Press fittings for compressed air systems

inoxPRES steelPRES AESPRES MARINEPRES

RACCORDERIE METALLICHE

Contents

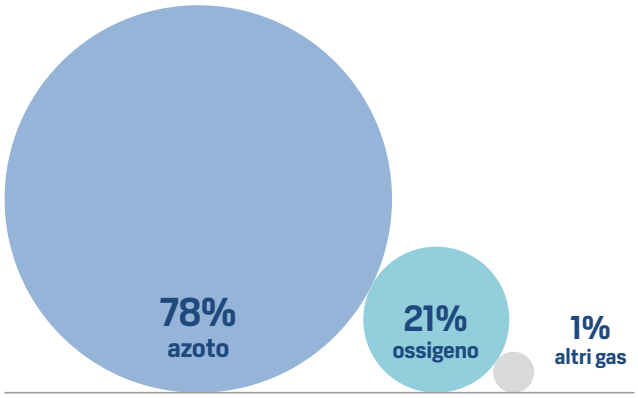
RACCORDERIE METALLICHE

1.0 Compressed air distribution systems

1.1 What is air

Our planet is surrounded by an invisible shield called the atmosphere, a mixture of gas and water vapour which constitutes the air we breathe.

The air is primarily made up of a mixture of gases among which nitrogen (78%), oxygen (21%), carbon dioxide/water vapour (0.04%) and other gases such as argon, neon, helium, methane, krypton, xenon, hydrogen and ozone.



Although invisible, odourless and colourless, air exists and has effects on everything around us.
Air exerts pressure and occupies all the space available to it, and unlike a vacuum, occupies a volume.

1.2 Compressed air

Compressed air means atmospheric air reduced in volume through a reciprocating compressor or pump, placed under pressure in a tank.

From a practical standpoint, compressed air is never pure and there are always contaminants present inside and of varying nature and physical state: liquids (oil – air) and solids (dust). They affect each other and mix forming compounds.

Water in particular is present in atmospheric air in the form of water vapour.
When air is compressed, the partial pressure of water vapour increases, but due to the increase in temperature caused by compression, condensation does not occur.
When the air is then cooled, the water condenses changing into a liquid state. Moisture can cause corrosion and damage the final product.

With lubricated compressors, the air inevitably becomes contaminated with **oil**. Even the air produced by non lubricated compressors may contain traces of oil sucked from the atmosphere.
The oil in the compressed air can be in a liquid, aerosol or vapour state.

The amount of **solid particles** in the atmosphere can be estimated at around 150 million per cubic metre. In particular solids that are smaller than 10 microns cannot be caught by suction filters and therefore enter into the compressed air circuit.
Some solids can have a catalytic effect and generate corrosion due to their chemical properties.
To this we must add the metallic particles, rust and metal flakes from the distribution network. This contamination occurs with any type of compressor.

1.3 Uses of compressed air

Compressed air is used in various industrial sectors. The required application conditions the design choices, the use of different filtration systems and the introduction of various working and processing instruments. In general, compressed air can be used:

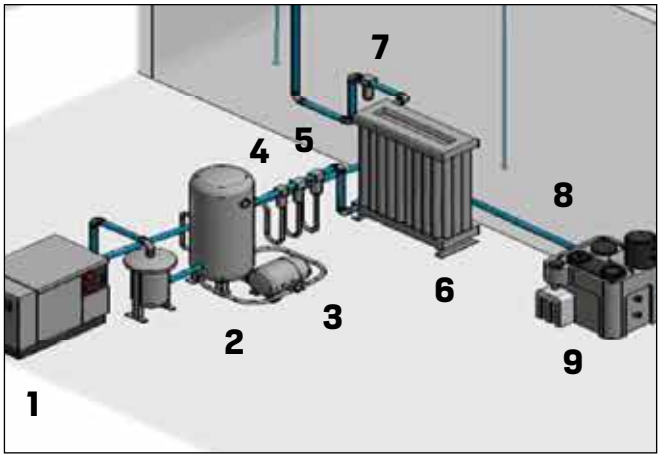
GENERAL PURPOSE OIL-FREE AIR

- General protection of ring networks
- Pre-filtration for adsorption air dryers
- Plant automation
- Air logistics
- Pneumatic tools
- General instrumentation
- Metal stamping
- Forging
- General industrial assembly (without external piping)
- Air motors pneumatic conveying
- Workshops (tools)
- Mechanical workshops (pneumatic inflation)
- Temperature control systems
- Blow guns
- Calibration equipment
- Mixing of raw materials
- Sand blasting / shot peening

HIGH QUALITY OIL-FREE AIR

- Blow moulding industry, e.g. PET containers
- Processing of films
- Critical instrumentation
- Advanced pneumatic applications
- Compressed air switches
- Decompression chambers
- Production of cosmetics
- Laser and optical systems
- Robotics
- Spray painting
- Pneumatic bearings
- Bleeding of ducts
- Measuring equipment
- Pretreatment for on-site gas generation

The rigorous air quality levels necessary for modern manufacturing plants require careful planning, installation and commissioning.
The press systems are indicated only for industrial applications while medical purposes are excluded.
The choice and the implementation of the piping type or system, depending on the type of application is responsibility of the planner/installer.



It is no longer enough to treat the air in one place and it is highly recommended that the air is treated in compressor rooms up to a level that provides air for general use so as to protect the air distribution system.

Treatment at the point of use must be studied not only to remove the residual contamination in the distribution system, but also by paying particular attention to the air quality required by each individual application. This design approach ensures correct air treatment and represents the most effective way to obtain high-quality compressed air.

Components

1_Compressor **2**_Air tank **3**_Condensate drain **4**_Condensate separator **5**_Coalescence filters
6_Dryer **7**_Dust filter **8**_Condensate drain **9**_Water/oil separator

Compressor

Filters with dryer

Filters with dryer

Compressed air tank

Sampling point

RACCORDERIE METALLICHE

2.0 Standards and classifications

2.1 Reference standards

The reference standard for compressed air is ISO 8573, which groups international standards relating to the quality (or purity) of compressed air. The standard is divided into nine parts, of which part 1 specifies the quality requirements for compressed air and parts 2-9 the testing procedures for the various contaminants.

ISO 8573-1 is the main document of the ISO 8573 series, since it specifies the permitted contamination level for every cubic metre of compressed air. ISO 8573-1 lists the main contaminants such as solid particulate, water and oil.
The purity levels for each contaminant are reported separately in the below table.

TABLE 1: CONTAMINATION ISO 8573:2010

Class ISO 8573-1 2010	Solid particulate				Water		Oil
	Maximum number of particles per m³			Mass concentration mg/m³	Pressure dew point	Liquid concentration g/m³	Total oil (aerosol liquid and vapour) mg/m³
	0.1-0.5 micron	0.5-1 micron	1-5 micron				
0	According to the specifications of the user or the supplier of the equipment and more restrictive than class 1						
1	≤ 20.000	≤ 400	≤ 10	-	≤ -70°C	-	≤ 0.01
2	≤ 400.000	≤ 6.000	≤ 100	-	≤ -40°C	-	≤ 0.1
3	-	≤ 90.000	≤ 1.000	-	≤ -20°C	-	≤ 1
4	-	-	≤ 10.000	-	≤ +3°C	-	≤ 5
5	-	-	≤ 100.000	-	≤ +7°C	-	-
6	-	-	-	0 < Cp ≤ 5	≤ +10°C	-	-
7	-	-	-	5 < Cp ≤ 10	-	Cw ≤ 0,5	-
8	-	-	-	-	-	0,5 < Cw ≤ 5	-
9	-	-	-	-	-	5 < Cw < 10	-
X	-	-	-	Cp > 10	-	Cw > 10	> 5

2.2 Classification of air purity

In accordance with ISO8573-1, to specify the purity of the air it is always necessary to specify the standard, followed by purity class chosen for each contaminant, solid, water and oil total.
It is possible to choose a different purity class for each contaminant.

Example
The air quality designation "ISO 8573-1 Class 1.2.1" indicates that under the operating conditions specified by the standard, the air presents the quality described here:

- Class 1 - particulates: permitted for each cubic metre of compressed air is a maximum of 20,000 particles with a size of between 0.1 and 0.5 microns, 400 particles with a size of between 0.5 and 1 micron and 10 particles with a size of between 1 and 5 microns.
- Class 2 - water: a pressure dew point of -40° C or better and water in a liquid state is not permitted.
- Class 1 - oil: each cubic metre of compressed air can contain a maximum of 0.01 mg of oil. This is a combined limit on oil in liquid form, aerosol and vapour.

ISO 8573-1:2010 class zero: Class 0 does not mean zero contaminants.

Class 0 requires that the user and the equipment manufacturer agree on the level of contamination in a written document on air quality specifications. The contamination levels agreed upon shall be measurable with the equipment and testing procedures required by ISO 8573 parts 2-9. The class 0 agreed upon must appear in all documentation in order to conform to the standard.

3.0 System components

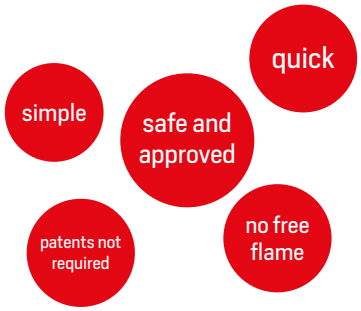
3.1 Press fitting - Product definition

A compression air distribution system this well branched and widespread requires an innovative application solution.

Forget about soldering copper pipes, galvanized steel thread or screwing together plastic pipes and the limitations of aluminium systems. The press fitting system is simple and requires only the automatic crushing of a pipe on a fitting, without welding, gluing or crimping. This new system is fast and cheap, because it requires only half the time for installation. A plant built with press fitting is very durable because the steel tubes are inherently tougher and more rigid than plastic ones. The rigidity of the system and the very low thermal expansion means the use of fasteners and sliding and fixed points can be minimized.

These are the advantages that the **inoxPRES** and **steelPRES** press fitting systems offer, specifically designed and approved for delivery of compressed air.

- easy assembly, practical and convenient (efficient);
- quick installation (saving on hours of labour);
- safe and approved (guaranteed system);
- no need for specialised personnel (no special skills required);
- safe and no use of naked flames.



