are integrated in the technical note NT20181003\_1 to which reference should be made for further details. The following points are addressed in the above-mentioned note:

* Housing cabinet;
* Electrical panel;
* Cables and installation methods;
* Protection from electrical risk;
* Additional requirements for the installation of equipment in explosion hazard areas;
* Documentation accompanying the installation;
* Initial and periodic checks.

## Protective coating (painting)

Each DFRU must be protected from external corrosion damage. Any metal surfaces to be painted must offer maximum adhesion to the protective film. To such purpose, they must be suitably subjected to treatment cycles so as to be cleaned of any foreign matter (e.g. degreasing, mechanical cleaning, etc.) that prevents adherence of the paint, guaranteeing suitable characteristics for the type of product.

The following paints must be used:

* non-toxic/harmful;
* with high coefficient of adhesion to the surface to be protected;
* with good anti-corrosion properties;
* with reduced porosity and permeability to gases and liquids;
* with high resistance to the persistent action of atmospheric and chemical agents;
* colour = RAL 1016 (yellow).

# Marking

On each DFRU, an identification plate must be affixed in an easily identifiable and readable position, indicating the data as provided for by point 3.3, letter a) of Annex I to Legislative Decree no. 93 of 25 February 2000 as amended and supplemented by the following information:

* Type of "Digital Final Reduction Unit" (Supplier's ref.);
* Maximum upstream operating pressure (MOPu);
* Maximum downstream operating pressure (MOPu);
* Design pressure (DP);
* Upstream operating pressure (OPu);
* Nominal flow rate Qnom
* Maximum flow rate (Qmax);
* Year of construction;
* Weight in kilograms;
* Serial number or other identification data of the Final Reduction Unit;
* Material code (Italgas ref.) of the control system;
* Purchase order number and position.

Similarly, on each main piece of equipment composing the DFRU – such as valves, filters, blocking valves, pressure reducer-regulators, pilots, atmosphere release devices etc.– an identification plate must be affixed containing, as a minimum requirement, the following data:

* Manufacturer's name and/or trademark;
* Type and model of equipment;
* Year of construction;
* Features (see Supplier's);
* Serial number or other identifying data;
* Pressures (max. supply, operating, flanging, etc.);
* Nominal flow rate expressed in Sm3/h:
* Calibration range;
* Operating temperature range;
* Any references for spare parts (e.g. filter cartridge, etc.).

The DFRU will also be supplied with all the safety signs required by the regulations.

# MACHINING TOLERANCES

The system of tolerances and couplings envisaged, except where design and processing requirements require specific tolerances, must comply with the following standards:

UNI EN 22768 parts 1 and 2, or equivalents;

UNI EN 286 Parts 1 and 2, or equivalents.

# HOUSING / CABINET

The housing/cabinet must be constructed of materials with a reaction to fire rating not greater than 1, in accordance with Ministerial Decree of 26 June 1984 as amended and T.S. 9991310 (e.g. galvanised sheet metal, fibreglass, brick, etc.), provided it is designed in such a way as to give the structure good stability characteristics against adverse weather conditions (snow, wind, etc.), and subject to the more stringent requirements contained in this T.S.

Ventilation must be achieved by means of openings in the doors, distributed at the top and bottom. In the event that the soundproofing panels in front of the upper openings interfere with equipment constituting the DFRU, such openings may be made in an strip above the doors. The openings must have a total surface area of at least 20% of the floor surface (in accordance with UNI 8827), and at least such that the classification of explosion hazard locations (in accordance with CEI EN 60079-10-1) is the least onerous possible (preferably zone 2 inside the housing and a non-hazardous location outside, for the installation of a cabinet for electrical and electronic equipment envisaged in this T.S. adjacent to at least one of the two smaller sides).

Ventilation grilles may be constructed without rain deflectors in compliance with the presence of free openings, protected with spark guard netting.

