Press fittings for fire protection systems

inoxPRES®

AESPRES®

RACCORDERIE METALLICHE

Certified Company

DNV

MANAGEMENT SYSTEM CERTIFICATE

Certificate no.:
10000457222-MSC-ACCREDIA-ITA

Initial certification date:
23 November 2015
(based on OHSAS 18001)

Valid:
07 December 2021 – 23 November 2024
Expiry date of last certification cycle:
23 November 2021
Date of last re-certification:
06 October 2021

This is to certify that the management system of

RACCORDERIE METALLICHE S.p.A. - Sede Legale e Operativa

Strada Sabbionetana, 59 - 46010 Campitello di Marcaria (MN) - Italy
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:
Production and marketing of metal fittings, welded, threaded, press-on and insulating collars and fixing systems for pipes and radiators. Marketing mix of valves and air vent, products and complementary accessories for use hydro-thermal health, according to national/international customer specifications and internal specifications established. Marketing of metal pipes made of steel and other metals.
(IAF 17, 29)

Place and date:
Vimercate (MB), 07 December 2021

ACCREDIA

For the issuing office:
DNV - Business Assurance
Via Energy Park, 14, - 20871 Vimercate (MB) - Italy

Zeno Beltrami
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV Business Assurance Italy S.r.l., Via Energy Park, 14 - 20871 Vimercate (MB) - Italy - TEL: +39 68 99 905. www.dnv.it

ISO 45001:2018 - DNV

DNV

MANAGEMENT SYSTEM CERTIFICATE

Certificate no.:
CERT-00317-94-AQ-MIL-SINCERT

Initial certification date:
10 November 1994

Valid:
08 October 2021 – 07 October 2024

This is to certify that the management system of

RACCORDERIE METALLICHE S.p.A. - Sede Legale e Operativa

Strada Sabbionetana, 59 - 46010 Campitello di Marcaria (MN) - Italy
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Manufacture and trade of welding, threaded and press metal pipe fittings and dedicated insulation system; collars and clamping systems for pipes and radiators. Trade of mixing valves and automatic float air vents, products and accessories for heating and plumbing uses in conformity with national/international standards, specifications furnished by the customer and established company specifications
(IAF 17, 29)

Place and date:
Vimercate (MB), 06 October 2021

ACCREDIA

For the issuing office:
DNV - Business Assurance
Via Energy Park, 14, - 20871 Vimercate (MB) - Italy

Zeno Beltrami
Management Representative

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ISO 9001:2015 - DNV

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificato no./Certificate No.:
9047/s-2010-AE-ITA-SINCERT

Data prima emissione/Initial date:
22 dicembre 2010

Validità/Valid:
24 dicembre 2019 - 23 dicembre 2022

Si certifica che il sistema di gestione di/This is to certify that the management system of

RACCORDERIE METALLICHE S.p.A.

Strada Sabbionetana, 59 - 46010 Campitello di Marcaria (MN) - Italia
e i siti come elencati nell'Appendix che accompagna questo certificato / and the sites as mentioned in the appendix accompanying this certificate

È conforme ai requisiti della norma per il Sistema di Gestione Ambientale/
Has been found to conform to the Environmental Management System standard:
ISO 14001:2015

Valutato secondo le prescrizioni del Regolamento Tecnico RT-09/
Evaluated according to the requirements of Technical Regulations RT-09

Questa certificazione è valida per il seguente campo applicativo:

Produzione (attraverso le fasi di taglio, deformazione e filettatura) e commercializzazione di raccorderia metallica, a saldare, filettata, a pressare e relativo isolante; collari e sistemi di fissaggio per tubi e radiatori. Commercializzazione di valvole mix e a sfogo d'aria, prodotti/accessori complementari per impieghi idro-termo sanitari, in accordo a normative nazionali/internazionali, specifiche fornite dal cliente e specifiche interne consolidate (IAF: 17, 29)

This certificate is valid for the following scope:

Production (through cutting, deformation and thread phases) and marketing of metal fittings, welded, threaded, press-on and insulating collars and fixing systems for pipes and radiators. Marketing mix of valves and air vent, products and complementary accessories for use hydro-thermal health, according to national / international customer specifications and internal specifications established (IAF: 17, 29)

Luogo e Data/Place and date:
Vimercate (MB), 09 gennaio 2020

ACCREDIA

Per l'Organismo di Certificazione/
For the Certification Body
DNV GL - Business Assurance
Via Energy Park, 14, - 20871 Vimercate (MB) - Italy

Zeno Beltrami
Management Representative

La validità del presente Certificato è subordinata al rispetto delle condizioni contenute nel Contratto di Certificazione/
Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
DNV GL Business Assurance Italia S.r.l., Via Energy Park, 14 - 20871 Vimercate (MB) - Italy. TEL: +39 68 99 905. www.dnvgl.it

ISO 14001:2015 - DNV

RACCORDERIE METALLICHE

Contents

RACCORDERIE METALLICHE

1.0 Introduction

1.1 Raccorderie Metalliche S.p.A

Raccorderie Metalliche S.p.A. (RM) was founded as a family company in the Mantova province of Italy in 1970 and is specialised in the production and distribution of:

- sockets;
- carbon steel fittings;
- stainless steel fittings;
- plugs and accessories for radiators.

In 1999 the company introduced **inoxPRES**, the press fitting system in stainless steel, and later **steelPRES**, the carbon steel press fitting system.
In 2010 Raccorderie Metalliche extended the production of press fitting systems to copper (**aesPRES**) and coppernickel materials (**marinePRES**)

Extensive investment in buildings and very modern machinery in operation ensure the current annual capacity of approximately 12 million press fittings. The specialist sanitary and heating stockist trade within Europe, together with selected non-European markets, are supplied within the framework of the three-stage distribution set-up; market support subsidiary companies exist in both Germany / France and Spain.

The company has a distinctive quality management system which has been certified in accordance with UNI EN ISO 9001:2015.

The suitability of the **inoxPRES**, **steelPRES**, **aesPRES** and **marinePRES** press fitting systems described in this handbook for the applications defined has been– as far as required– tested and certified by WRAS, the DVGW in Germany and a wide range of other international organisations.

Figure 1 – Campitello head office and factory

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificato no./Certificate No.: CERT-00317-94-AQ-MIL-SINCERT
Data prima emissione/Initial date: 10 novembre 1994
Validità:/Valid: 07 ottobre 2018 - 07 ottobre 2021

Si certifica che il sistema di gestione di/This is to certify that the management system of

RACCORDERIE METALLICHE S.p.A. - Sede Legale e Operativa
Strada Sabbionetana, 59 - 46010 Campitello di Marcaria (MN) - Italy
e i siti come elencati nell'Appendix che accompagna questo certificato / and the sites as mentioned in the appendix accompanying this certificate

È conforme ai requisiti della norma per il Sistema di Gestione Qualità/ has been found to conform to the Quality Management System standard:
ISO 9001:2015

Questa certificazione è valida per il seguente campo applicativo:
Produzione e commercializzazione di raccorderia metallica, a saldare, filettata, a pressare e relativo isolante; collari e sistemi di fissaggio per tubi e radiatori. Commercializzazione di valvole mix e a sfogo d'aria, prodotti/accessori complementari per impieghi idro-termo sanitari, in accordo a normative nazionali/internazionali, specifiche fornite dal cliente e specifiche interne consolidate (EA 17, 29)

This certificate is valid for the following scope:
Manufacture and trade of welding, threaded and press metal pipe fittings and dedicated insulation system; collars and clamping systems for pipes and radiators. Trade of mixing valves and automatic float air vents, products and accessories for heating and plumbing uses in conformity with national/international standards, specifications furnished by the customer and established company specifications (EA 17, 29)

Luogo e Data/Place and date:
Vimercate (MB), 10 agosto 2018

ACCREDIA

Per l'Organismo di Certificazione/ For the Certification Body
DNV GL – Business Assurance
Via Energy Park, 14 - 20871 Vimercate (MB) - Italy

Zeno Beltrami
Management Representative

La validità del presente Certificato è subordinata al rispetto delle condizioni contenute nel Contratto di Certificazione/ Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
DNV GL Business Assurance Italia S.r.l., Via Energy Park, 14 - 20871 Vimercate (MB) - Italy. TEL: 039 68 99 905. www.dnvgl.it

Figure 2 – EN ISO 9001:2015 RM Certification

1.2 Press fitting systems in water, heating and cooling installation

Press fittings made of steel and copper were developed in Sweden at the end of the fifties and have enjoyed an increasingly large share of the market since the beginning of the eighties, in Europe. The connection technique is still considered to be innovative, since the tried-and-trusted simple 'cold' mounting technique allows fast, solid and permanent connection of tubing, especially in domestic water, gas and heating installations. In the meantime, the connection technique in the form of press fittings has spread to include not only all types of metal, carbon steel, stainless steel, copper, red bronze, etc., also plastic and plastic composite tubing, and is in Europe the leading connection technique.
Raccorderie Metalliche S.p.A. (RM) has furtherly developed carbon steel, stainless steel and nowadays copper/copper-nickel press fitting range as well. Besides It has clearly simplified the system assembly through the modification of our o-ring shape and toroidal chamber. At the same time, the sealing surface has been enlarged and the risk of accidental non-pressing has been minimised by the creation of a security seal ring.