The **inoxPRES** range is the most suitable for the delivery of compressed air, being made both for pipes and fittings, in stainless steel, a "clean" material, highly resistant to corrosion and mechanically very efficient. The choice of the **inoxPRES** range is recommended especially when the air quality is an important requirement for equipment connected to the network. In such cases we recommend the use of stainless steel pipes AISI 316 l (1.4404) or AISI 304 (1.4301).
The press systems are indicated only for industrial applications while medical purposes are excluded.
The choice and the implementation of the piping type or system, depending on the type of application is responsibility of the planner/installer.

Other materials such as copper and carbon steel can be used with the necessary preliminary analysis according to the type of application and environment.

Plastic piping and galvanized steel systems have been used in the industry for years, but they can cost much more than expected. Galvanized pipe corrodes inside without it being possible to perform surveillance and interventions. The greater wall thickness, consdering the same external diameter, reduce the internal cross section resulting in increased pressure drop. Over and above plastic piping, if not properly secured, tends to flex creating condensate collection points

3.2 Press fitting - inoxPRES: characteristics

The following information will be related to the **inoxPRES** range deemed "top class" for the delivery of compressed air.

3.2.1 Press fitting – inoxPRES: fittings

inoxPRES press fittings are manufactured using high-alloyed austenitic stainless Cr-Ni-Mo steel AISI 316L(material number 1.4404).

The press fittings are indelibly marked with laser indicating the manufacturer name, diameter, DVGW test symbol and internal code.

At the press fitting swollen ends, a black EPDM o-ring is fitted as standard.

3.2.2 Press fitting – inoxPRES: pipes

inoxPRES pipes are longitudinally welded thin-walled tubes made of high alloyed austenitic stainless Cr-Ni-Mo steel AISI 316L (material number 1.4404), ferritic stainless steel (nickel free) pipe Type 444 (material no. 1.4521) and in AISI 304 (material no. 1.4301). The tubes are manufactured according to EN 10217-7 and EN 10312. Inner and outer surfaces are made of smooth metal and are free of corrosion-promoting substances. **inoxPRES** pipes are classified as non-combustible pipes according to material class A; they are supplied in lengths of 6 meters and are closed with plastic plugs/caps at the ends.

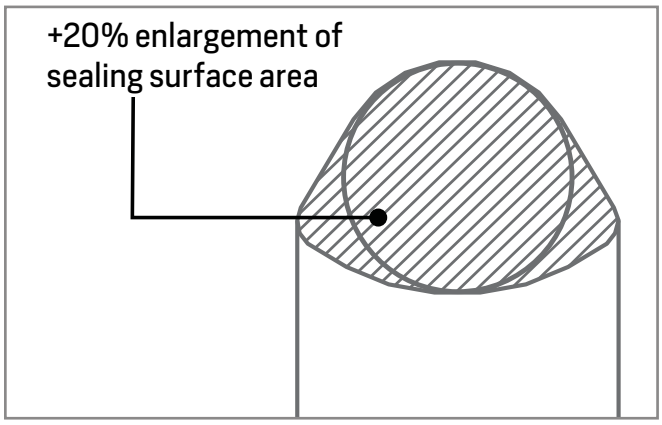
TABLE 2: INOXPRES PIPES - PIPE DIMENSIONS AND CHARACTERISTICS (SERIES 2)

External diameter x thickness in mm	Nominal width DN	Internal diameter in mm	Mass in kg/m	Water volume in l/m
15 x 1	12	13	0.351	0.133
18 x 1	15	16	0.426	0.201
22 x 1,2	20	19.6	0.624	0.302
28 x 1,2	25	25.6	0.790	0.514
35 x 1,5	32	32	1.240	0.804
42 x 1,5	40	39	1.503	1.194
54 x 1,5	50	51	1.972	2.042
76.1 x 2	65	72.1	3.550	4.080
88.9 x 2	80	84.9	4.150	5.660
108 x 2	100	104	5.050	8.490

3.2.3 Press fitting – inoxPRES: seals

Traditional press fitting systems use round sealing rings (O-rings), which can easily be damaged by careless fitting. RM on the other hand uses a patented sealing ring with a lenticular profile which fits the press crimp groove.
This provides the following advantages:

- a 20% enlargement of the sealing surface area;
- major reduction of the risk of the sealing ring being damaged;
- easier pipe insertion.



The 15 – 54 mm black EPDM sealing ring is supplied with an additional safety feature that guarantees that any accidentally unpressed connection is visible during the pressure test that causes a leakage.

Depending on the residue of oil present in the compressed air lines, it is necessary to check that the EPDM o-ring is suitable, if not it might be necessary to replace it with an FKM o-ring. For compressed air in class 5, with oil content that is greater than 5 mg/m³, it is recommended to use sealing rings made of FKM, resistant to oils and hydrocarbons.

O-rings in EPDM Optimal for oil concentration up to class 4 (< 5 mg/m³)

O-rings made of FKM Optimal for all oil concentrations starting from class 5 (> 5 mg/m³)

To ensure optimal sealing pipes, it is recommended to humidify the sealing ring with water prior to assembly.

**Compressed air systems for painting plants must be "silicone free" to avoid damaging the painted surface. The pressing systems come out of production with EPDM o-rings (not silicon free).
Any replacement of the o-rings does not guarantee that the system is free of any traces of silicone.
In this regard, for painting systems it is necessary to specifically request that the manufacturer supply the product with a specific o-ring mounted in the factory without silicon traces (inoxpres HT silicone free product range with FKM o-ring).**

3.2.4 Press fitting – applications

At Raccorderie Metalliche we know all about compressed air: here are some photos of the systems built in the Raccorderie Metalliche plants in Campitello and Pilastro.

3.2.5 Press fitting – technical characteristics and performances

The **inoxPRES** system is particularly efficient because it is made of AISI 316 stainless steel, among the best stainless steel alloys available, and has been tested and approved by the main international certification bodies.

TABLE 3: INOXPRES TECHNICAL CHARACTERISTICS

OPERATING PRESSURES	Min	-0.95 bar
	Max	Pn16 (16 bar) DN 15 ÷ 108 mm
OPERATING TEMPERATURES	Min	-20°C
	Max	+120°C (EPDM o-ring) +220°C (FKM o-ring)
COMPATIBLE FLUIDS/SYS-TEMS	Neutral gases	nitrogen, argon, carbon dioxide
METAL PIPE CHARACTERISITCS	Tensile strength	600 N/mm²
	Yield strength	220 N/mm²
	Elongation	40 %
	Coefficient of linear expansion	1.7×10^{-5}
	Surface roughness	≤ 1.0 µm
	Fire resistance	according to DIN 4102-1, Class A
THREAD	EN 10226-1 (ex ISO 7/1) Conical male thread	
	EN 10226-1 (ex ISO 7/1) Conical female thread	

The next table shows the mechanical properties of stainless steel **inoxPRES** compared with other materials used for compressed air lines.

TABLE 4: MECHANICAL CHARACTERISTICS OF MATERIALS

MECHANICAL CHARACTERISTICS	Stainless steel	Galvanized steel	Copper	Aluminium	PVC
Limit of tensile strength (N/mm²)	600	350	250	90	55
Elastic limit (N/mm²)	220	220	130	70	-
Elongation (%)	40	25	50	15	30
Coefficient of linear expansion	1.7×10^{-5}	1.2×10^{-5}	1.7×10^{-5}	2.4×10^{-5}	7×10^{-5}

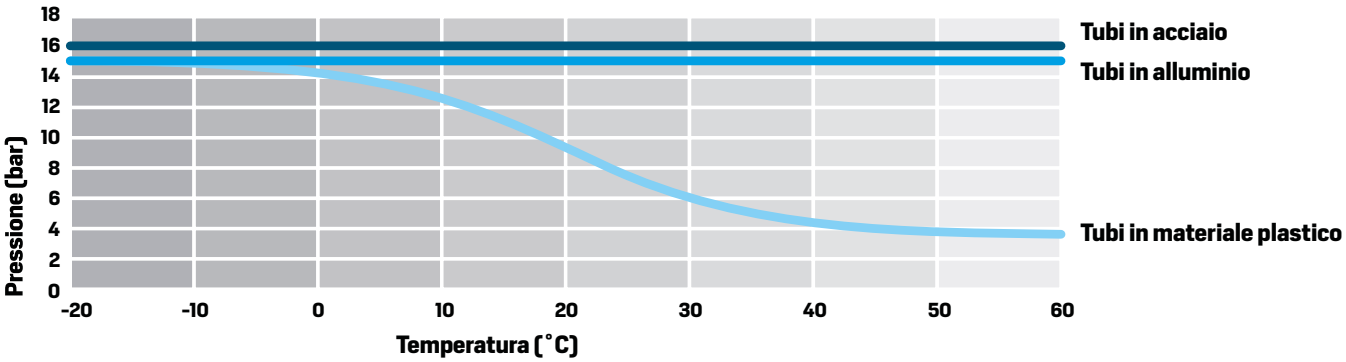
With regards to dimensions, the reduced thickness of the **inoxPRES** pipe, offers a better flow and a lower pressure drop, with the same external diameter, compared to plastic and aluminium tubes.

TABLE 5: PIPE DIMENSIONS GENERAL DATA SHEET

Mat. Plastic		Aluminium		inoxPRES PIPS (SERIES 2)	
De	**Di**	**De**	**Di**	**De**	**Di**
20	14	20	17	22	19.6
25	18	25	23	28	25.6
32	23	32	29	35	32
40	29	40	37	42	39
50	36	50	46	54	51
63	45	63	59	-	-
-	-	-	-	76.1	72.1
90	65	-	-	88.9	84.9
110	79	110	106	108	104

Comparing the sizes of pipes with plastic and aluminium systems, in some cases, it is possible to use a pipe with a smaller external diameter yet having an larger inner section, thus achieving a better flow and lower pressure drop.

MAXIMUM OPERATING PRESSURE AT DIFFERENT WORKING TEMPERATURES



3.2.6 Press fitting – general conditions of installation

The networks for compressed air are generally air mounted systems and have a closed ring for a better distribution of the pressures. The press fitting systems are an ideal solution for the construction of these facilities given the complexity and the numerous ramifications. The **inoxpres range** in particular offers several solutions to facilitate installation.