The cabinet must be adequately lined internally (including the cover panel) with soundproofing fireproof panels, which, in the case of "mineral fibre/glass" cladding, must be ≥ 25 mm thick. This cladding must in any case be protected by a containment wire mesh/grid. In order to maintain the functionality of the ventilation openings, special panels (one for each opening) must be provided, suitably spaced (≥ 15 mm) from the soundproofing panel of the door, and no larger than 180 mm on each side in relation to the openings. The cabinet is an integral part of the DFRU supply. There is no personnel access to the inside of the cabinet, but the two larger sides must be fully openable to the outside with two- or three-leaf doors. Door leaves must have a minimum net opening height of 1700 mm, and must be equipped with a blocking system in the open position at an angle ≥ 90°. One end of the blocking system must be fixed to the cabinet frame (e.g. with a chain or hinged). Above and/or below the doors, one or two 100 mm high strips may be made, if necessary for the construction-static purposes of the housing, for improved connection with the vertical walls of the housing, without prejudice to the minimum opening height of the doors.

The doors of the housing/cabinet must be fitted with a VIRO 8211 latch lock with F33642 key, in order to allow manoeuvring, checks and normal maintenance operations.

The maximum dimensions of the cabinets in the floor plan, expressed in millimetres, must be in accordance with Table 8.

| **System code** | **MAXIMUM CABINET DIMENSIONS** | |
| --- | --- | --- |
|
| **LENGTH mm** | **WIDTH mm** |
| **DFRU 0** | 1300 | 700 |
| **DFRU 1** | 1600 | 900 |
| **DFRU 2** | 1600 | 900 |
| **DFRU 3** | 1600 | 1000 |
| **DFRU 4** | 2100 | 1200 |
| **DFRU 5** | 2400 | 1350 |
| **DFRU 6** | 2800 | 1800 |

Table 8 – Cabinets for DFRUs

# ABATEMENT OF ACOUSTIC EMISSIONS

In relation to the need to install final reduction units in compliance with the legal provisions in force, regarding noise pollution of the environment (sound emissions), they must comply, through use of silent pressure reducers-regulators and soundproof cabinets, with the following maximum noise emission levels expressed[[7]](#footnote-8) under conditions of maximum delivery:

**Table 9: Noise emissions for standard DFRUs**

|  |  |
| --- | --- |
| ***Noise emission level from DFRUs under standard conditions*** | |
| Distance from cabinet walls: 2 m | Distance from cabinet walls: 10 m |
| dB(A) = 45 | dB(A) ≤ 40 |

# TYPE TEST

During the design phase of the DFRU, it will be the Supplier's responsibility to carry out at recognised laboratories or directly at the Supplier's premises all the "Type Tests" envisaged by the reference standards and/or the Supplier's own design standards and the standards referred to therein to verify the intended end use of the DFRU.

Note:

Type tests are not envisaged in the event that Italgas Reti deems that any modifications made by the Supplier to the DFRUs already accepted for company use, affecting the structure and/or the arrangement of the piping connecting the equipment, do not affect the functionality, safety and reliability of the DFRU.

# DOCUMENTATION required from the supplier

## Supplier[[8]](#footnote-9)

The potential Supplier must be qualified as an ITALGAS RETI Supplier and must be able to provide after sales services directly in Italy.

## Documentation for the company approval process

The potential Supplier must submit the following documentation to the PROMA-CMMAT Department at the tender stage:

* “Declaration of conformity” with this technical specification and any specific documents mentioned in it (legal provisions, applied standards, ATEX, EMC, PED, etc.) to which the supplier refers for the design and construction of the product, as indicated in the UNI CEI EN ISO/IEC 17050-1 standard (see the example given in APPENDIX 1 of this technical specification).

In addition, the ATECH-NORM Department of Italgas Reti, will request the schematic drawings of the DFRUs showing the general dimensions and identifying characteristics of the main materials from the Supplier, upon completion of the tender process with awarding of the Supply Contract.

## Test Documentation

The Supplier must issue a “type 3.1” Inspection and Material Certificate in accordance with UNI EN 10204, stating that the DFRU supplied are compliant with the requirements of these specifications as well as the legislative provisions as per point 14.

In accordance with UNI 8827, the Supplier must also produce a test report for each of the tests containing at least the following information:

* Name of the authorised person responsible for the test;
* Test date;
* System manufacturer;
* Identification of the section to which the test relates;
* Design pressure;
* Pressure reached during the test and the period of time for which it was maintained;
* Test fluid;
* Test results;
* Reference to the test procedure (if any);
* Instrumentation used for the test with indication of calibration validity;
* Type and serial number of the instrument used for the test.