Product Range	Material	O-Ring	Diameters	Note
inoxPRES	STAINLESS STEEL AISI 316L (1.4404)	EPDM	ø 15 ÷ 108 mm	--
inoxPRES GAS	STAINLESS STEEL AISI 316L (1.4404)	NBR - HNBR	ø 15 ÷ 108 mm	--
inoxPRES HT FREE	STAINLESS STEEL AISI 316L (1.4404)	FKM	ø 15 ÷ 54 mm	**Silicone Free**
inoxPRES STEAM	STAINLESS STEEL AISI 316L (1.4404)	STEAM	ø 15 ÷ 54 mm	**See the dedicated technical handbook**
inoxPRES OVERSIZE	STAINLESS STEEL AISI 316L (1.4404)	EPDM	ø 139,7 ÷ 168,3 mm	--
steelPRES	GALVANISED CARBON STEEL	EPDM	ø 12 ÷ 108 mm	--
AESPRES	COPPER-BRONZE	EPDM	ø 12 ÷ 54 mm	--
AESPRES GAS	COPPER-BRONZE	NBR	ø 15 ÷ 54 mm	--
MARINEPRES	COPPER-NICKEL	FKM	ø 15 ÷ 108 mm	--

Figure 3 – Product range

With the **inoxPRES** press fitting system of stainless steel for potable water and gas installations, **steelPRES** for closed hot water heating systems, **aesPRES** for potable water and gas installations, **marinePRES** for naval sector, RM offers a comprehensive shaped fitting series in the dimension range from 12 ÷ 168,3 mm OD, together with piping, pressing tools and accessories.
To simplify applications for the fitter, the pressing of the fittings has been so constructed that all the tools approved from the press fitting systems leading manufacturers, i.e. pressing tools and pressing jaws or collars, are also approved by RM.
The planning and installation of potable water and heating systems demands comprehensive expert knowledge, together with knowledge of a multitude of industrial standards and technical guidelines. Of particular importance are DIN 1988 part 100-600, the VDI guideline 6023, DIN EN 806, DIN EN 1717, DIN EN 12329 and the amendment to the potable water legislation (TrinkwV) which came into effect on the 1st January 2003 as well as DVGW work sheets W 534 and GW 541. This technical handbook is intended to provide especially planners and fitters with essential information to help both size up the field of application and to carry out professional installation.

This handbook mostly refers to industrial standards and regulations which are valid in Germany. Of particular importance are DIN 1988 part 100-600, the VDI guideline 6023, DIN EN 806, DIN EN 1717, DIN EN 12329 and the amendment to the potable water legislation (TrinkwV) which came into effect on the 1st January 2003 as well as DVGW work sheets W 534 and GW 541.

For supplementary information, please contact the appropriate technical department at Raccorderie Metalliche S.p.A. Names, addresses and further details can be found at **raccorderiemetalliche.com**.

RM RACCORDERIE METALLICHE

2.0 Press fitting systems

2.1 Connection technique - M profil

The press connection is made by inserting the pipe into the press fitting as far as the marked insertion depth. The connection is created by pressing, using an approved pressing tool (see point 2.7 Pressing tools).

Press fittings in dimensions ø 12 ÷ 35 mm must by pressed with jaws, ø 42 ÷ 168,3 mm must by pressed with pressing collars/chains.

The longitudinal and compression closing character of the connection is clearly illustrated in figures 4 and 5. During the pressing process a deformation takes place on two planes. The first plane creates a permanent connection and provides mechanical strength through the mechanical deformation of the press fitting and the pipe.
On the second plane the seal ring is deformed in its cross section and through its elastic properties creates the permanently tight joint.

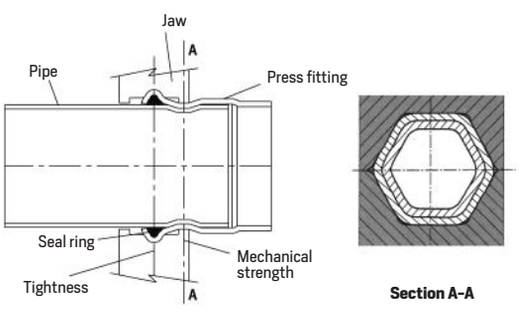


Figure 4 – Section view of an **inoxPRES / aesPRES** connection with jaw still in position. Dimensions of ø 22 ÷ 35 mm produce a hexagonal pressing profile.

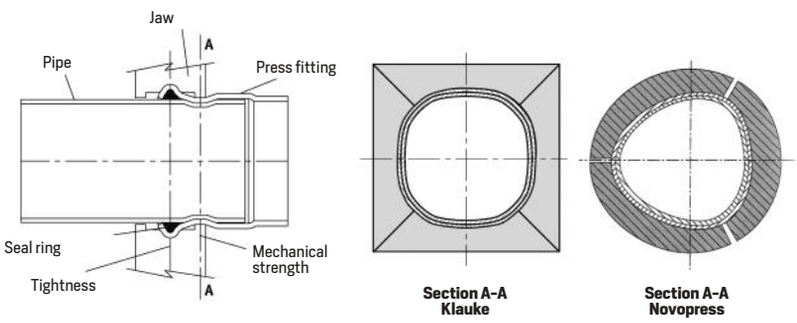


Figure 5 – Section view of an **inoxPRES / aesPRES** connection with collar still in position. Dimensions of 42-168,3 mm produce a defined profile.

The complete range of press fitting systems **inoxPRES, aesPRES** is described in the relevant "Product range" catalogue.

2.2 Inoxpres press fittings

inoxPRES press fittings are manufactured using high-alloyed austenitic stainless Cr-Ni-Mo steel with the material number 1.4404 (AISI 316 L). The press fittings are indelibly marked with laser reporting the manufacturer name, diameter, DVGW test symbol and internal code. The formed ends of the press fittings are fitted with a black EPDM seal ring as standard for potable water applications.

Figure 6 – **inoxPRES** press fitting

2.3 inoxPRES piping

inoxPRES pipes are longitudinally welded thin-walled tubes made of high alloyed austenitic stainless Cr-Ni- Mo steel with material number 1.4404 (AISI 316L). The tubes correspond to worksheet GW 541 of the German Association for Gas and Water, EN 10217-7 (DIN 17455) and EN 10312. Pipes in stainless steel with material n º 1.4521 (AISI 444) and in stainless steel with material number 1.4307 (AISI 304L) are also available.

Inner and outer surfaces are made of smooth metal and are free of corrosion-promoting substances.
inoxPRES pipes are classified as non-combustible pipes belonging to material class A; they are supplied in lengths of 6 metres and are sealed with plastic plugs/caps at the ends.

TABLE 1: INOXPRES PIPES - DIMENSIONS AND CHARACTERISTICS

Pipe outside diameter x wall thickness mm	Nominal width DN	Pipe inside diameter mm	Mass kg/m	Water volume l/m
22 x 1,2	20	19,6	0,625	0,302
28 x 1,2	25	25,6	0,805	0,514
35 x 1,5	32	32	1,258	0,804
42 x 1,5	40	39	1,521	1,194
54 x 1,5	50	51	1,972	2,042
76,1 x 2	65	72,1	3,711	4,080
88,9 x 2	80	84,9	4,352	5,660
108 x 2	100	104	5,308	8,490
139,7 x 2*	125	135,7	6,896	14,460
168,3 x 2*	150	164,3	8,328	21,200
139,7 x 2,6	125	134,5	8,926	14,208
168,3 x 2,6	150	163,1	10,788	20,893

* Not certified DVGW

2.4 aesPRES press fittings

aesPRES press fittings are made in DHP Cu-DHP 99.9 (CW024A) copper and in CuSn5Zn5Pb2 (CC499K) bronze from ø 22 to ø 54 mm included.
aesPRES fittings are indelibly marked with a laser system with the manufacturer name, the diameter, the DVGW approval stamp and with an internal code. At the press fitting swollen ends, a black EPDM o-ring is fitted.

Figure 7 - **aesPRES** press fitting

2.5 aesPRES copper piping

Piping for copper water installation should comply with the standard EN 1057:2010,

TABLE 2: MECHANICAL FEATURES FOR COPPER TUBES - EN 1057

Resistance class	Delivery condition	ø (mm)
R220	Annealed – Rolls	22
R250	Semi-hard – Bars	22 ÷ 28
R290	Hard – Bars	22 ÷ 54
Resistance class	**Minimum traction resistance Rm (MPa)**	**Minimum elongation at fracture (%)**
R220	220	40
R250	250	20
R290	290	3

Tube sizes to be used with **aesPRES** and **aesPRES GAS** press fittings are inluceded in the annexet table.

TABLE 3: AESPRES PIPES - DIMENSIONS AND CHARACTERISTICS - EN 1057 / DVGW GW 392

Pipe outside diameter x wall thickness mm	Nominal width DN	Pipe inside diameter mm	Mass kg/m	Water volume l/m	Supplied condition
22 x 1	20	20	0,589	0,314	Rolls 25/50 m (R 220) o Bars 5 m (R 250 – R 290)
28 x 1,5	25	25	1,115	0,491	Bars 5 m (R 250 – R 290)
35 x 1,5	32	32	1,410	0,804	
42 x 1,5	40	39	1,704	1,194	Bars 5 m (R 290)
54 x 2	50	50	2,918	1,963	

2.6 Sealing elements

2.6.1 Sealing ring profile

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 perfectly in the groove. This provides the following advantages:

- a 20% enlargement of the sealing surface area;
- Major reduction of the risk of the sealing ring being pressed out or damaged;
- fit makes the pipes insertion easier.

The 22 – 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.