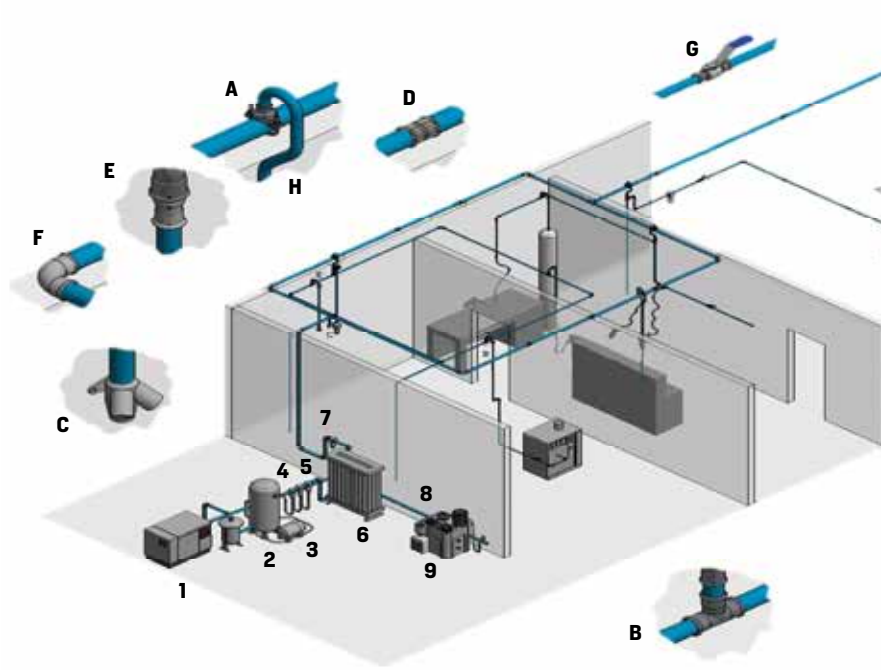
Gripping collar with press fitting and threaded junction
Ideal for the creation of vertical lines aimed at final users. The simplicity and speed of use provides great flexibility in the implementation of the distribution network and makes additions or modifications easy to perform.

Compressed air pipe
This special curved pipe combined with a tee or gripping collar is the ideal solution for a vertical junction, allowing any remaining water to be separated, preventing it from reaching the users.

Y-shaped junction for compressed air systems
Indispensable fitting at the end of the line for connecting quick couplings. The configuration with two outputs at 60º enables the simultaneous connection of two quick couplings and avoids interference in their use. The fitting is also provided with a third outlet, serving as a bleeding device.

Press fitting valve (2 pieces and 3 pieces)
These are important elements in a compressed air distribution network because they allow the airflow to be adjusted and improve the management of the flow.

Omega and straight hose
These elements are highly flexible and allow connections to be made easily even in tight spaces and where a traditional line is impossible.
They consist of stainless steel components, so they maintain the same excellent characteristics of other **inoxPRES** fittings.



KEY

Air treatment system components

1 Air compressor
2 Humid air tank
3 Condensate drain
4 Water separator
5 Coalescence filters
6 Modular adsorption dryer
7 Dust filter
8 Condensate drain
9 Water/oil separator

Inoxpres range fittings for compressed air

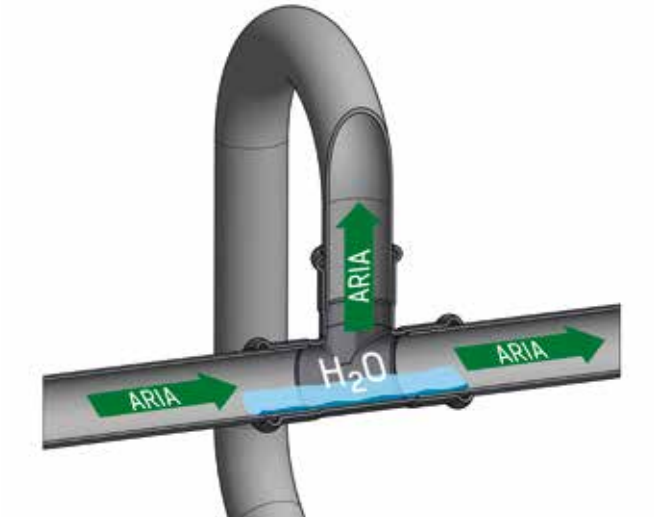
A Collar with junction box
B Tee
C Y-junction
D Sleeve
E MF reduction
F Elbow
G Ball valve
H Curved pipe for compressed air

3.3 Press fitting - proper management of contaminant water

The compressed air outlet from the compressor is never perfectly dry, but contains moisture which condenses, turning into water contaminating the air itself. If the system does not have an efficient dryer downstream of the compressor, water can spread in the pipes, creating corrosion over time. The choice of a stainless steel pipe and fittings, eliminates the risk of internal corrosion.

If a design does not include a dryer, the following guidelines must be observed:

- the pipes must have a slight inclination, in the direction of air flow, equal to 7 mm/m (as far as possible it is desirable to maintain an inclination of 1 cm per metre);
- every 20-30 metres a condensate drainage point will be required, as well as at the lower end of each junction;
- the supply junctions for the users, must be carried out using an **inoxPRES** tee or **inoxPRES** gripping collars combined with a curved pipe for compressed air, in order to avoid as much as possible the conveying of condensation to the users.



4.0 Network design

4.1 Press fitting - dimensioning the network

The data required for the dimensioning of a compressed air network, are as follows:

- fuel consumption rate for each user and total consumption for zones and overall total, expressed in m³/min;
- nominal operating pressure of each user, as well as the minimum and maximum pressure allowed.

With this information it is possible to calculate the various sections of the distribution network, and the branching to each individual user.
When correctly dimensioning, the network pressure drops play a key role, which are dependent on the type of piping installed (internal surface), the size of the pipes, geometry of the fittings and become a critical parameter the greater the complexity and length of the network. The **InoxPRES** system in particular is an ideal solution in reducing losses because it presents a particularly smooth inner surface of the pipes and therefore offers little resistance to internal flow.

TABELLA 6: COMPRESSED AIR PRESSURE DROP AT 7 bar AND AT 15°C

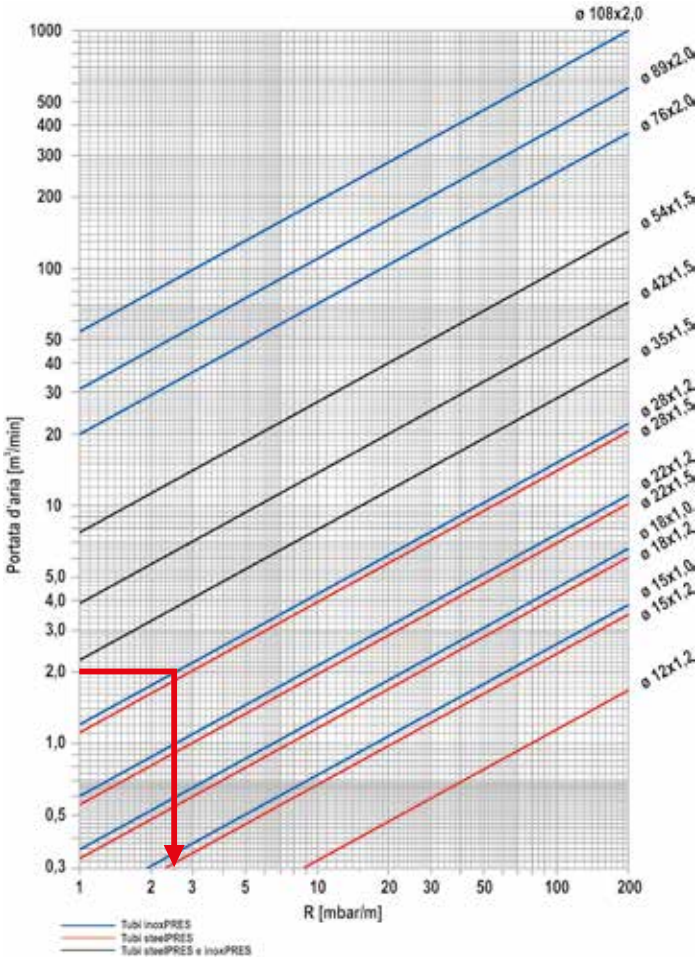
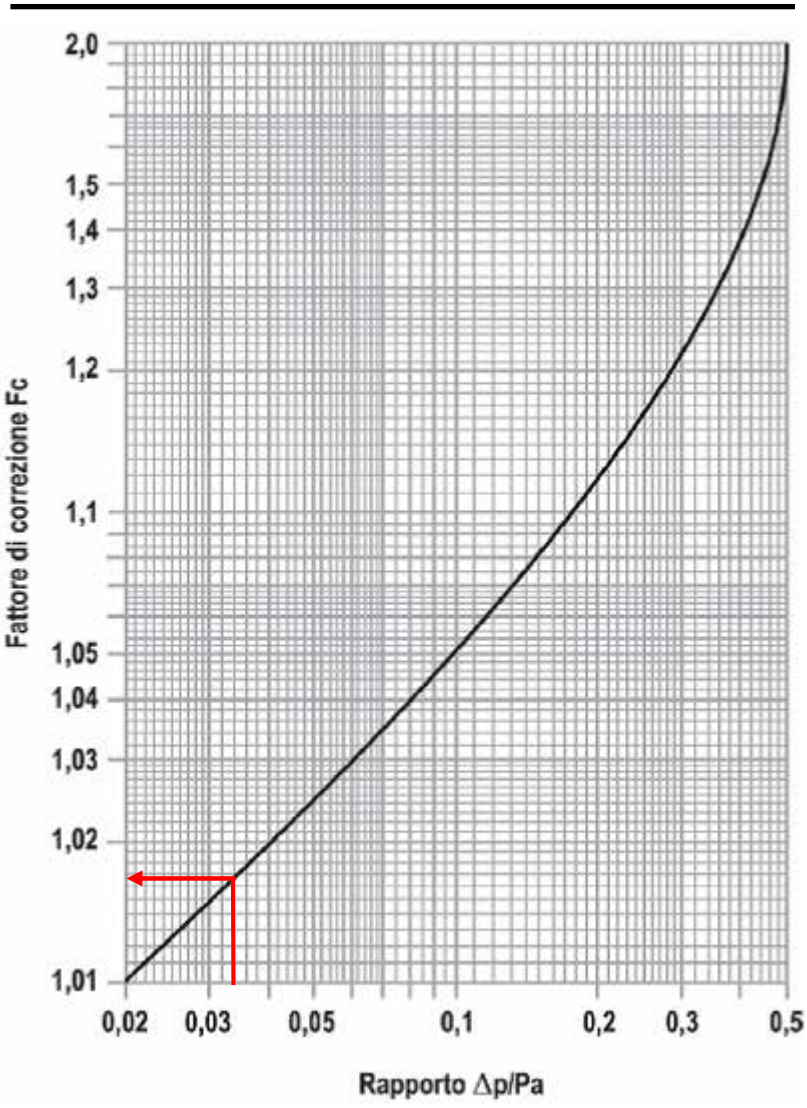


Table 6 shows the pressure drop elbows of inoxPRES pipes, for compressed air at 15° C and a pressure of 7 bar.