Registration of the full production/test documentation completed by the Supplier must be kept (on the basis of legal provisions) for 10 years under its responsibility, and must be made available whenever requested by the Client.

## Supply Documentation

* Documents compliant with Legislative Decree no. Decree no. 286 of 21 November 2005, as amended

In addition, for each individual DFRU, upon delivery the Supplier must provide to the DESTINATION UNIT[[9]](#footnote-10) a technical file (Data Book) containing at least the following documentation:

* “Type 3.1” Inspection and Material Certificates in accordance with UNI EN 10204;
* Statement certifying ownership to market the product;
* "EU Declaration of Conformity" in accordance with recent legislative decrees implementing the Directives applicable to the product (e.g. ATEX, PED Directives etc.):
* If, on the basis of the design of a project intended for use under pressure (Directive 2014/68/EU), the Supplier determines that its product does not have the characteristics defined by the aforementioned directive, it must in any case submit a declaration of inclusion within art. 3 paragraph 3 of the aforementioned directive to certify the exemption of the product in compliance with the provisions of the same paragraph (see the example in Appendix 2 of this Technical Specification).
* If, on the basis of the design of an DFRU intended for use in potentially explosive atmospheres (Directive 2014/34/EU), the Supplier determines that its component does not fall within the provisions of the aforementioned Directive, the Supplier must submit a declaration of assumption of responsibility (see the example in Appendix 3 to this Technical Specification) which certifies that, following the risk analysis carried out, the product does not have any potential ignition sources of its own, and therefore does not fall within the scope of Legislative Decree no. 85/2016 (Directive 2014/34/EU) and can therefore be installed in all the zone types referred to in Legislative Decree no. 233/03 (Directive 1999/92/EC);
* Any list of references of the main customers using the proposed materials;
* Copy of the "EU type inspection certificate" for products for which the applied directives require the intervention of a Notified Body (e.g. ATEX);
* User and maintenance manual in Italian of all the equipment installed, which, for pressure equipment, complies with points 3.3 and 3.4 of Annex I to Legislative Decree no. 93 of 25 February 2000, as amended and supplemented;
* Functional diagram, construction drawing and equipment list with materials used;
* Recommended spare parts list of equipment subject to preventive maintenance;
* Test report;
* Declaration of conformity and compliance with applicable UNI standards (e.g. UNI 8827);
* Declaration of conformity with applicable legislation;
* Declaration of conformity of installed equipment with applicable directives;
* Whatever else the potential Supplier considers useful to better qualify the proposed product.
* For equipment covered by the PED Directive 2014/68/EU (e.g. filters), for which at least two of the following conditions arise:
  + 1. Internal diameter in mm or nominal dimensions 500 or less;
    2. Maximum allowed pressure AP 6 bar or less;
    3. The product of the internal diameter in mm or nominal dimensions ND times the maximum allowed pressure 3000 or less,

the Supplier must make available the documentation containing the basic data and construction characteristics (e.g. thicknesses) required to carry out integrity checks of the various components (external equipment body, ellipsoidal caps, etc.) of the pressure equipment.

# Tests and inspections

Italgas Reti reserves the right:

* To be present with its own Inspectors and/or Inspection Companies appointed by the same to carry out tests/checks c/o your plant and at your care and expense, to check the constructive and functional compliance of the materials in accordance with the specifications and/or reference standards.
* To verify, upon receipt and/or under actual conditions of use, the perfect compliance of the goods with the functional technical characteristics expressly indicated in the Contract.

It is understood that the favourable outcome of our inspection and checking of the materials shall not release you in any way from the responsibilities and obligations arising from each individual contract.

The tests and inspections described below must be carried out by the Supplier on each DFRU supplied:

* Visual and dimensional inspection (point 12.1);
* Mechanical strength test (point 12.2);
* Pneumatic external leak test (point 12.3);
* Functional tests (point 12.4);
* Non-destructive testing of welds (point 12.5).