A black EPDM standard sealing ring is factory-fitted only on **inoxPRES** and press fittings.

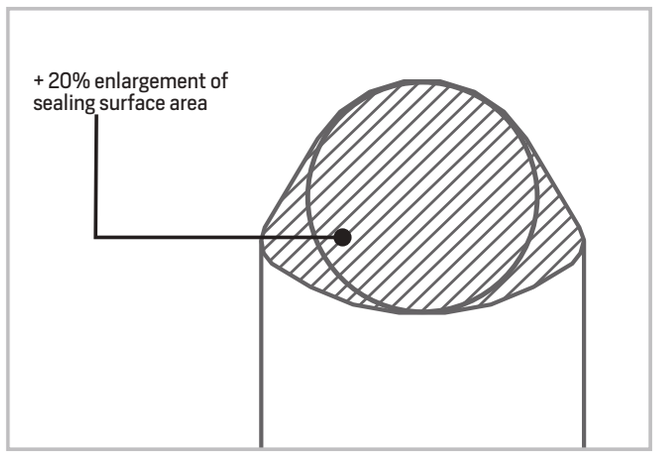


Figure 8 – Sealing ring profile

Figure 9 – Security EPDM sealing ring (ø 22 ÷ 54 mm).

TABLE 4: SEALING RINGS - FIELDS OF APPLICATION AND TECHNICAL DATA

Technical term	Colours	Operating temperature Min / Max Degrees centigrade	Operating pressure maximum in bar	Approvals and certifications
EPDM	black	-20°/+120°	16	KTW W 270 DVGW W 534
FKM	green	-20°/+220°	16	-

2.7 Pressing tools

2.7.1 Basic indications

Pressing tools basically consist of the pressing tool 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 standardised the jaw attachment so that pressing jaws from other manufacturers can also be used.

Press fittings in dimensions 22÷35 mm must by pressed with jaws, 42÷168,3 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.

Figure 10 – Klauke UAP332BT

Figure 11 – Klauke UAP100120 BT

Figure 12 – Novopress ACO203 BT

Figure 13 – Novopress ACO403 BT

2.7.2 Approved pressing tools

RM approves the tools produced by Klauke and Novopress listed in the tables 5 and 6 below. These are pressing tools with the appropriate pressing jaws or collars/chains.

TABLE 5: MANUFACTURER KLAUKE

Type		Piston strength	Dimension range	Weight	Compatible with jaws from
MAP2L _ 19 MAP2119BT		19 KN	22÷35 mm	~ 1,7 Kg	--
UAP2 – UAP3L		32 KN	22÷54 mm	~ 3,5 Kg	Novopress EFP2 – EFP201 – AFP201 – EFP202 – AFP202 – ECO1 – ACO1
UNP2		32 KN	22÷54 mm	~ 3,5 Kg	Novopress EFP2 – EFP201 – AFP201 – EFP202 – AFP202 – ECO1 – ACO1
UAP4 – UAP4L UAP432BT		32 KN	22÷54 mm	~ 4,3 Kg	Novopress EFP2 – EFP201 – AFP201 – EFP202 – AFP202 – ECO1 – ACO1 12-54 mm
UAP100 – UA-P100L-UAP100120BT		120 KN	76,1÷108 mm	~ 12,7 Kg	--
AH-P700LS	PKUAP3	32 KN	22÷54 mm	~ 12,3 Kg	Novopress EFP2 – EFP201 – AFP201 – EFP202 – AFP202 – ECO1 – ACO1 12-54 mm
	PKUAP4	32 KN	22÷54 mm	~ 12,6 Kg	
	PK100AHP	120 KN	76,1÷108 mm	~ 20,2 Kg	--
EHP2/SANB		0,75 KW	76,1÷108 mm	~ 69 Kg	--

GENERAL NOTE: only equipment with crimping force PN 16 must be used.

TABLE 6: MANUFACTURER NOVOPRESS

Type	Piston strength	Dimension range	Weight	Compatible with jaws from
EFP2	32 KN	22 ÷ 54 mm	~ 6,1 Kg	EFP201 – AFP201 – ECO1 – ACO1
EFP201 – EFP202	32 KN	22 ÷ 54 mm	~ 4,4 Kg	EFP2 – ECO1 – ACO1
AFP201 – AFP202	32 KN	22 ÷ 54 mm	~ 4,3 Kg	EFP2 – ECO1 – ACO1
ECO202 – ACO202 ECO203 – ACO203	32 KN	22 ÷ 54 mm	~ 3,3 Kg	ECO201 – ACO201 – ECO1 – ACO1
ACO202XL ACO203XL	32 KN	22 ÷ 54 mm	~ 4,6 Kg	ECO202 – ACO202
ACO401 ACO403	100 KN 120 KN	76,1 ÷ 168,3 mm	~ 13 kg	--
ACO3	36 KN	22 ÷ 54 mm	~ 5,0 Kg	ECO3
ECO301	45 KN	22 ÷ 54 mm	~ 5,0 Kg	ACO3
HCP	190 KN	76,1 ÷ 168,3 mm	~ 70 Kg	--

GENERAL NOTE: only equipment with crimping force PN 16 must be used.

PRESSING MACHINES APPROVED BY VdS

The complete list of pressing tools approved for the VdS system can be found on VdS certificate no. G4060006.

2.7.3 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 general affect the tool reliability leading to equipment sliding problems on joints during pressing.

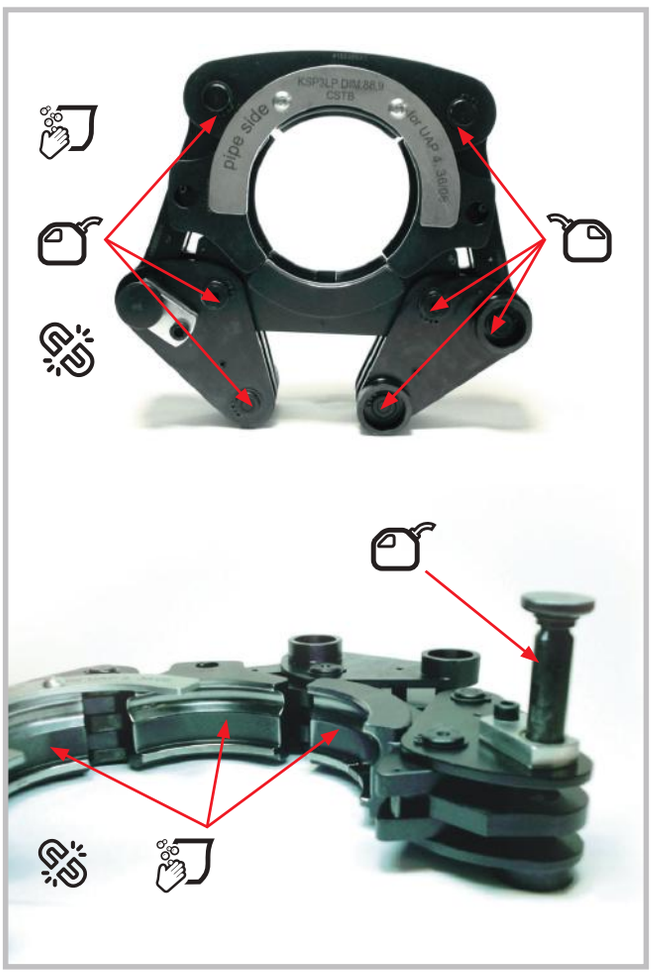


Figure 14 – Klauke equipment

Figure 15 – Novopress equipment

Keep the chain clean

Keep the pins lubricated with oil

Attention it can be broken

3.0 Areas of use

TABLE 7: FIELD OF APPLICATION FOR PRESS FITTING SYSTEMS INOXPRES / AESPRES

Application	System	O-ring	Notes	PN max. (bar)	T °C
Hydrants systems	**inoxPRES** (pipe AISI 316L) pipe AISI 304 pipe AISI 444)	EPDM black	Dimensions: ø 22 ÷ 108 mm	16	Room temperature
	aesPRES (copper pipe table 2-3)	EPDM black	Dimensions: ø 22 ÷ 54 mm	16	Room temperature
Sprinkler systems	**Inoxpres** (pipe AISI 316L [3] pipe AISI 304 pipe AISI 444)	EPDM black	Dimensions: ø 22 ÷ 108 mm [3]	16	Room temperature
	aesPRES (copper pipe table 2-3)	EPDM black	Dimensions: ø 22 ÷ 54 mm usable: – Only for wet sprinkler systems – Only for systems in risk class LH, OH1, OH2 and OH3	16	Room temperature
Water mist systems	**inoxPRES** (pipe AISI 316L pipe AISI 304 pipe AISI 444)	EPDM black	Dimensions: ø 22 ÷ 108 mm	16	Room temperature
Foam extinguishing systems	**inoxPRES** (pipe AISI 316L pipe AISI 304 pipe AISI 444)	EPDM black	Dimensions: ø 22 ÷ 108 mm	16	Room temperature
Spray systems	**inoxPRES** (pipe AISI 316L pipe AISI 304 pipe AISI 444)	EPDM black	Dimensions: ø 22 ÷ 108 mm	16	Room temperature

[3] VdS certificate PN12.5 from Ø 22 ÷ 76.1 mm – PN16 Ø 88.9 mm (wet and dry)

GENERAL NOTE

- For joints up to ø 54 mm use pressing tools with a driving force of ≥ 32 KN. For king size fittings (Ø 76.1 ÷ 108 mm), use pressing tools with a driving force of ≥ 100 KN.
- For each country, the local laws and regulations must be checked concerning the use of press fitting systems in the field of sprinklers/fire prevention.
- Check the applicability of press fitting systems in the case of using design rules that are different from EN.