A compressed air installation is correct when the pressure drop that takes place in the pipes, from the central tank up to the outlets for the users, is in the order of 10,000 - 30,000 Pa (0.1 - 0.3 bar) and in general, it should not be more than 5% of the operating pressure.

The diagram has been developed taking into consideration the main parameters for the dimensioning of a distribution network:
Δp = unit pressure drop [mbar/m]
G = air flow [m³/min]
P = operating pressure [bar]
di = internal diameter of pipes [mm]

TABELLA 7: PRESSURE DROP CORRECTION FACTOR



By calculating the total pressure drop of the circuit, if the resulting value exceeds 5% of the value of the initial pressure, a correction will need to be made to the value of [Δp], to take into account the expansion (table 7) and subsequently considering the use of pipes with a larger diameter.

As the diagrams were developed for air at 15°C, if the actual temperature is very different from this value, it will be necessary to apply a second correction of [Δp], to take into account the different dynamic viscosity of the fluid.

Table 7
Pressure drop correction factor

4.2 Press fitting - influence of fittings in the dimensioning of the line

The length of the system network requires the consideration of the equivalent length of special parts such as valves, elbows, tees, etc.

TABLE 8: EQUIVALENT LENGTH OF SPECIAL PARTS

Fittings	Equivalent length in meters of pipe									
	15	18	22	28	35	42	54	76.1	88.9	108
Elbow	0.5	0.7	1	1.5	2.5	3	3.5	4.5	5	7
Tee	1	1.3	1.5	2	3	3.5	4	6	7	10
Reduction	0.1	0.2	0.3	0.5	0.7	0.8	1	1.5	2	2.5
Valve	0.1	0.1	0.1	0.3	0.5	0.6	0.7	0.9	1	1.5

Example:
a compressed air distribution network, 100 metres long, made of **inoxPRES** pipe Ø 28 x 1.2, with an air flow rate of 2 m³/min at a pressure of 7 bar (8.013 bar of absolute pressure).
Within the system there are 4 elbows Ø 28, 1 valve Ø 28, an 2 tee Ø 28.

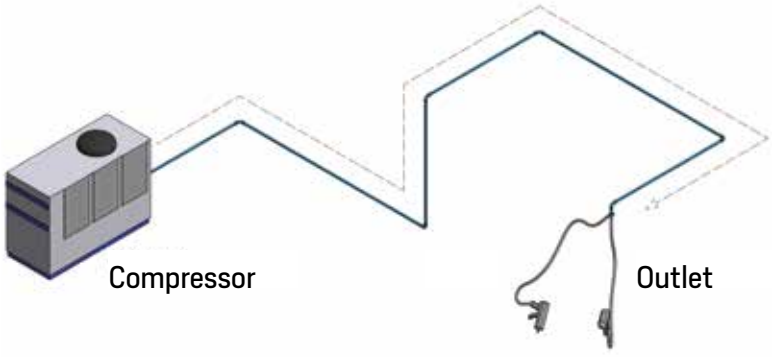
The equivalent length is: 4 * 1.5 + 1 * 0.3 + 2 * 2 = 10.3 m
The total length to be considered is: 100 + 10.3 = 110.3 m

From the diagram, Table 6 gives:
R = 2.5 mbar/m
The pressure drop will be:
Δp = 2.5 * 110.3 = 275.75 mbar
By comparing this figure to the value of absolute pressure, you will have:
[Δp/Pa] = 0.275 / 8.013 = 0.034

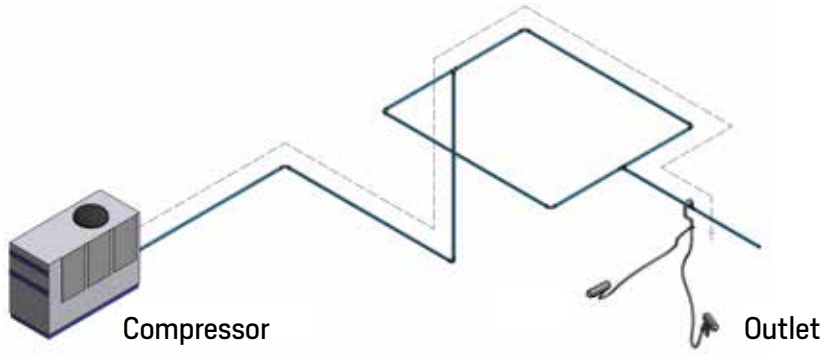
From diagram, Table 7, the correction factor is obtained:
Fc = 1.016

Then the value of the pressure drop according to the fluid expansion would be:
Δp_c = 1.016 * 2.5 * 110.3 = 280.16 mbar = 0.28 bar

Distance between compressor user



Linear distribution network



Ring distribution network

For the correct dimensioning of the network it is important to consider the length of the line and, in particular, the distance between the compressor and final users.

The following tables 9 and 10 show the recommended diameters to complete a line of compressed air according to the flow and distance between compressor and users.
Here are two tables: one with working pressure 7 bar and a second at 12 bar, considering a maximum pressure drop of 4%.

TABLE 9: RECOMMENDED DIAMETERS P= 7 bar

Air flow			Distance between compressor and farthest user										
Nl/min	Nm³/h	cfm	25	50	100	150	200	300	400	500	1000	1500	2000
230	14	8	15	15	18	18	18	18	18	18	22	22	28
650	39	23	15	18	22	22	22	28	28	28	35	35	35
900	54	32	18	18	22	28	28	28	28	28	35	35	42
1200	72	42	18	22	28	28	28	28	35	35	42	42	42
1750	105	62	18	28	28	28	35	35	35	42	42	54	54
2000	120	71	22	28	28	35	35	35	42	42	54	54	54
2500	150	88	28	28	35	35	35	42	42	42	54	54	54
3000	180	106	28	28	35	35	42	42	42	54	54	54	76.1
3500	210	124	28	35	35	42	42	42	54	54	54	76.1	76.1
4500	270	159	28	35	42	42	42	54	54	54	76.1	76.1	76.1
6000	360	212	35	42	42	54	54	54	54	76.1	76.1	76.1	76.1
7000	420	247	35	42	54	54	54	54	76.1	76.1	76.1	76.1	88.9
8500	510	300	35	42	54	54	54	76.1	76.1	76.1	76.1	88.9	88.9
12000	720	424	42	54	54	76.1	76.1	76.1	76.1	76.1	88.9	88.9	108
15000	900	530	54	54	76.1	76.1	76.1	76.1	76.1	88.9	88.9	108	108
18000	1080	636	54	54	76.1	76.1	76.1	76.1	88.9	88.9	108	108	108
21000	1260	742	54	76.1	76.1	76.1	76.1	88.9	88.9	88.9	108	108	108
26000	1560	918	54	76.1	76.1	76.1	88.9	88.9	108	108	108	108	108
31000	1860	1095	76.1	76.1	76.1	88.9	88.9	108	108	108	108	108	108
33000	1980	1165	76.1	76.1	76.1	88.9	88.9	108	108	108	108	108	108
44000	2640	1554	76.1	76.1	88.9	108	108	108	108	108	108	108	108
50000	3000	1766	76.1	76.1	88.9	108	108	108	108	108	108	108	108
58000	3480	2048	76.1	88.9	108	108	108	108	108	108	108	108	108
67000	4020	2366	76.1	88.9	108	108	108	108	108	108	108	108	108
75000	4500	2648	76.1	88.9	108	108	108	108	108	108	108	108	108
83000	4980	2931	88.9	108	108	108	108	108	108	108	108	108	108
92000	5520	3249	88.9	108	108	108	108	108	108	108	108	108	108
100000	6000	3531	88.9	108	108	108	108	108	108	108	108	108	108

Operating pressure: 7 bar
Maximum total pressure drop: 4%
In red the values for which the pressure drop is greater than 4%
In these cases it is possible to use larger stainless weld fittings of 108 mm

TABLE 10: RECOMMENDED DIAMETERS P= 12 bar

Air flow			Distance between compressor and farthest user										
Nl/min	Nm³/h	cfm	25	50	100	150	200	300	400	500	1000	1500	2000
230	14	8	15	15	15	15	15	15	15	15	18	18	22
650	39	23	15	15	18	18	18	22	22	22	28	28	28
900	54	32	15	18	18	22	22	22	28	28	28	35	35
1200	72	42	18	18	22	22	22	28	28	28	35	35	35
1750	105	62	18	22	22	28	28	28	28	35	35	42	42
2000	120	71	22	22	28	28	28	28	35	35	42	42	42
2500	150	88	22	22	28	28	28	35	35	35	42	42	54
3000	180	106	22	28	28	28	35	35	35	42	42	54	54
3500	210	124	28	28	28	35	35	35	42	42	54	54	54
4500	270	159	28	28	35	35	35	42	42	42	54	54	54
6000	360	212	28	35	35	42	42	42	54	54	54	76.1	76.1
7000	420	247	35	35	35	42	42	54	54	54	76.1	76.1	76.1
8500	510	300	35	35	42	42	54	54	54	54	76.1	76.1	76.1
12000	720	424	35	42	54	54	54	54	76.1	76.1	76.1	76.1	88.9
15000	900	530	42	42	54	54	54	76.1	76.1	76.1	76.1	88.9	88.9
18000	1080	636	42	54	54	54	76.1	76.1	76.1	76.1	88.9	88.9	88.9
21000	1260	742	42	54	54	76.1	76.1	76.1	76.1	76.1	88.9	88.9	108
26000	1560	918	54	54	76.1	76.1	76.1	76.1	76.1	88.9	88.9	108	108
31000	1860	1095	54	54	76.1	76.1	76.1	76.1	88.9	88.9	108	108	108
33000	1980	1165	54	54	76.1	76.1	76.1	76.1	88.9	88.9	108	108	108
44000	2640	1554	54	76.1	76.1	76.1	88.9	88.9	88.9	108	108	108	108
50000	3000	1766	54	76.1	76.1	88.9	88.9	88.9	108	108	108	108	108
58000	3480	2048	76.1	76.1	76.1	88.9	88.9	108	108	108	108	108	108
67000	4020	2366	76.1	76.1	88.9	88.9	108	108	108	108	108	108	108
75000	4500	2648	76.1	76.1	88.9	88.9	108	108	108	108	108	108	108
83000	4980	2931	76.1	76.1	88.9	108	108	108	108	108	108	108	108
92000	5520	3249	76.1	88.9	88.9	108	108	108	108	108	108	108	108
100000	6000	3531	76.1	88.9	108	108	108	108	108	108	108	108	108