## Visual and dimensional inspection

The construction and dimensional conformity with the construction drawing must be checked.

The dimensional tolerances of the threads must be those specified in the relevant standards.

The inspections must be certified in accordance with UNI EN 10204 type 3.1.

## Mechanical strength test

Before the installation is assembled, the main circuit of each DFRU must undergo a mechanical strength test at the factory, which must be recorded. Test procedures must be chosen according to UNI EN 12327.

The mechanical strength test must have a minimum duration of 4 hours, after temperature stabilisation, and must be performed under the conditions specified below in Table 10:

Table 10: Mechanical strength test pressures

|  |  |
| --- | --- |
| Test pressure  Pcol | MOP |
| ≥2.5 bar | MOP ≤ 1.5 bar  (part affected by downstream pressure) |
| 7.5 bar | 1.5 < MOP ≤ 5 bar  (part affected by upstream pressure) |

The test can be performed by means of a hydraulic test or by using air or inert gases, provided that the necessary precautions are taken to perform the tests under safe conditions.

The test is considered successful if, after 4 hours, the pressure has remained constant less variations due to the influence of temperature.

The mechanical strength test is not required for:

* Pressure reducer-regulator, blocking valve, filter, meter;

for which the factory test must be carried out in accordance with the relevant regulations in force and in any case with a test pressure not lower than the values indicated in Table .

If the Supplier can prove, by means of suitable existing documentation, that the components of the main circuit have been previously tested at least to the required test pressure, the strength test need not be repeated on these components.

## Pneumatic external leak test

After the strength test, all the components that were removed from the installation before the test must be reinstalled.

The entire installation must be subjected to an external pneumatic leak test. The test must have a minimum duration of 30 minutes, after temperature stabilisation, and must be carried out under the following conditions:

1. Factory test:

* Upstream section: maximum operating pressure;
* Downstream section: 0.10 bar.

1. Field test:

* Upstream section: maximum network pressure available;
* Downstream section: maximum calibration value of safety devices.

Air or inert gas or mains gas must be used as the test fluid.

The outcome of the test is considered positive when:

* no visible leaks are detected using a leak detection fluid (e.g. soap or surfactant solutions) or
* no drop in pressure is detected after 30 min, except for variations due to the influence of temperature.

The perfect tightness of the pressure reducer-regulator obturators and safety devices must also be checked and guaranteed by means of a pneumatic leak test, to be carried out for one minute immediately after the obturator has closed.

## Functional tests

The following functional tests must be carried out on each fully assembled DFRU and must be certified in accordance with UNI EN 10204 type 3.1:

### Check calibration of the regulation pressure of the pressure reducer-regulator with service function

With reference to point 5.3.5.2 above, the value of the regulation pressure must comply with the order specifications and must be within the tolerance values of:

* ± 5%. for piloted pressure reducer-regulators;
* ± 10% for direct-acting pressure reducer-regulators.

### Check regulation pressure with zero flow

The regulated pressure with zero flow must not exceed 120% of the regulated pressure during normal delivery; this condition must be checked with inlet pressures of either 0.5 bar or 5 bar.

### Check regulation pressure and triggering of pressure reducer-regulator with emergency function (monitor) for DFRUs 1 to 6

In addition to the tests referred to in points 12.4.1 and 12.4.2 above, triggering of the monitor within 10 seconds after the triggering pressure plus 5% is reached must be checked.

### Check triggering of the fast release device (accelerator valve) for DFRUs 1 to 6

As described in point 12.4.5, by gradually increasing the regulation pressure, the accelerator valve must release the motorisation pressure of the monitor upon reaching the set value.

### Check triggering of the release device (relief valve)

By gradually increasing the regulation pressure, the pressure relief device must trigger when the set value is reached, which must be greater than the pressure regulated by the pressure reducer-regulator with monitor function (for DFRUs 1 to 6), or with service function (for DFRU 0), and less than the calibration value of the blocking valve(s) for maximum downstream pressure. As soon as the pressure falls below the preset maximum value, the device must stop release and remain tightly closed.

The test can be performed by artificially increasing the pressure, by means of suitable equipment external to the plant.