3.1 Fire protection systems - applications

Following numerous tests to check behaviour in case of fire of the joints and mechanical press fittings, RM recommends the use of press fitting systems for the following applications. The press systems used in fire prevention systems must be in the sole configuration "above ground" (excluding underground networks).

3.1.1 Sprinkler systems

The press fitting systems **inoxPRES** and **aesPRES** with black EPDM sealing rings are used for sprinkler systems, with maximum pressure PN 16.
The Italian standard reference is UNI 10779. The standard applies to sprinkler systems to be installed or to be modified, as a result of the fire risk assessment, in both civil and industrial activities. The standard allows the use of joining systems other than those which are threaded, grooved or welded, made of steel alloys or copper, within the technical recommendations of the manufacturer (paragraph 6.2.1, standard UNI 10779).

The use of anti-corrosion or antifreeze additives requires the approval of RM.

Figure 16 – **inoxPRES** – Fire protection installation

3.1.2 Extinguishing systems, sprinkler installations

The press fitting systems **inoxPRES** and **aesPRES** with black EPDM sealing rings are used for sprinkler systems, with maximum pressure PN 16: open and closed circuit (**inoxPRES** and **aesPRES**).
inoxPRES and **aesPRES** are suitable for both on-wall and in-wall installation (with the appropriate protective measures).

Sprinkler systems in Europe are regulated by EN 12845, which establishes the criteria for the design and choice of components used. The use of pipes and fittings other than those which are threaded, grooved or welded is permitted on the basis of the manufacturer's instructions (paragraph 17.1.2 standard EN 12845).
The use of copper in sprinkler systems, has the following limitations:

Figure 17 – **inoxPRES** – Extinguishing systems

- **aesPRES** – copper: only can be used only for wet sprinkler systems (not dry) and for systems with hazard classes LH, OH1, OH2 and OH3.

3.1.3 Water mist systems

The press fitting systems **inoxPRES** and **aesPRES** with black EPDM sealing rings are used for water mist systems, with maximum pressure PN 16, both for open-circuit and closed circuit systems. The use of stainless steel ensures the absence of internal corrosion that could prevent the correct discharge of the nozzles.
Water mist systems in Europe are subjected to the standard UNI EN 14972-1. The system proposed by RM ensures compliance with the regulatory requirements in that the pressure tests were carried out with safety factor 4 (paragraph 7.2 standard UNI EN 14972-1 2021).

Figure 18- inoxPRES – Water spray system

3.1.4 Foam systems

The **inoxPRES** press systems with black EPDM sealing rings are suitable for foam systems, with maximum pressure PN16, for fixed installations with low/medium/high expansion in an open or closed circuit. The sealing ring is compatible with most foaming agents used for fire-fighting purposes; if in doubt please contact RM for verification regarding compatibility.
The reference standards at a European level are EN 15565-1 and EN 15565-2, which requires fittings and piping with good resistance to corrosion and the use of PN16 components: stainless steel products from the **inoxPRES** range guarantee all the required quality levels.

Figure 19 – **inoxPRES** – Sprinkler system in warehouses

3.1.5 Spray systems

The **inoxPRES** pressfitting systems with black EPDM sealing rings are used for spray systems, with maximum pressure PN 16.
The reference standard is CEN/TS 14816 which requires fittings and piping with good resistance to corrosion and the use of components compatible with the maximum operating pressures of the systems (paragraph 7.6.1 standard CEN/TS 14816): the stainless steel products in the **inoxPRES** range guarantee all the required quality levels up to 16 bar.

Figure 20 – **inoxPRES** – Sprinkler system in industrial kitchen

3.1.6 Systems according to VdS standard

inoxPRES is certified for use in sprinkler systems with the German certification body VdS:

- ø 22 ÷ 88.9 mm;
- PN12.5 from Ø 22 ÷ 76.1 mm – PN16 Ø 88.9 mm;
- Piping and fittings material in AISI 316L;
- Standard O-ring in EPDM;
- For dry and wet sprinkler systems.

VdS certification requires the use of pressing tools with a driving force of ≥ 32 KN up to ø 54 mm while for King Size fittings (ø 76 ÷ 108 mm), only use pressing tools with a driving force of ≥ 100 KN. They must also comply with the installation requirements for VdS approval.
With reference to VdS **inoxPRES** certification, the use of the stainless steel press fitting system is limited to the protection of activities with a medium-low risk level (LH, OH1-OH3 and OH4 limited to exhibition halls, cinemas, theatres, concert halls).

3.1.7 Systems according to design standards other than EN

In the case of using design standards that are different from those listed in the previous paragraphs it is required that the compatibility of the press fitting system is checked by the designer. When in doubt or need, contact RM.

3.1.8 Identifying fire prevention equipment

The design and construction standards usually require painting, conventionally made of RAL3000 red, for all non-ferrous pipes galvanized externally. There are no regulatory requirements for the surface painting of galvanized pipes, alloy steels and copper alloys.
If, for safety requirements the immediate identification of the system is necessary, RM recommends painting red strips, first with a primer and then with a final enamel coat, every 3 metres of piping or alternative identification methods.

3.1.9 Glycols for systems

The following table lists some types of glycols commonly used in order to reduce the risk of freezing inside the pipes. Should glycols be used, which are not listed in the table, please contact the technical office of Raccorderie Metalliche.

TABLE 8: CHEMICAL COMPATIBILITY OF GLYCOLS

GLICOLE	Manufacturer
GLYKOSOL N	Pro Kühlsole GmbH
Glysofor N – Glysofor L	WITTIG Umweltchemie GmbH
PEKASOL L	Pro Kühlsole GmbH
TYFOCOR – TYFOCOR L – CosmoSOL	Tyforop Chemie GmbH
Antifrogen N – Antifrogen L	Clariant
DOWNCAL 100 - DOWNCAL 200	DOW
STAUBCO® COOL N – STAUBCO® COOL L	STAUB & CO. – SILBERMANN GmbH

NOTE: please follow the manufacturer's utilization notes.

4.0 Processing

4.1 Storage and transport

inoxPRES / aesPRES 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.

Figure 21 – Cutting the pipe to length

4.2 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.

Figure 22 – Deburring 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 22 – R=77 mm. No tube hot bending allowed.

4.3 Marking the insertion depth

Sufficient mechanical strength of the press fitting connection will only be achieved if the insertion depths shown in table 9 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 9:
INSERTION DEPTH AND MINIMUM DISTANCES

Pipe outside diameter mm	A (*) mm	D mm	L mm
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
139,7	95	100	290
168,3	113	100	326

(*) Tolerance: ± 2 mm

4.4 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.

4.5 Making the press connection ø 22 - 108 mm

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 5-6, approved pressing tools.

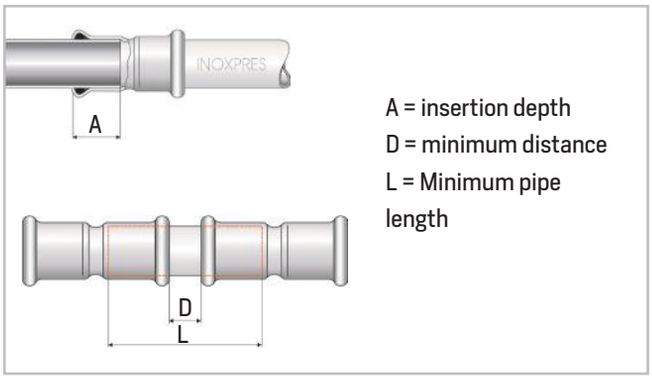


Figure 23 – Insertion depth and minimum dimensions

Figure 24 – Marking the insertion depth

Figure 25 – Checking the sealing ring

Figure 26 – Inserting pipe into the press fitting

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.

Figure 27 – Making the press connection

Figure 28 – Checking the press connection

4.6 The Oversize range ø 139-168 mm

Unlike diameters up to 108 mm, the pressing phases of the Oversize 139,7 and 168,3 mm dimensions must be carried out in two distinct pressing phases.

1st PRESSING PHASE

a) Open the chain and place it around the fitting: the groove of the chain must be positioned exactly above the toroidal chamber of the fitting.
b) Close the chain and press the lock button.
c) Rotate the latch inwards and engage the lock.
d) Carry out pressing operation nº 1.
e) Unhook and rotate the latch, open the chain and remove it from the fitting.

Figure 34 – Press assembly phase 1

Chain groove above the o-ring groove

1st PRESSING PHASE

a) Open the chain and place it around the fitting: the groove of the chain must be positioned exactly above the toroidal chamber of the fitting.
b) Close the chain and press the lock button.
c) Rotate the latch inwards and engage the lock.
d) Carry out pressing operation nº 1.
e) Unhook and rotate the latch, open the chain and remove it from the fitting.

Figure 35 – Press assembly phase 2

Guides over the o-ring groove

After pressing, the connection must be checked to ensure that the work has been carried out correctly and that the insertion depth is correct.

The fitter must also ensure that all connections have been adequately pressed.
Once pressing has been complete, the connections must not be subjected to further mechanical loads.
The alignment of the pipeline and the fixing of the threaded connections must therefore be carried out before pressing.
Slight movement and lifting of pipes, e.g. for painting work, is permitted.