Operating pressure: 12 bar

Maximum total pressure drop: 4%

In red the values for which the pressure drop is greater than 4%

In these cases it is possible to use larger stainless weld fittings of 108 mm

4.3 Press fitting - fluid speed

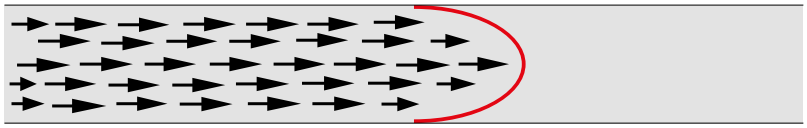
One of the parameters usually overlooked but very important for the dimensioning of the network, is the velocity of the compressed air. An under-dimensioned system causes an increase in the velocity of the fluid, with negative consequences on the management of the system, especially on performance and costs. Inside the line, high speed flow can generate turbulence when fluid passes inside fittings, such as tees and elbows.

The maximum speed of the air passing inside the main pipe must not exceed 8 m/s. In the service or secondary piping (supplying pneumatic equipment), the maximum speed should not exceed 15 m/s.

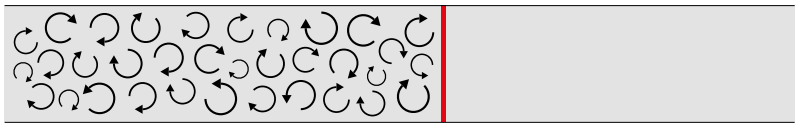
Therefore during the design phase it is recommended to consider the speed of the flow to avoid the following negative effects:

- irregular flow pressure;
- turbulence in the network;
- pressure drops to the users;
- redundant power required at the compressor.

LAMINAR FLOW



TURBULENT FLOW



5.0 Pipe fixing, distances between clamps

Pipe supports serve to fix the pipe to the ceiling or wall and should take up changes in length which result from temperature variations. Through the setting of fixed and sliding points the length variations in the pipe are steered in the required direction. Pipe supports must not be mounted on fittings. Sliding supports must be so positioned that they do not prevent the piping from moving.
The maximum permitted support distances for press fitting pipes are shown in table 11.

TABLE 11: MAXIMUM PERMITTED DISTANCES BETWEEN SUPPORTS

DN	External pipe diameter (mm)	Distances between supports (m) DIN 1988	Indicative values: (m)
10	12	1.25	1.50
12	15	1.25	1.50
15	18	1.50	1.50
20	22	2.00	2.00
25	28	2.25	2.50
32	35	2.75	2.50
40	42	3.00	3.00
50	54	3.50	3.50
65	76.1	4.25	4.00
80	88.9	4.75	4.50
100	108	5.00	5.00

The excellent rigidity of **inoxPRES** pipes can reduce the use of collars when compared to other systems.

6.0 Expansion compensation

Metal pipelines expand in different ways under the influence of heat and according to the material they are made of.
The longitudinal change under various temperature differences in the press fitting pipe is shown in table 12. The longitudinal change can be compensated for through the correct setting of fixed and sliding points, the installation of compensators, s-bends, u-bends or expansion compensators and by the creation of sufficient expansion spaces.
Typical installations are shown in the figures on page 21.

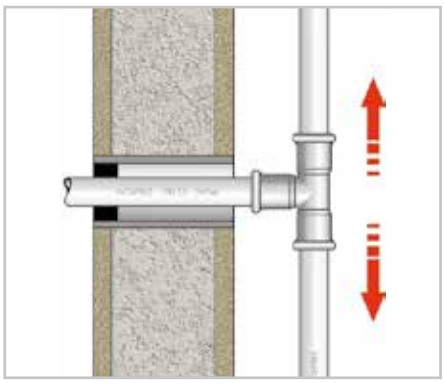
TABLE 12: LENGTH VARIATIONS inoxPRES/steelPRES/aesPRES/marinePRES

	L [m]	Δt [°K]									
		10	20	30	40	50	60	70	80	90	100
inoxPRES	3	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	4	0.7	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6
	5	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.4	8.3
	6	1.0	2.0	3.0	4.0	5.0	5.9	6.9	7.9	8.9	9.9
	7	1.2	2.3	3.5	4.6	5.8	6.9	8.1	9.2	10.4	11.6
	8	1.3	2.6	4.0	5.3	6.6	7.9	9.2	10.6	11.9	13.2
	9	1.5	3.0	4.5	5.9	7.4	8.9	10.4	11.9	13.4	14.9
	10	1.7	3.3	5.0	6.6	8.3	9.9	11.6	13.2	14.9	16.5
	12	2.0	4.0	5.9	7.9	9.9	11.9	13.9	15.8	17.8	19.8
	14	2.3	4.6	6.9	9.2	11.6	13.9	16.2	18.5	20.8	23.1
	16	2.6	5.3	7.9	10.6	13.2	15.8	18.5	21.1	23.8	26.4
	18	3.0	5.9	8.9	11.9	14.9	17.8	20.8	23.8	26.7	29.7
	20	3.3	6.6	9.9	13.2	16.5	19.8	23.1	26.4	29.7	33.0
steelPRES	3	0.36	0.72	1.08	1.44	1.80	2.16	2.52	2.88	3.24	3.60
	4	0.48	0.96	1.44	1.92	2.40	2.88	3.36	3.84	4.32	4.80
	5	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00
	6	0.72	1.44	2.16	2.88	3.60	4.32	5.04	5.76	6.48	7.20
	7	0.84	1.66	2.52	3.36	4.20	5.04	5.88	6.72	7.56	8.40
	8	0.96	1.92	2.88	3.84	4.80	5.76	6.72	7.68	8.64	9.60
	9	1.08	2.16	3.24	4.32	5.40	6.48	7.56	8.64	9.72	10.80
	10	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00
	12	1.44	2.88	4.32	5.76	7.20	8.4	10.08	11.52	12.96	14.40
	14	1.68	3.36	5.04	6.72	8.40	10.08	11.76	13.44	15.12	16.80
	16	1.92	3.84	5.76	7.68	9.60	11.52	13.44	15.36	17.28	19.20
	18	2.16	4.32	6.48	8.64	10.80	12.96	15.12	17.28	19.44	21.60
	20	2.40	4.80	7.20	9.60	12.00	14.40	16.80	19.20	21.60	24.00
aesPRES / marinePRES	3	0.5	1.0	1.5	2.0	2.6	3.1	3.6	4.1	4.6	5.1
	4	0.7	1.4	2.0	2.7	3.4	4.1	4.8	5.4	6.1	6.8
	5	0.9	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5
	6	1.0	2.0	3.1	4.1	5.1	6.1	7.1	8.2	9.2	10.2
	7	1.2	2.4	3.6	4.8	6.0	7.1	8.3	9.5	10.7	11.9
	8	1.4	2.7	4.1	5.4	6.8	8.2	9.5	10.9	12.2	13.6
	9	1.5	3.1	4.6	6.1	7.7	9.2	10.7	12.2	13.8	15.3
	10	1.7	3.4	5.1	6.8	8.5	10.2	11.9	13.6	15.3	17.0
	12	2.0	4.1	6.1	8.2	10.2	12.2	14.3	16.3	18.4	20.4
	14	2.4	4.8	7.1	9.5	11.9	14.3	16.7	19.0	21.4	23.8
	16	2.7	5.4	8.2	10.9	13.6	16.3	19.0	21.8	24.5	27.2
	18	3.1	6.1	9.2	12.2	15.3	18.4	21.4	24.5	27.5	30.6
	20	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.2	30.6	34.0

Elongation of the pipe

ΔL = L x α x Δt

ΔL = linear expansion in mm
L = pipe length in m
α = coefficient of linear expansion
inoxPRES α = 0.0165 mm / (m x °K)
steelPRES α = 0.0120 mm / (m x °K)
aesPRES / marinePRES α = 0.017 mm / (m x °K)
Δt = temperature difference in °K



Element passing through wall

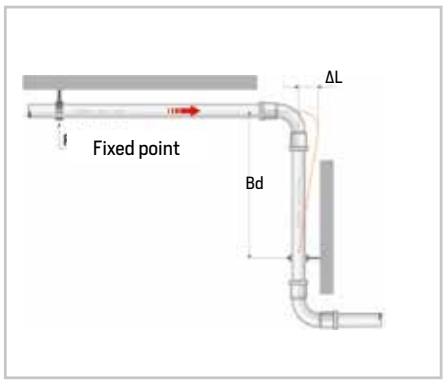


Figure A – Expansion compensation (Bd) using orthogonal shift

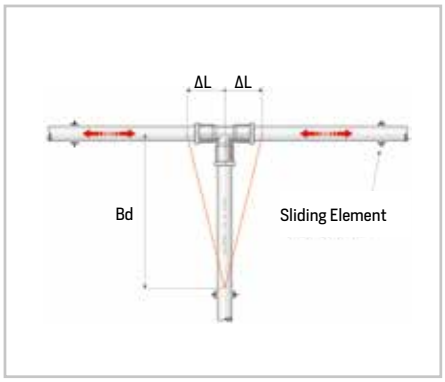


Figure B – Expansion compensation (Bd) using T units

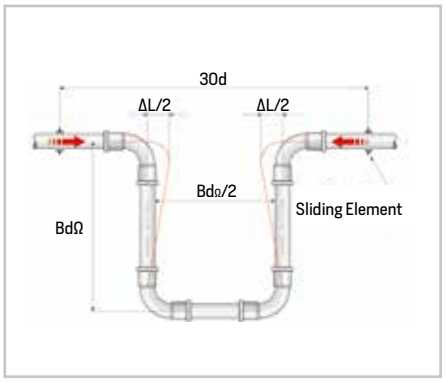


Figura C – **Figure B** – U-bend expansion compensation (Bdω = Bdω / 1.8)