### Check calibration of the shut-off valve(s) for maximum regulation pressure

The check must be carried out by varying the regulation pressure, as described in point 12.4.5 above, until the delivery blocking valve(s) is/are triggered. This test must be repeated six consecutive times. The values found must be within the tolerance of ±10%.

## Non-Destructive Testing (NDT) of welds

Welding of steel pipes must be carried out in accordance with UNI EN 12732, according to qualified procedures complying with UNI EN ISO 15614-1 or equivalent standards.

Welders must be qualified in compliance with UNI EN ISO 9606-1 or equivalent standards.

The Supplier must carry out non-destructive testing of the welds of the plants at its own expense, in accordance with the relevant UNI standards.

All non-destructive testing operations must be carried out by qualified Level 2 personnel in accordance with formalised procedures. Level 2 personnel must be certified in compliance with UNI EN ISO 9712.

The non-destructive testing (NDT) to be carried out on welded joints subjected to pressure must include at least the following checks:

* head-to-head welds must be radiographed at 20% in accordance with Italgas Reti and in compliance with UNI EN ISO 17636-1 (Class B); the acceptability level is level 1 according to UNI EN ISO 10675-1;
* any welds that cannot be radiographed must be checked 100% with liquid penetrants in accordance with UNI EN ISO 3452-1, acceptability level 1 to UNI EN ISO 23277 or with magnetic particles in accordance with UNI EN ISO 17638, acceptability level 1 according to UNI EN ISO 23278.

## Right of the client

***It is Italgas Reti's right, for each purchase order, to request from the Supplier:***

* further technical and/or graphic documentation;
* additional laboratory and/or field tests to check the conformity of the proposed products with the content of this T.S. and the standards it refers to.

# Conditions of Supply

The plants must be supplied pre-assembled on a metal skid suitably designed and manufactured to allow and facilitate the manoeuvring of the shut-off devices as well as control and maintenance operations of the filtration, regulation and safety equipment.

The arrangement of the equipment must be such as to allow for the proper functioning of the DFRU. The maximum height of the pre-assembled DFRU should not exceed h max = 1.9 m from the floor. The equipment must be assembled according to good engineering practice. In particular, the layout of the pipes must not give rise to additional stresses on the equipment connected to them.

## Packaging

Potential Supplier's standards in accordance with Legislative Decree no. 152 of 3 April 2006, as amended.