Figure 36 – Visual inspection of oversize pressing

4.6 Protection of pipes and fittings from frost - General requirements

All the pipes permanently filled with water, installed outdoors or in non-air conditioned environments may be subject to freezing, especially in winter periods. These sections of pipe must be protected externally with suitable thermal insulation and/or heating tapes.
For the insulation of **inoxPRES** pipes only insulation materials which contain less than 0.05% water soluble chloride ions may be used. Insulation materials in accordance with AGI-Q135 are well below this value and thus are suitable for use with **inoxPRES**.
For the use of heating cables see par. 5.7.

Important: the choice and the implementation of the type of protection against external corrosion is responsibility of the planner and installer.

4.7 Minimum distances and space requirement for pressing

To carry out pressing correctly, there must be a minimum distance between the pipe and the building, and from pipe to pipe, as shown in tables 10 and 11.

TABLE 10: MINIMUM DISTANCES AND SPACE REQUIREMENT 22 ÷ 35 mm

Pipe Ø	Figure 29		Figure 30			Figure 31				Figure 32	
	A	D	A	D	D1	A	C	D	D1	D	E
22 x 1.2	75	40	80	40	40	85	165	40	40	40	61
28 x 1.2	82	40	90	40	45	90	180	40	45	40	63
35 x 1.5	85	40	90	40	45	90	180	40	45	40	66

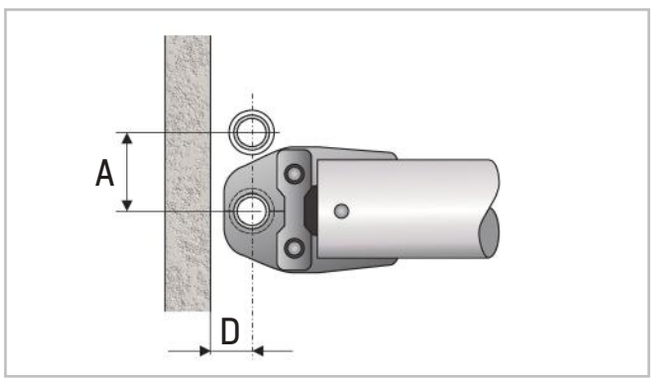


Figure 29 – Minimum distances and space requirements

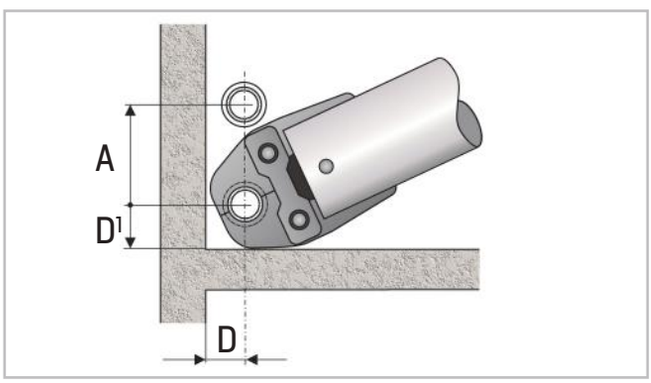


Figure 30 – Minimum distances and space requirements

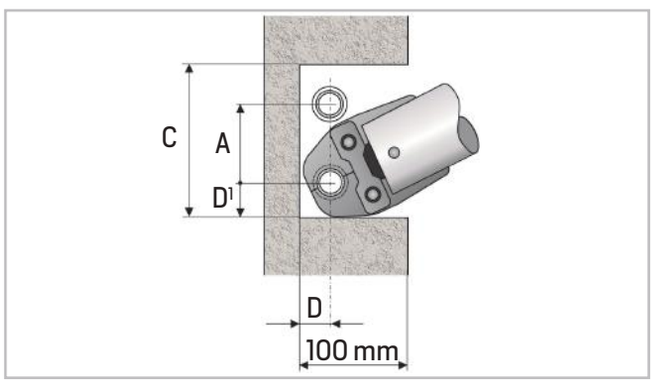


Figure 31 – Minimum distances and space requirements

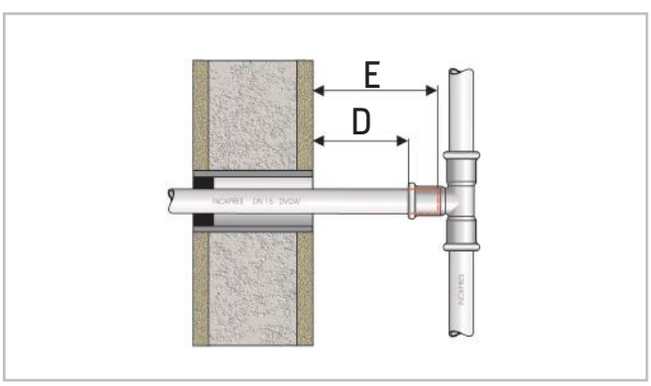
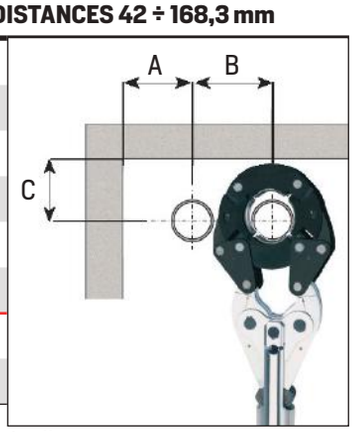


Figure 32 – Minimum distances and space requirements

TABLE 11: MINIMUM DISTANCES 42 ÷ 168,3 mm

Tubo Ø	A	B	C
42	150	150	110
54	150	150	110
76,1	170	210	170
88,9	190	260	190
108	200	320	280
139,7	250	350	250
168,3	260	350	260



Minimum distances for chains / collars

4.8 Thread or flange connections

Press fittings can be connected using standard threaded fittings in accordance with ISO 7-1 (thread standard DIN 2999) or ISO 228 (thread standard DIN 259) or with fittings made of stainless steel or non-ferrous metals. When sealing threaded connections, no sealant containing chloride (for example teflon tapes) may be used. We recommend using hemp with sealing paste and plastic sealing tape free from chlorides. The flanges available from the **inoxPRES** range can be connected to normal flanges at pressure PN 16. During installation, first the thread/flange connection must be completed, then the press connection.

5.0 Planning

The design of the fire protection systems is regulated by specific regulations at a national and international level, to be observed by the designer to ensure the construction of systems in line with good practice. Presented below are some figures and typical construction situations, together with the relative solutions offered by Raccorderie Metalliche.

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

"T" shaped press fitting:
ideal for lateral and vertical junction lines in original systems, or for connection with hoses.

"T" shaped press and threaded fittings:
the reduced tees are ideal for the lateral and vertical junction lines with diameter reduction. Threaded tees are suitable for direct connection of sprinklers or hoses.

Shank with threaded Male and Female insert:
ideal for connection to sprinklers, it is available in different thread and pipe sizes.

Omega and straight hose:
elements with great flexibility, allowing connections to be made simply, even in narrow spaces and where the installation of traditional lines is impossible. They are constituted by stainless steel components, therefore they retain the same excellent characteristics of other **inoxPRES** fittings.