Expansion arm calculation for displacement (Figures A and B)

Bd = k x √(da x ΔL) [mm]

k = constant
inoxPRES / steelPRES = 45
aesPRES / marinePRES = 62
da = outer diameter pipe in mm
ΔL = linear expansion in mm

Calculation formula U bend (Figure C)

Bdω = k x √(da x ΔL) [mm] or
Bdω = Bd / 1,8

k = constant
inoxPRES / steelPRES = 25
aesPRES / marinePRES = 34
da = outer diameter pipe in mm
ΔL = linear expansion in mm

TABLE 13: CALCULATION OF THE EXPANSION REACH (Bd) inoxPRES / steelPRES

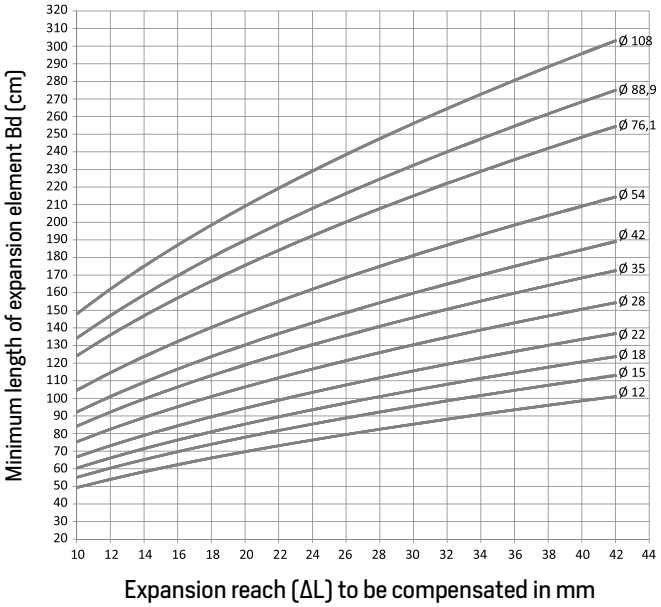


TABLE 14: CALCULATION OF THE EXPANSION REACH (Bd) aesPRES / marinePRES

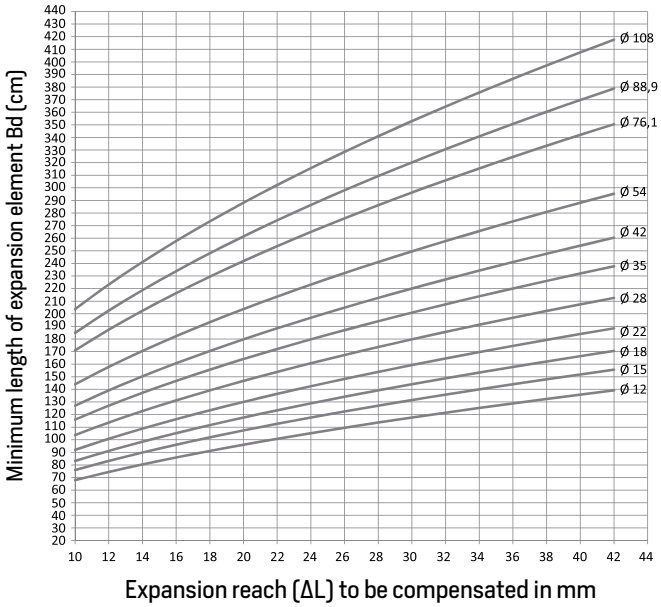


TABLE 15: EXPANSION ARM FOR U DILATOR (BdΩ) inoxPRES / steelPRES

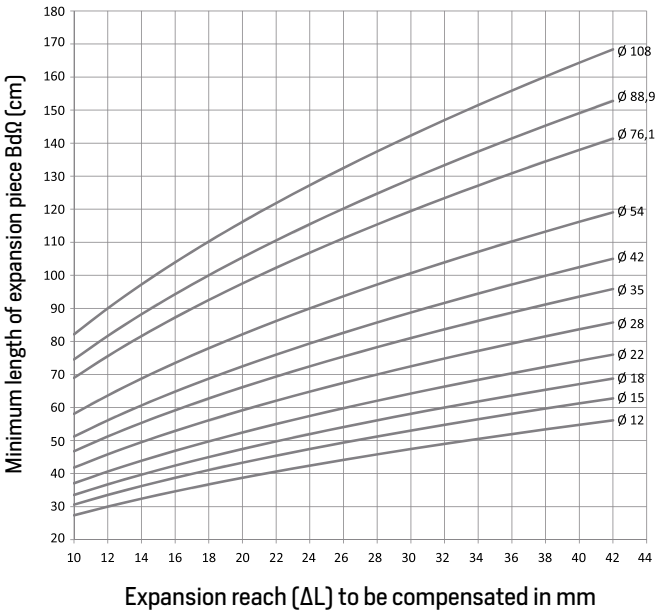
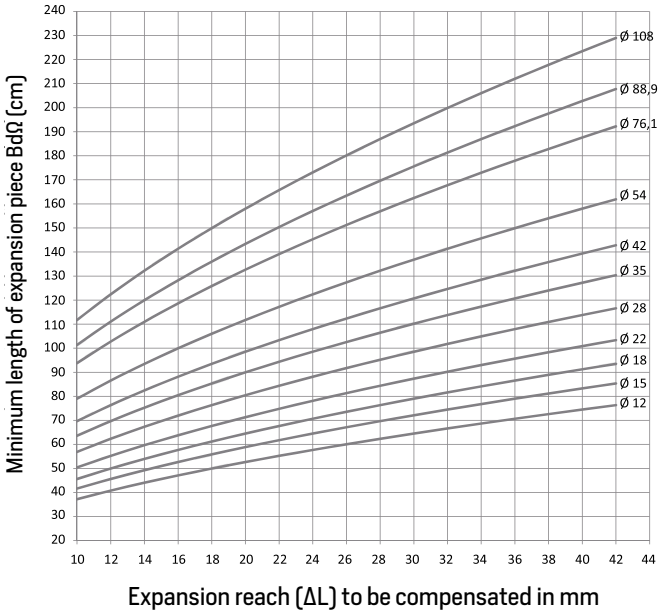


TABLE 16: EXPANSION ARM FOR U DILATOR (BdΩ) aesPRES / marinePRES



7.0 Processing

7.1 Storage and transport

inoxPRES / **steelPRES** / **aesPRES** / **marinePRES** system components have to be protected against dirt and damage during transport and storage. The ends of the pipes are factory-fitted with plugs/caps to prevent dirt. The pipes must be stored in a device with a protective coating or plastic alloy, so that they do not come in contact with other materials. Moreover, pipes as well as press fittings must be stored in a covered area protected against effects of humidity in order to prevent corrosion and/or oxidation of the surface to avoid (particularly in components of the **steelPRES** press fitting systems).

Pipe cutting

7.2 Pipes - cutting to length, deburring, bending

The pipes should be cut to length using professional pipe cutters which are suitable for the material in use. Alternatively, fine-tooth hacksaws or suitable electric saws may be used.

Deburring of the pipe

Not permitted are:

- tools which cause over-heating of the material and tempering of colours during cutting;
- oil-cooled saws;
- flame cutting or angle grinders.

To avoid damaging the sealing ring when inserting the pipe into the press fitting, the pipe must be carefully deburred, both inside and outside, following cutting to required length. This can be carried out using manual deburring tools which are suitable for the material in use, whilst for larger dimensions suitable electrical pipe deburring tools or files can be used. The pipes can be bent by means of conventional bending tools up to an outer diameter of 22 mm (R ≥ 3.5xD).

Copper tubes according to EN 1057 can be curved with the following minimum bending radii:
DN 12 – R=45 mm DN 15 – R=55 mm
DN 18 – R=70 mm DN 22 – R=77 mm.
No tube hot bending allowed.

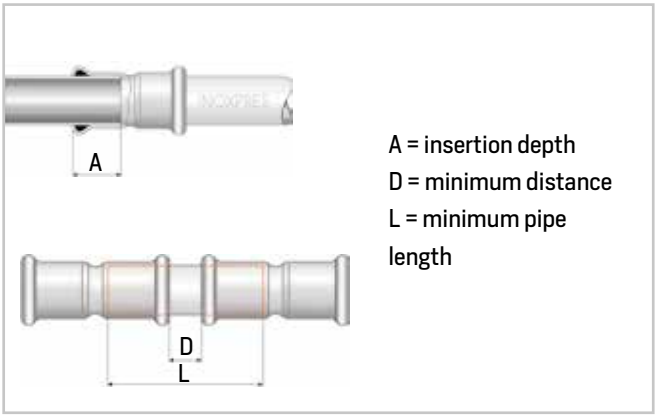
7.3 Marking the insertion depth

Sufficient mechanical strength of the press fitting connection will only be achieved if the insertion depths shown in table 17 are adhered to. These insertion depths are valid for pipes or fittings with insertion ends (i.e. fittings without pressfit end) and must be marked using a suitable marking tool.
The marking of the insertion depth on the pipe must be visible directly next to the press fitting groove following pressing. The distance of the marking on the pipe/fitting from the press fitting formed end may not exceed 10% of the required insertion depth, since otherwise the mechanical stability of the connection cannot be guaranteed.

TABLE 17:
INSERTION DEPTH AND MINIMUM DISTANCES

Pipe outside diameter mm	A (*) mm	D mm	L mm
12	18	20	56
15	20	20	60
18	20	20	60
22	21	20	62
28	23	20	66
35	26	20	72
42	30	40	100
54	35	40	110
76.1	55	60	170
88.9	60	60	180
108	75	60	210

(*) Tolerance: ± 2 mm



Minimum insertion depth and coupling

7.4 Press fitting seal ring check

Before assembly the sealing ring must be checked to ensure that it is lying in the pressing groove correctly and that it is clean and undamaged. If necessary, the sealing ring should be replaced.

Additionally, the fitter should check whether the ring in position is suitable for the special application, or whether it should be replaced with another sealing ring.