# REFERENCE STANDARDS

* Law no. 447 of 26/10/1995, as amended. “Framework law on noise pollution”.
* Legislative Decree No. 85 of 19 May 2016 - “Implementation of Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres”.
* Italian Legislative Decree no. 93 of 25 February 2000, as amended - Implementation of Directive 97/23/EC on pressure equipment and Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment (recast), providing for its repeal.
* Legislative Decree No. 233 of 12 June 2003 as amended and supplemented “Implementation of Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers exposed to the risk of explosive atmospheres”.
* Italian Legislative Decree no. 152 of 03 April 2006, as amended “Environmental standards”.
* Italian Legislative Decree no. 81 of 09 April 2008, as amended “Implementation of Article 1 of Law no. 123 of 3 August 2007 on the protection of health and safety in the workplace”.
* Ministerial Decree of 18 May 2018 "Update of the technical regulation on the chemical-physical characteristics and presence of other components in combustible gas to be transported".
* Ministerial Decree of 16 April 2008 “Technical regulations for the design, construction, testing, operation and supervision of works and distribution systems and direct lines for natural gas with a density not exceeding 0.8”.
* Ministerial Decree of 26 June 1984, as amended. – "Classification of reaction to fire and approval of materials for the purposes of fire prevention".
* UNI 8827 "Gas pressure control systems operating with upstream pressure between 0.04 bar and 5 bar - Design, construction and testing".
* UNI 9165 “Gas distribution networks - Pipeworks with maximum operating pressure up to 5 bar - Design, construction, testing, operation, maintenance and rehabilitation”.
* UNI 11354 "Shut-off devices for gas distribution and/or transportation networks - Butterfly valves”;
* UNI 9734 “Shut-off devices for gas pipelines. Steel valves with ball obturator”.
* UNI 10285 "Monolithic insulation joints. 80 ≤ ND ≤ 600. NP 16".
* UNI 10702-1 "Gas pressure regulating installations and/or metering systems operating with upstream pressure between 0.04 bar and 12 bar - Part 1: Pressure control surveillance”.
* [UNI CEI EN ISO/IEC 17050-1](http://store.uni.com/magento-1.4.0.1/index.php/uni-cei-en-iso-iec-17050-1-2010.html) - "Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements”.
* [UNI CEI EN ISO/IEC 17050-2](http://store.uni.com/magento-1.4.0.1/index.php/uni-cei-en-iso-iec-17050-1-2010.html) - "Conformity assessment - Supplier's declaration of conformity - Part 2: Supporting documentation".
* UNI EN 1555-2 “Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 2: Pipes”.
* UNI EN 593 “Industrial valves. Metallic butterfly valves”.
* UNI EN 12186 "Gas infrastructure - Gas pressure regulating stations for transport and distribution - Functional requirements".
* UNI EN 12327 "Gas infrastructures - Pressure testing, commissioning and decommissioning procedures for gas supply networks - Functional requirements".
* UNI EN 12732 "Gas infrastructures - Welding of steel pipework - Functional requirements".
* UNI EN 10204 “Metallic products - Types of inspection documents”.
* UNI EN 10226 “Pipe threads for thread seal coupling”.
* UNI EN 751-3 "Sealing material for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Unsintered PTFE tapes".
* UNI EN 334 "Gas pressure regulators for inlet pressures up to 100 bar".
* UNI EN 12279 "Transport and distribution of gas - Gas pressure regulating installations on distribution networks - Functional requirements"
* UNI EN ISO 22768-1 "General tolerances. Tolerances for linear and angular dimensions without individual tolerance indications"
* UNI EN ISO 22768-2 "General tolerances. Geometric tolerances for features without individual tolerance indications"
* UNI EN ISO 3452-1 “Non-destructive testing - Penetrant testing - Part 1: General Principles”.
* UNI EN ISO 23277: “Non-destructive testing of welds - Penetrant testing - Acceptance levels".
* UNI EN ISO 17638: "Non-destructive testing of welds - Magnetic particle testing".
* UNI EN ISO 23278: "Non-destructive testing of welds - Magnetic particle testing - Acceptance levels".
* UNI EN ISO 17636-1 "Non-destructive testing of welds - Radiographic testing - Part 1: X and gamma-ray techniques with film".
* UNI EN ISO 10675-1 "Non-destructive testing of welds - Acceptance levels for radiographic inspection - Part 1: Steel, nickel, titanium and their alloys".
* UNI EN ISO 9712 "Non-destructive testing - Qualification and certification of non-destructive testing personnel"
* UNI EN ISO 15614-1 “Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys”.
* UNI EN ISO 286-1 "Geometrical product specifications (GPS) - ISO code system for tolerances on linear sizes - Part 1: Fundamental principles for tolerances, deviations and fits”.
* UNI EN ISO 286-2 "Geometrical product specifications (GPS) - ISO code system for tolerances on linear sizes - Part 2: Tables of standardised tolerance classes and limit deviations of holes and shafts".
* UNI EN ISO 3183 - “Petroleum and natural gas industries - Steel pipe for pipeline transportation systems”.
* CEI EN 60079-10-1 “Classification of areas - Explosive gas atmospheres".
* CEI EN 60079-14 - Explosive atmospheres - Part 14: Design, selection and installation of electrical systems;
* CEI 23-51 – Requirements for the construction, verification and testing of distribution panels for fixed domestic and similar installations;
* CEI UNEL 35016 – Class of reaction to fire of cables in relation to the EU Regulation “Construction Products” (305/2011);
* CEI 64-8/1-7 – Electrical consumer systems at nominal voltage not exceeding 1 kV alternating current and 1.5 kV direct current;
* CEI 11-17 – Public Power Generation, Transmission and Distribution Installations. Cable lines;
* CEI EN 62305 – Lightning protection;
* CEI 64-14 – Guide to the inspection of electrical utility systems;
* CEI 31-108 – Explosive atmospheres – Guide to the design, selection and installation of electrical systems in application of standard CEI EN 60079-14;
* CEI EN 60079-17 - Explosive atmospheres - Part 17: Electrical installations inspection and maintenance.