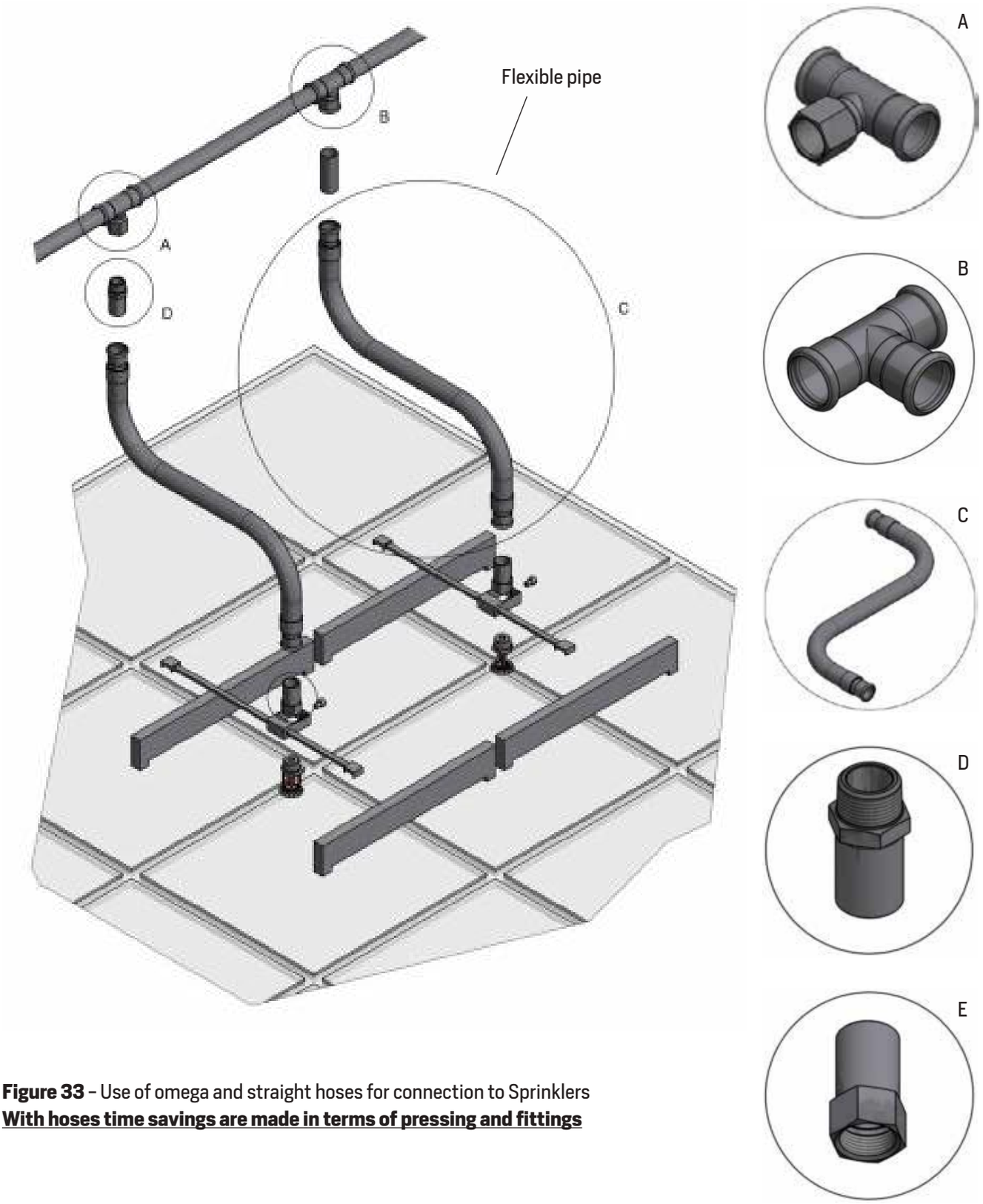


Figure 33 – Use of omega and straight hoses for connection to Sprinklers
With hoses time savings are made in terms of pressing and fittings

IDEAL FOR THE EXPANSION OF THE SYSTEM	IDEAL FOR THE DESIGN OF THE SYSTEM

Figure 34 – Use of the various figures in the installation of fire prevention systems

5.1 Pipe fixing, distances between clamps

Pipe supports serve to fix the pipe to the ceiling or wall and should compensate for 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 support spacing recommended by Raccorderie Metalliche for **inoxPRES** / **aesPRES** pipes are shown in table 12.

TABLE 12: MAXIMUM PERMITTED DISTANCES BETWEEN SUPPORTS

DN	Pipe outside diameter (mm)	Horizontal spacing in meters (indicative)	Vertical spacing in meters (indicative)
20	22	1,8	2,4
25	28	1,8	2,4
32	35	2,4	3,0
40	42	2,4	3,0
50	54	2,7	3,6
65	76,1	3,0	3,6
80	88,9	3,0	3,6
100	108	3,0	3,6
125	139,7	3,6	4,2
150	168,3	3,6	4,2

The design of supports for fire prevention systems must comply with the conditions required by standard EN 12845, unless otherwise stated in the specific design rules for each type of system.

5.2 Expansion compensation

Metal pipelines expand in different ways under the influence of heat and according to the material they are made of. The fire prevention systems may be subject to movements due to the oscillation of the structure under seismic conditions or displacements due to temperature variations. The breakages of the pipes can be prevented through the correct setting of fixed and sliding points, the installation of compensators, s-bends, u-bends or expansion compensators creating sufficient expansion spaces.

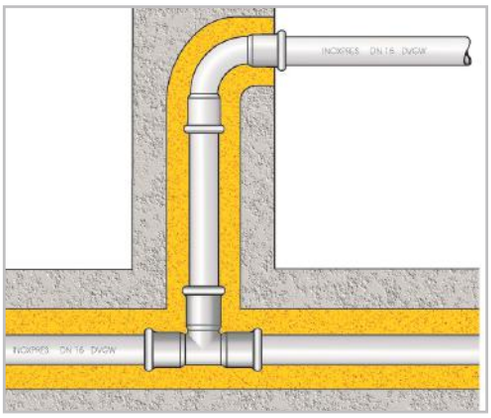


Figure 35a – Creation of expansion spaces

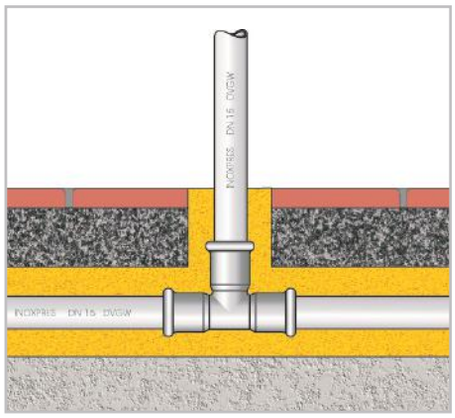


Figure 35b – Creation of expansion spaces

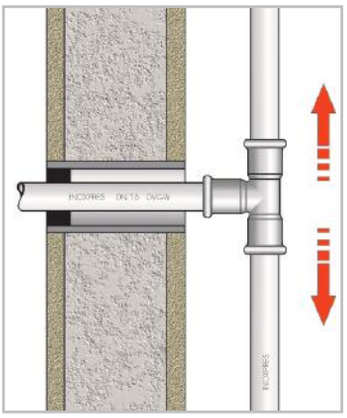


Figure 35c – Creation of expansion spaces

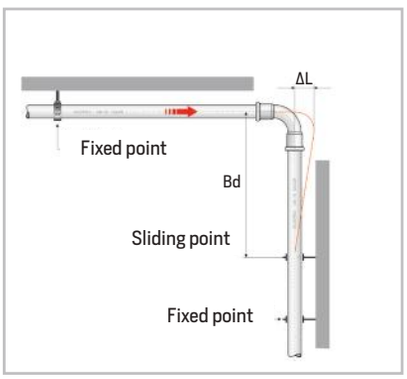


Figure 36 – Compensation for expansion (Bd) using a T junction

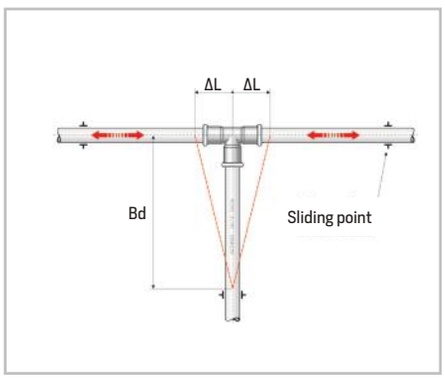


Figure 37 – Compensation for expansion (Bd) using a T junction

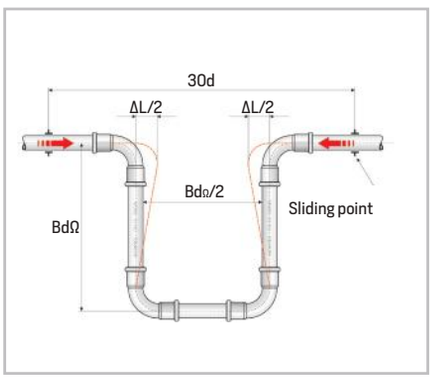


Figure 38 – Compensation for expanion U-bend Bdω = Bdω / 1,8

Calculation formula Z - bend and T - junction expansion (figure 36 e 37)

$Bd = k \times \sqrt{(da \times \Delta L)}$ [mm]

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

Calculation formula for Ω bend expansion (figure 38)