Marking the insertion depth

7.5 Making the press connection

Using light pressure and making a turning movement at the same time, press the pipe into the press fitting up to the marked insertion depth. If the tolerances are so narrow that additional force is required to insert the pipe into the press fitting, then water or soapy water may be used as a lubricant.

Oil and grease are not permitted for use as lubricants.

Pressing is carried out using suitable electromechanical/electrohydraulic pressing tools and dimension-matching pressing jaws or collars/chains. Tested and approved pressing tools or pressing jaws/collars/chains are listed under table 18-19, approved pressing tools.

Checking O-rings

The matching pressing jaw is mounted in the pressing machine, or the appropriate collar/chain mounted on the fitting, depending on the dimensions of the press fitting. The slot of the pressing jaw/collar must be positioned exactly over the press fitting formed end.

Following pressing, the complete connection should then be checked to ensure that the work has been carried out correctly and that the insertion depth is correct.

The fitter should also ensure that all connections have actually been pressed.
Following completed pressing, the pressing points may not be subjected to further mechanical loading. The positioning and straightening of the pipes and the sealing of threaded connections must therefore take place before the pressing is carried out. Slight movement and lifting of pipes, for example for painting work, is permitted.

Inserting the pipe into the press fitting

Assembly

7.6 Pressing tools

7.6.1 Basic indications

Pressing tools basically consist of the pressing machine (= drive machine) and pressing jaws or collars/chains. Many of the pressing jaws/collars can generally be used with the pressing machines from one manufacturer. Additionally, many manufacturers of pressing tools have so standardised the jaw attachment that pressing jaws from other manufacturers can also be used.

Press fittings in dimensions 12–35 mm must by pressed with jaws, 42–108 mm must by pressed with pressing collars/chains.
Principally, all metallic press fitting systems have a pressing contour on the press fittings which matches the profile of the pressing jaws/collars. For this reason it is necessary to have the approval of the tooling by the manufacturer of the press fittings intended for use. In addition, it is important to follow exactly the maintenance and servicing instructions issued by the pressing tool manufacturer.

Klauke UAP3L

Klauke UAP100L

Novopress ACO203

Novopress ACO401

7.6.2 Approved pressing tools

RM approves the tools produced by Klauke and Novopress listed in the tables 18 and 19 below. These are pressing tools with the appropriate pressing jaws or collars/chains.

TABLE 18: MANUFACTURER KLAUKE

Type		Piston strength	Dimension range	Weight	Compatible with jaws from
MAP1 – MAP2L		15 KN	12 ÷ 22 mm	~ 2,5 Kg	--
UAP2 – UAP3L		32 KN	12 ÷ 54 mm	~ 3,5 Kg	Novopress EFP2 / EFP201 / AFP201 / EFP202 / AFP202 / ECO 1 / ACO 1
UNP2		32 KN	12 ÷ 54 mm	~ 3,5 Kg	Novopress EFP2 / EFP201 / AFP201 / EFP202 / AFP202 / ECO 1 / ACO 1
UAP4 – UAP4L		32 KN	12 ÷ 54 mm PN16 76.1 ÷ 108 mm PN10	~ 4,3 Kg	Novopress EFP2 / EFP201 / AFP201 / EFP202 / AFP202 / ECO 1 / ACO 1 12 ÷ 54 mm
UAP100 – UAP100L		120 KN	76.1 ÷ 108 mm	~ 12,7 Kg	--
AH-P700LS	PKUAP3	32 KN	12 ÷ 54 mm	~ 12,3 Kg	Novopress EFP2/EFP201/AFP201 / EFP202/AFP202 / ECO 1 / ACO 1 12 ÷ 54 mm
	PKUAP4	32 KN	12 ÷ 54 mm PN16 76.1 ÷ 108 mm PN10	~ 12,6 Kg	
	PK100AHP	120 KN	76.1 ÷ 108 mm	~ 20,2 Kg	--
EHP2/SANB		0.75 KW	76.1 ÷ 108 mm	~ 28 Kg	--

With regard to the Klauke pressing tool UAP4/UAP4L, the limitation on PN 10 is to be observed for the kingsize dimensions 76–108 mm outer diameter.

TABLE 19: MANUFACTURER NOVOPRESS

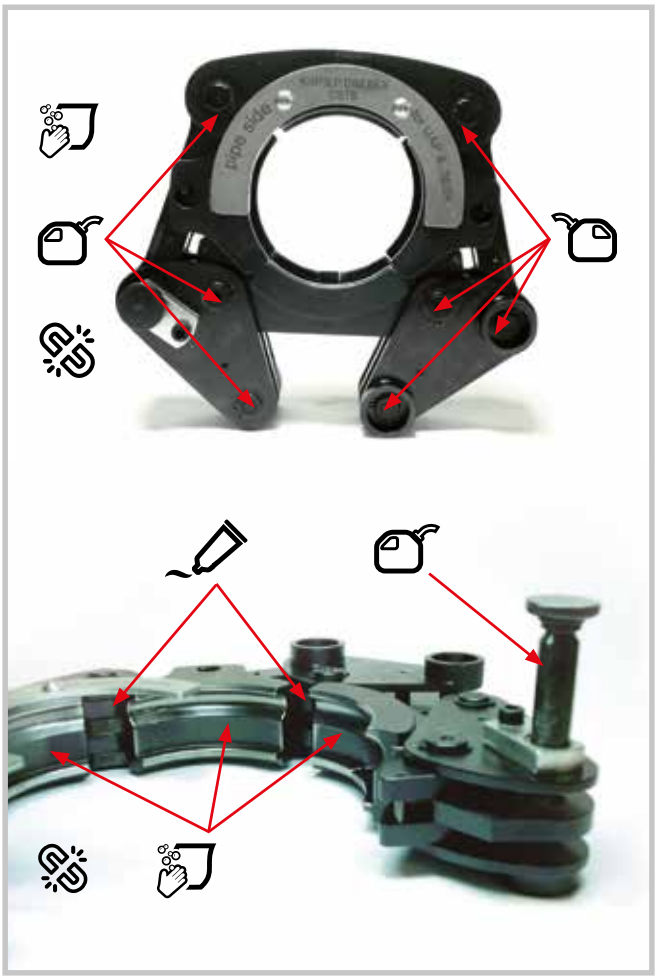
Type	Piston strength	Dimension range	Weight	Compatible with jaws from
ACO 102	19 KN	12 ÷ 22 mm	~ 1,7 Kg	--
EFP2	32 KN	12 ÷ 54 mm	~ 6,1 Kg	EFP 201 / AFP 201 / ECO 1 / ACO 1
EFP 201/EFP 202	32 KN	12 ÷ 54 mm	~ 4,4 Kg	EFP 2 ECO 1 / ACO 1
AFP 201/AFP 202	32 KN	12 ÷ 54 mm	~ 4,3 Kg	EFP 2 ECO 1 / ACO1
ECO 202/ACO 202	32 KN	12 ÷ 54 mm	~ 3,3 Kg	ECO 201 / ACO 201 ECO 1 / ACO 1
ACO 202XL ACO 203XL	32 KN	12 ÷ 54 mm PN16 76.1 ÷ 108 mm PN10	~ 4,6 Kg	ECO 202 / ACO 202
ACO401	100 KN	76.1 ÷ 108 mm	~ 13 kg	--
ACO 3	36 KN	15 ÷ 54 mm	~ 5,0 Kg	ECO 3
ECO 301	45 KN	15 ÷ 54 mm PN16 76.1 ÷ 108 mm PN10	~ 5,0 Kg	ACO 3
HCP	190 KN	76.1 ÷ 108 mm	~ 14-16 Kg	--

With regard to the Novopress pressing tool ACO 202XL/203XL/ECO301, the limitation on PN 10 is to be observed for the kingsize dimensions 76–108 mm outer diameter.

7.6.3 Periodical equipment service

Jaw and chain pressing units are to be serviced to guarantee a correct joint. **The pressing tools must be checked by an officially authorized repairer according to the manufacturer specifications.**
Over and above any moving part (drive rolls) and pressing jaw and chain surfaces (internal profiles) are to be daily serviced, cleaned and lubricated.
As indicated also on UNI 7129-1 norm.

Any possible oxidation, paint or dirt in generally affect the tool reliability leading to equipment sliding problems on joints during pressing.



Klauke equipment

Novopress equipment

Keep the chain clean

Keep the pins lubricated with oil

Keep the pins lubricated with grease

Attention it can break

8.0 Testing and approvals

The following are the test reports relating to the tests that the **inoxPRES** system exceeded at the DNV laboratory and the declaration of conformity to the PED directive. Any other documentation related to systems and materials must be requested from Raccorderie Metalliche.

DNV·GL

INSPECTION REPORT – IR01 Rev.00

Section 1 – Inspection Details

Customer: Raccorderie Metalliche S.p.A. – Campitello di Marcaria MN, Italy
Customer's P.O/Contract No.: 94.1.1.41.15 dtd. 08/06/2015
Laboratory: TTR Institute - Busto Arsizio VA, Italy
Laboratory's Job Ref..: 2502820
Location Address of Inspection: Busto Arsizio VA, Italy
DNV GL Order/Project No. : A-0264305
Date/Period of Inspection: 2015-09-15 and 2015-09-28
Scope of Inspection/Visit:
Hydraulic and Mechanical tests on assembled piping for the system INOXPRES (according to UNI 11179 – G5614 DVGW)

The following material/item was inspected

P.O Item No.	Quantity			Description and Serial Nos.
	Ordered	Offered	Inspected	
D15	-	-	-	*Samples for INOXPRES diam. 15*
D28	-	-	-	*Samples for INOXPRES diam. 28*
D54	-	-	-	*Samples for INOXPRES diam. 54*
D108	-	-	-	*Samples for INOXPRES diam. 108*
Variuos samples as required for the applicable tests				

Overall Result

Satisfactory	X	
Unsatisfactory		

For further information regarding the report summary, see section three.