# ATTACHMENTS

* Annex 1 - T.S. 23273. "List of pressure reducers-regulators approved for company use”.
* Annex 2 - Table M. 17850 "Steel dielectric joint, NP 16, butt-weld ends”
* Annex 3 - T.S. 1800300 “Polyethylene fittings and special pieces for methane gas pipelines”.
* Annex 4 - T.S. 2000300 “Steel valves for gas pipelines”.
* Annex 5 - T.S. 9991300 - "Cartridge filter elements for filters of gas reduction and metering units and plants".
* Annex 6 - T.S. 15AA300 “Welded steel pipes for natural gas pipelines”.
* Annex 7 - T.S. 17AA300 “Steel fittings”.
* Annex 8 - T.S. 9991308 "Measuring and precision indicating instruments for plant installations".
* Annex 9 - T.S. 999503 "Ultrasonic meters".
* Annex 10 - T.S. 9991310 "Soundproof cabinets for natural gas reduction plants and units"

# Appendices

* APPENDIX 1 – “Sample declaration of conformity with this technical specification”
* APPENDIX 2 – “Sample declaration of SOUND ENGINEERING PRACTICE (SEP)”
* APPENDIX 3 – “Sample declaration of ATEX Exclusion”.

## Appendix 1

***Supplier's Declaration of Conformity***

(in accordance with the UNI CEI EN ISO/IEC 17050-1 standard)

(1) **No.** ...............................................

NOTE:

SAMPLE

(2) **Name of the issuer**:..............................................................................................................................................................................

**Address of the issuer:** ................................................................................*.*........................................................................................

(3) **Subject of the declaration:** ...............................................*.*...................................................................................................................

(4) **The following products manufactured by us:**

|  |  |
| --- | --- |
| **Our material code** (5) | **Italgas Reti material code** (6) |
| xxx | **2327920** |

**The subject of the above declaration complies with the requirements of the following documents:**

Document nos. Title Edition/Date of issue

(7) *T.S. 2327300* New *Final pressure reduction units from road pipes Edition 5 of 24/03/2021*

*with upstream pressure connection between 0.5 and 5 bar*

**Additional information:**

(8) ...................................................................................................................................................................................................................

Signed for and on behalf of:

.............................................................

(Place and date of issue)

(9) ............................................................. ......................................................................................................................

(Name and position) (Signature or equivalent mark authorised by the issuer)

KEY:

1. The Declaration must be issued on headed paper or, if visible, on applied stamps and be uniquely identified (e.g. by a log number).
2. The person issuing the Declaration (Supplier) must be unequivocally specified.
3. The “subject” must be unambiguously described so that the declaration of conformity can be referred to the subject in question.
4. List all the products for which company use authorisation is being requested.
5. For each individual product supplied, state the material code used by the Supplier.
6. For each individual product supplied, please quote the material code assigned by Italgas Reti, which can be found in the Italgas Reti reference documents. If there are none, please contact ATECH-NORM.
7. Include references to the Italgas Reti documents for the proposed products.
8. Indicate any deviations from the reference documentation and any other information deemed useful by the Supplier for product evaluation purposes (see note 6) of appendix A of UNI CEI EN ISO/IEC 17050-1).
9. Include the handwritten signature of the person authorised to issue the Declaration, stating their full Name, Surname and Position within the Organisation.

## Appendix 2

***Declaration of compliance with Article 3, subsection 3 of Legislative Decree no. 93***

*(SEP Declaration[[10]](#footnote-11))*

We ..............................................................................................................................................................

NOTE:

SAMPLE

(name of organisation)

with registered office in .............................................................................................................

(address)

as the .................................................................................................................................................

(Manufacturer / Authorised Representative)

we declare that, following the analysis carried out in accordance with Legislative Decree no. 26 of 15 February 2016 implementing the Integration Directive 2014/68/EU,

the series products:

..................................................................................................................................................................... ..................................................................................................................................................................... (name, type or model, batch, group or serial number)

described in the document:

…………………..………..……………………………………………………………………………….