$Bd\Omega = k \times \sqrt{(da \times \Delta L)}$ [mm] or
Bdω = Bd / 1,8

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

TABLE 18a: CALCULATION OF THE EXPANSION REACH ø 22 ÷ 168,3 mm (Bd) INOXPRES

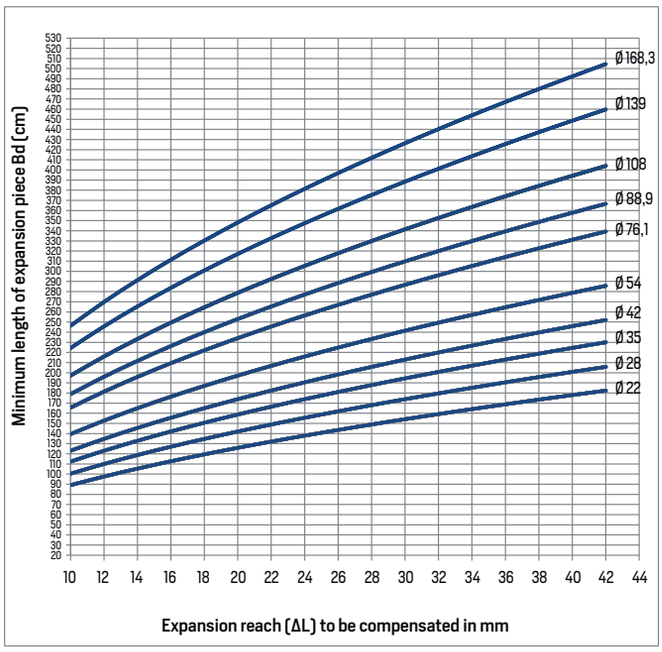


TABLE 18b: EXPANSION PIECE FOR U-BEND ø 22 ÷ 108 mm (BdΩ) INOXPRES

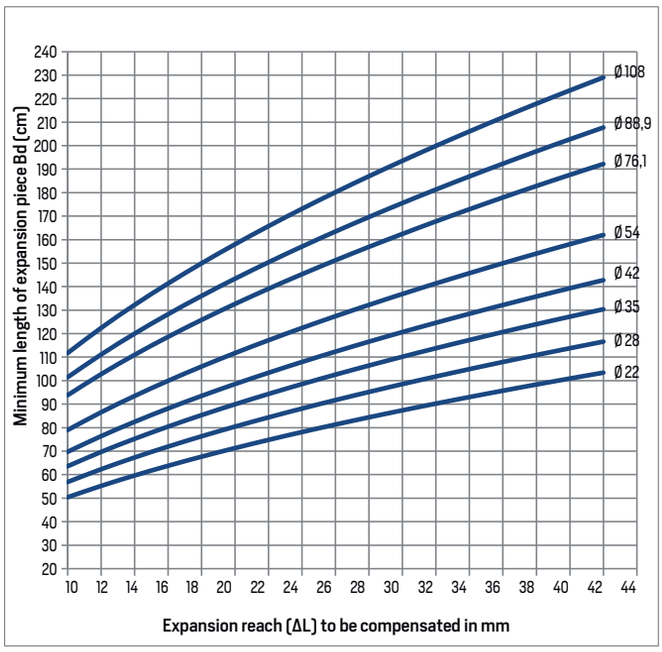


TABLE 20a: CALCULATION OF THE EXPANSION REACH ø 22 ÷ 54 mm (Bd) AESPRES

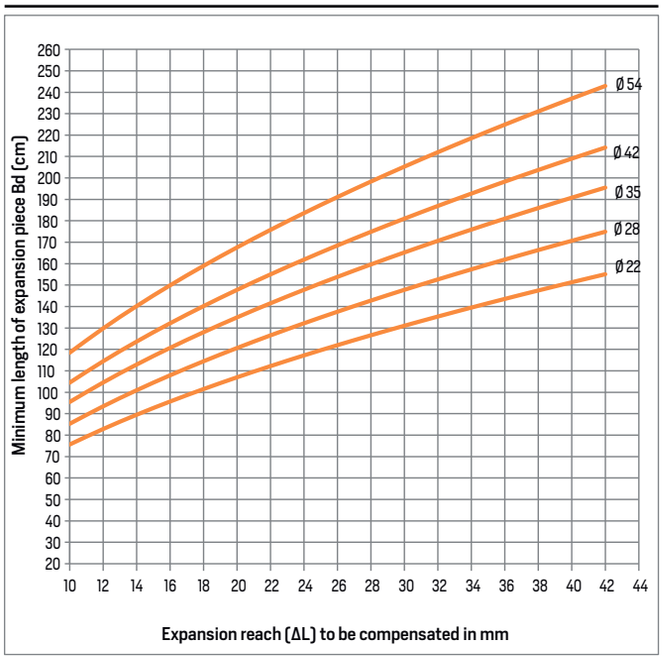
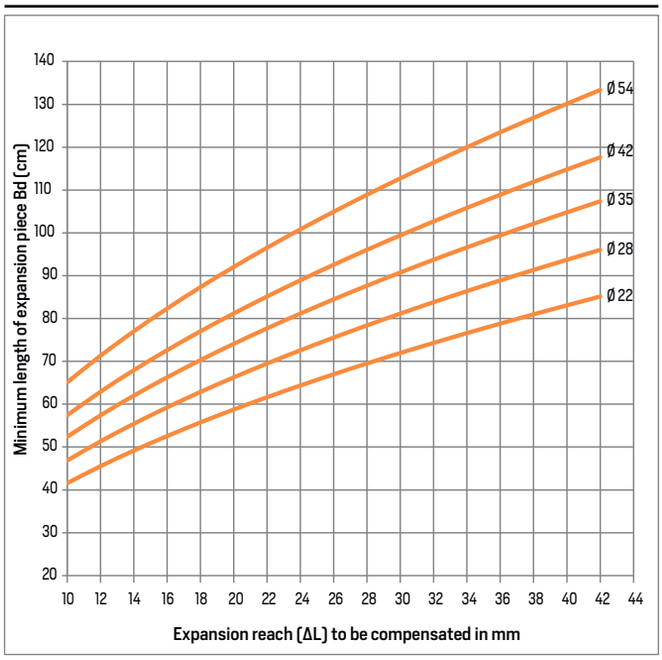


TABLE 20b: EXPANSION PIECE FOR U-BEND ø 22 ÷ 54 mm (BdΩ) AESPRES



5.3 Design of earthquake resistant systems

With the introduction of the Eurocodes, requirements have been introduced for specific earthquake resistant design for non-structural elements, such as fire prevention systems. The support structures of the systems must therefore be able to resist to seismic events and ensure the continuity of service of the system, therefore preventing collisions between the system and the structure, which move independently of each other during a seismic event. The metal pipes must be able to absorb the differential movements with respect to the building structure which occur at the seismic joints.
The system design must ensure the compatibility with the differential displacements of the different sections in which the protected building structure is divided.

5.4 Fire prevention

inoxPRES / aesPRES pipes are classified as non-flammable materials in building material class A in accordance with DIN 4102-1. The main pipes must still be protected from fire when crossing zones subject to fire risk that do not have automatic extinguishing systems.

5.5 Potential equalisation

All parts of metallic water and gas piping which can conduct electricity have to be included in the main potential equalisation of a building. **inoxPRES**, **aesPRES** are conductive systems and must therefore be included in the potential equalisation connection. The responsibility for this work lies with the persons installing the electrical system.

5.6 Dimensioning

The objective of pipe system calculation is to achieve perfect functioning of the system with economical pipe diameters. In particular it is necessary to respect the calculation methods prescribed by standard EN 12845 and CEN/TS 14972. The pipe friction pressure drop for **inoxPRES / aesPRES** piping is shown in table 17a and 17b.

5.7 Trace heating

When trace heating is used, the temperature of the pipe inside wall may not exceed 60° centigrade. For thermal disinfection purposes a temporary temperature increase to 70° centigrade (1 hour per day) is permitted. Pipes which are fitted with drainage valves or back-flow prevention valves must be protected against excessive pressure increase resulting from heat. The fitting instructions issued by trace heating manufacturers are to be followed exactly.