Section 3 – Details of Visit

Persons Present

Name	Company	Position
Mr A. Aspesi	TTR Institute	QA/QC
Mr M. Ripamonti	DNVGL	Senior Surveyor
Mr S. Pozzetti	Raccorderie Metalliche RACMET	QM
Mr L. Fulegatti	Raccorderie Metalliche RACMET	QC

DNV GL Headquarters, Veritasveien 1, P.O.Box 300, 1322 Høvik, Norway. Tel: +47 67 57 99 00. www.dnvgl.com

[Legal information] IR01_Raccorderie Metalliche_2502820_2015-09-15_28.docx

DECLARATION OF SUITABILITY FOR COMPRESSED AIR

(EN 10204 - 2.1_ rev 0 of 11-2016)

relating to press fitting systems and stainless steel pipes

INOXPRES

RACCORDERIE METALLICHE S.p.A.

Strada Sabbionetana, 59
46010 Campitello di Marcaria
Mantova (ITALY)

DECLARES

that the INOXPRES press fitting systems and stainless steel pipes

- complies with UNI 11179 – "Press fittings for metal pipes";
- complies with DVGW G5614 – "Permanent pipe joints for metal gas pipes - Compression fittings";
- complies with the requirements of the European Directive 97/23/EC (PED: Pressure Equipment Directive);
- is suitable for the construction of networks for the delivery of compressed air with the following parameters;
  - operating pressure 16 bar (PN 16);
  - operating temperature range between -20 / +120 °C;
  - fluid delivered: air containing water and oil residue according to ISO 8573-1, subject to what is prescribed in the technical documentation of Raccorderie Metalliche S.p.A.;

The INOXPRES press fitting system and its components are manufactured under the quality management system certificate ISO 9001:2008.

Campitello di Marcaria, November 2016

Ceccardi Guido

Chief Executive Officer (CEO)

RACCORDERIE METALLICHE S.P.A.
Sede e Stabilimento:
Strada Sabbionetana, 59 – 46010
Campitello di Marcaria (MN) Italy

Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com

Cap. soc. € 3.039.000 i.v.
Registro Imprese MN 02066990173
Codice Fiscale 02066990173

Partita IVA 01591820202
R.E.A. 169204

raccorderiemetalliche.com

DECLARATION OF SUITABILITY FOR COMPRESSED AIR

(EN 10204 - 2.1_ rev 0 of 11-2016)

relating to press fitting systems and stainless steel pipes

INOXPRES

CONFORMITY TO PED DIRECTIVE

The INOXPRES press fitting systems and stainless steel pipes

- is suitable for the construction of facilities for the delivery of compressed air with the following parameters;
  - > operating pressure 16 bar (PN 16);
  - > operating temperature range between -20 / +120 °C;
  - > fluid delivered: air containing water and oil residue according to ISO 8573-1, subject to what is prescribed in the technical documentation of Raccorderie Metalliche S.p.A.;
- complies with the requirements of the European Directive 97/23/EC (PED: Pressure Equipment Directive) article 3.3 for the size range between Ø15 mm and Ø54mm, that does not require the CE marking;
- complies with the requirements of the European Directive 97/23/EC (PED: Pressure Equipment Directive) category I to the size range between Ø76.1 mm and Ø108 mm, for which the internal production control is required;

To guarantee product quality and compliance with PED, the INOXPRES press fitting system and its components are manufactured under the quality management system certificate ISO 9001:2008, and in accordance with the regulations of the main European and international certification bodies, DVGW, CSTB, KIWA, IMQ, ITeC, DNV, LLOYD's REGISTER, ABS, which carry out regular periodic surveillance of products and factory (third party inspection conducted by an independent body).

Campitello di Marcaria, November 2016

Ceccardi Guido

Chief Executive Officer (CEO)

RACCORDERIE METALLICHE S.P.A.
Sede e Stabilimento:
Strada Sabbionetana, 59 – 46010
Campitello di Marcaria (MN) Italy

Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com

Cap. soc. € 3.039.000 i.v.
Registro Imprese MN 02066990173
Codice Fiscale 02066990173

Partita IVA 01591820202
R.E.A. 169204

raccorderiemetalliche.com

DECLARATION OF SUITABILITY FOR COMPRESSED AIR

(EN 10204 - 2.1_ rev 0 of 11-2016)

relating to press fitting systems and stainless steel pipes

INOXPRES

CORRECT USE OF THE SYSTEM

The INOXPRES press fitting system is suitable for compressed air with a maximum working pressure of 16 bar (PN 16).

For correct use of the INOXPRES press fitting system, and successful installation please refer to the following documents:

- Press fitting Technical Manual of Raccorderie Metalliche;
  (on the website *www.racmet.com* the latest updated edition is always available)
- European Directive 97/23/EC (PED: Presure Equipment Directive);
- National regulations in force in the field of design, installation and maintenance of plants for transport of compressed air;

For the selection of pressing equipment, please refer to the Press fitting Technical Manual and use equipment that ensures the working pressure of 16 bar, declared compatible and suitable for use by Raccorderie Metalliche S.p.A.

Where required, the designer or installer must apply for the technical opinion of recognized body, which can approve the plant and choice of components installed.

Raccorderie Metalliche S.p.A. leaves it to the plant designer to assess the conformity of the INOXPRES press fitting system in accordance with territorial regulations and national laws that specify and regulate the design, installation and maintenance of systems intended for the transport of compressed air.

RACCORDERIE METALLICHE S.P.A.
Sede e Stabilimento:
Strada Sabbionetana, 59 – 46010
Campitello di Marcaria (MN) Italy

Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com

Cap. soc. € 3.039.000 i.v.
Registro Imprese MN 02066990173
Codice Fiscale 02066990173

Partita IVA 01591820202
R.E.A. 169204

raccorderiemetalliche.com

DECLARATION OF SUITABILITY FOR COMPRESSED AIR

(EN 10204 - 2.1_ rev 0 of 11-2016)

relating to press fitting systems and stainless steel pipes

INOXPRES

INOXPRES PRESS FITTING SYSTEM CHARACTERISITICS

Taking note of the following regulations:

- Art. 7 – Ministerial Decree 37 of 22-01-08 – Rules for plant safety;
- Art. 5 – Law No. 447 of 06/12/91 – Regulation implementing Law No. 46/90;

CERTIFIES

- that the INOXPRES system consists of press fittings, o-rings in EPDM (-20 +120°C), connecting pipes, pressing tools and suitable clamps or chains;
- that the INOXPRES system is approved by the leading international certification bodies such as: DVGW – Germany, CSTBat - France, ETA - Denmark, WRAS – UK, VdS – Germany;
- that the material used for the production of INOXPRES press fittings is AISI 316, 1.4404, in compliance with EN 10088 – EN 10312 – EN 10217-7;
- that INOXPRES press fittings are manufactured according to UNI 11179 and the technical regulations of the leading international certification bodies;
- that INOXPRES pipes are made of stainless steel AISI 316L – 1.4404, AISI 304 – 1.4301 (series 1 and 2), TYPE 444 - 1.4521, in compliance with EN 10088 – EN 10312 – EN 10217-7;
- that all of the threads for the INOXPRES system are performed according to EN 10226-1 (DIN 2999 – UNI ISO 7/1) or UNI ISO 228/1 (DIN 259);
- that all the welds on the fittings for the INOXPRES system are 100% controlled, under pressure with automatic machines;
- that the chloride content contained in the conveyed water, does not exceed 250 mg/l;
- that the EPDM seals can be used for compressed air up to a maximum residual oil concentration of 5 mg/m³ (4th class of ISO 8573-1); for residual oil concentrations up to 25 mg/m3 (5th class of ISO 8573-1) the use of FKM seals is required, available in the range as an accessory (see table below);

RACCORDERIE METALLICHE S.P.A.
Sede e Stabilimento:
Strada Sabbionetana, 59 – 46010
Campitello di Marcaria (MN) Italy

Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com

Cap. soc. € 3.039.000 i.v.
Registro Imprese MN 02066990173
Codice Fiscale 02066990173

Partita IVA 01591820202
R.E.A. 169204

raccorderiemetalliche.com

Class ISO8573-1	Particles				Water		Oil
	Maximum number of particles per cubic metre as a function of particle size			Mass concentration mg/m3	Pressure dewpoint	Concentration of liquid water g/m3	Concentration of total oil (liquid, aerosol and vapour) mg/m3
	0.1-0.5 micron	0.5-1 micron	1-5 micron				
0	As specified by the equipment user or supplier and more stringent than class 1						
1	≤ 20.000	≤ 400	≤ 10	-	≤ - 70°C	-	≤ 0.01
2	≤ 400.000	≤ 6.000	≤ 100	-	≤ - 40°C	-	≤ 0.1
3	-	≤ 90.000	≤ 1.000	-	≤ - 20°C	-	≤ 1
4	-	-	≤ 10.000	-	≤ + 3°C	-	≤ 5
5	-	-	≤ 100.000	-	≤ + 7 °C	-	-

Classification according to ISO 8573-1

(the values refer to a pressure of 1 bar, at 20°C and relative vapour pressure of 0.6)

- that the seals used by the INOXPRES system are made of EPDM and approved according to: DIN 681 – 1 Typ WB; KTW 1.3.13 elastomers sector D2; WBS Water Byelaws Scheme - BS 6920; ANSI / NSF Standard 61; FDA - title 21 - part 170 – 199 – item 177.2600 (e) + (f). Supplement: compression strength test, DVR, 3000 hours / 110°C;
- that the FKM seals for the INOXPRES system are certified according to: FDA - title 21 - part 170 – 199 – item 177.2600 (e) + (f);
- that the INOXPRES system components are not subject to CE marking as prescribed by Legislative Decree no. 93 of 25 February, 2000;

Campitello di Marcaria, November 2016

Ceccardi Guido
Chief Executive Officer (CEO)

Pozzetti Silvio
Head of Quality System

Pizzamiglio Fabrizio
Product Manager Plumbing & Heating Division

RACCORDERIE METALLICHE S.P.A.
Sede e Stabilimento:
Strada Sabbionetana, 59 – 46010
Campitello di Marcaria (MN) Italy

Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com

Cap. soc. € 3.039.000 i.v.
Registro Imprese MN 02066990173
Codice Fiscale 02066990173

Partita IVA 01591820202
R.E.A. 169204

raccorderiemetalliche.com

Notes

RACCORDERIE METALLICHE

RACCORDERIE METALLICHE S.P.A.
Head Office and Manufacturing Plant:
Strada Sabbionetana, 59
46010 Campitello di Marcaria (MN) ITALY
Tel. +39 0376 96001
Fax +39 0376 96422
info@racmet.com
raccorderiemetalliche.com

CODE 102 RO 0317 GBR