…………………..………..……………………………………………………………………………….

(title and/or number and date of publication of the Standard(s) or other regulatory document(s))

to which this declaration refers, fall under Article 3, subsection 3, of Legislative Decree no. 93 of 25 February 2000 as amended, and are therefore subject to the provisions thereof. Consequently, the products mentioned are not subject to CE marking for the application of Legislative Decree no. 93 of 25 February 2000 as amended.

## Appendix 3

***ATEX Exclusion Declaration***

We ..............................................................................................................................................................

NOTE:

SAMPLE

(name of organisation)

with registered office in .............................................................................................................

(address)

as the .................................................................................................................................................

(Manufacturer / Authorised Representative)

declare under our sole responsibility that the products series

.....................................................................................................................................................................

.....................................................................................................................................................................

(name, type or model, batch, group or serial numbers)

described in the Technical Specification / document(s)

.....................................................................................................................................................................

.....................................................................................................................................................................

(when necessary)

to which this declaration refers, comply with the following legislative / regulatory document(s)

.....................................................................................................................................................................

.....................................................................................................................................................................

(title(s) and/or number(s) and date(s) of publication of the standard(s) or other legislative and/or regulatory document(s))

and, according to Article 1, subsection 1a) of Directive 2014/34/EU of 26 February 2014 (Legislative Decree no. 85 of 19 May 2016) and Chapter 1 of ATEX 2014/34/EU GUIDELINES (first edition), based on an *ATEX analysis* (see subsection 32 of the aforementioned ATEX 2014/34/EU GUIDELINES), do **not fall within the scope of the Directive 2014/34/EU,** as they do not risk causing an explosion due to the lack of potential ignition sources, as defined in Standard UNI EN 1127-1, when used in systems that comply with the following legislative and/or regulatory documents

.....................................................................................................................................................................

.....................................................................................................................................................................

.....................................................................................................................................................................

(title and/or number and date of publication of legislative and/or regulatory documents)

They can therefore be installed **in all types of zones** as defined in Legislative Decree no. 81 of 9 April 2008, as amended, Title XI (Directive 1999/92/EC of 16 December 1999).

.................................................................. ..................................................................................................................................

(place and date of issue) (name and signature or equivalent stamp of authorised person)

1. Henceforth referred to simply as DFRU. [↑](#footnote-ref-2)
2. L=5ND is the minimum length of the section, not counting flanges or bolts. This consists of a section with L≥3ND where the meter is to be positioned and an adapter with L≥2ND consisting of flange, counter flange and pipe. The maximum length must in any case be the same for all DFRUs of the same type and must comply with the need to be compact. [↑](#footnote-ref-3)
3. L=6ND is the minimum length of the section, not counting flanges or bolts. This consists of a section with L≥3ND where the meter is to be positioned and an adapter with L≥3ND consisting of flange, counter flange and pipe. A straight flanged section of at least L=2ND must be provided upstream of this section. [↑](#footnote-ref-4)
4. Meters suitable for the purpose of this T.S. need not necessarily be subject to legal metrology requirements (approved according to the requirements of the MID-2014/32/EU Directive), but the Client shall be free to choose the proposed model in any case. [↑](#footnote-ref-5)
5. The voltage level and any intrinsically safe equipment must be identified by the Supplier during the offer phase. [↑](#footnote-ref-6)
6. Aluminium alloys are not allowed. [↑](#footnote-ref-7)
7. Maximum permissible acoustic emission levels. Values assessed as indicated in T.S. 9991310 "SOUNDPROOF CABINETS FOR NATURAL GAS REDUCTION PLANTS AND UNITS". [↑](#footnote-ref-8)
8. Supplier means the entity responsible for the design and construction of the products or its legal representative as defined in Legislative Decree no. 206 of 6 September 2005 as amended and supplemented - “CONSUMER CODE” pursuant to Article 7 of Law no. 229 of 29 July 2003. [↑](#footnote-ref-9)
9. **DESTINATION UNIT** means the **OPERATIONAL UNIT** receiving the DFRU. [↑](#footnote-ref-10)
10. SOUND ENGINEERING PRACTICE [↑](#footnote-ref-11)