TABLE 17a: PIPE FRICTION PRESSURE DROP FOR INOXPRES

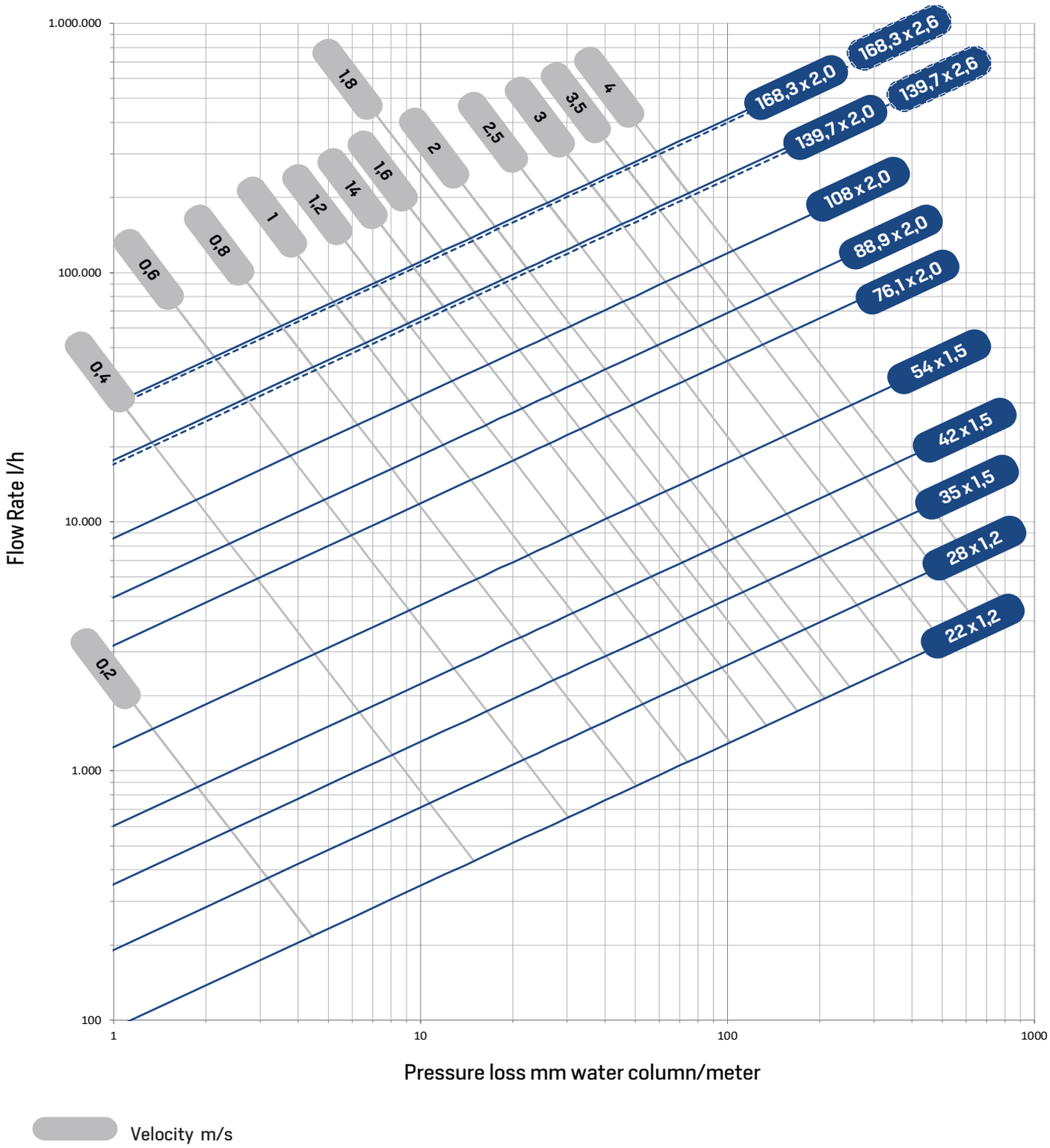
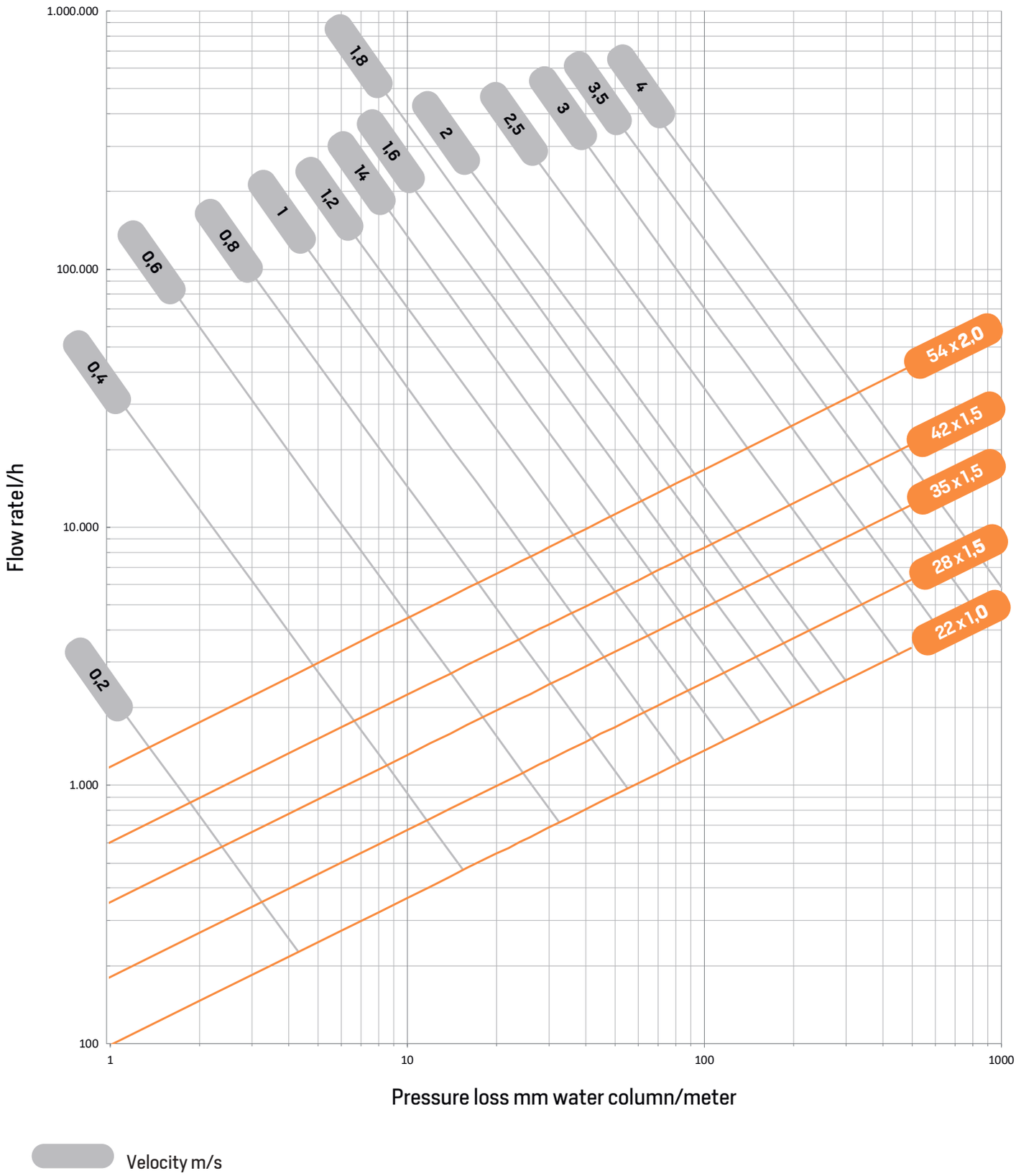


TABLE 17b: PIPE FRICTION PRESSURE DROP FOR AESPRES



6.0 Start-up

For each type of fire prevention system the means of putting them into operation established by the relevant regulations must be observed. Expressed below are some general recommendations that apply to all systems.

6.1 Pressure testing

The pressure test is generally required for all types of fire protection systems, with the methodology specifically expressed in the reference standards. The potable water system must stay completely filled until taken into operation. The presence of remaining quantities of water in the piping greatly increases the danger of corrosion in metal piping (three phase corrosion). This effect is avoided keeping the system completely filled with water up to commissioning otherwise the risk of corrosion would greatly increase due to the residual water remaining in the system (in the case of metal exposed to both water and air). If a system built with galvanized piping is not put into operation immediately after the pressure test, it is recommended to empty and blow the pipes with compressed air until completely dry.

6.2 Flushing the system and starting up

To avoid the possible processing residues in the pipes, it is recommended that a complete washing be performed of the distribution line with a water speed of not less than 2 m/s, in order to expel all the impurities that may create obstructions for the discharge of dispenser nozzles.

The pressure testing, flushing and start-up of the system have to be documented, as part of the testing documentation. The system operator has to be instructed with regard to correct working practices.

6.3 Regular checks

Maintaining conditions of system reliability is of paramount importance to ensure the safety conditions of the protected locations. The system regulations specify the maintenance methods and the time intervals of these operations. All maintenance must be performed by qualified and trained staff.

7.0 Corrosion

7.1 inoxPRES

The corrosion behaviour of **inoxPRES** press fitting systems is determined by the Cr-Ni -Mo steel with material nº 1.4404 (AISI 316 L) and nº 1.4307 (AISI 304L) and Cr-Mo nº 1.4521 (AISI 444). The following properties result from it:

- suitable for mixed installations;
- suitable for treated, softened and desalinated water.

7.1.1 Bimetal corrosion (mixed installation) - DIN 1988 part 200

inoxPRES can be combined with all non-ferrous metals (copper, brass, red brass) in one mixed installation without taking flow direction into account according to the nobility of the metals.

Bimetal corrosion can only appear on zinc-coated components if they are in direct contact with **inoxPRES** components. Bimetal corrosion can be prevented by installing a spacing section made of non-ferrous material > 80 mm (for example a shut-off valve).

7.1.2 Crevice, pitting corrosion (three phase corrosion)

Unacceptably high chloride content in potable water and building materials can lead to corrosion traces on stainless steels.
Crevice or pitting corrosion can occur in water with a chloride content which is above the levels of the potable water legislation (max. 250 mg/l). The chloride content of the potable water can be obtained from the local water company. It must be considered that, although the chloride limit for drinking water is equal to 250 mg/l, on the basis of laboratory and construction site experiences, it is recommended not to exceed 100 mg/l.
Situations of stagnation of the circulating fluid and dead branches in the system must be properly evaluated when planning and when managing the installation, taking into consideration the parameters about the quality of the water and all the conditions of the installation environment, which may generate corrosion phenomena.
As per drinking water systems, it is important to grant a continuous flow, avoiding dead branches and stagnation conditions (EN 806-1). These conditions of application and use, help to preserve the materials of Inoxpres range during the time, helping their durability.

inoxPRES components are in danger of crevice or pitting corrosion if:

- following pressure testing the system is emptied and some water remains in the piping which is open to the atmosphere. The slow evaporation of the remaining water may lead to an unacceptable increase in the chloride content level and thus initiat pitting (three phase corrosion) at the 'water-material- air' interface. If the system cannot be put into operation shortly after pressure testing ith water, hen the pressure testing should be carried out using air. See section 6. Pressure testing for more details;
- an increase in the water temperature is caused from the outside via the pipe wall (for example electrical trace heating). There may be an increase in chloride ions in the deposits which form on the inside pipe wall during this type of operation. See section 5.7 Trace heating for more information;
- non- approved sealants or plastic tapes containing chloride are used. The transfer of chloride ions from sealant materials to the potable water can lead to local increase in chloride and thus to crevice corrosion. See section 4.8 Thread or flange connections for more information;
- if the material is made more sensitive through incorrect heating. Any heating of the material which leads to tarnishing changes the microstructure of the material and can lead to intercrystalline corrosion. Hot bending or cutting the pipes using a grinder is not permitted.

7.1.3 Outside corrosion

inoxPRES components are in danger of outside corrosion if:

- non-approved insulation materials or lagging are used. Only insulation materials and lagging having a percentage of max.0.05% water solvable chloide ions can be used;
- **inoxPRES** is subjected to contact with gases or fumes containing chloride (e.g., galvanising shops, swimming pools);
- **inoxPRES** comes into contact with building materials which contain chloride, together with dampness;
- a concentration of chloride develops through water evaporation on warm piping (swimming pool atmosphere).

inoxPRES components can be protected against outside corrosion by means of:

- closed cell insulation material or lagging;
- coating;
- painting;
- avoiding installation in areas where the risk of corrosion is higher (e.g., floor without cellar space underneath).

The planner or the fitter carries the responsibility for the selection and installation of the corrosion protection measures.

7.2 aesPRES

Corrosion behaviour of the systems depends on the main material quality – copper – consisting of alloys of the two systems to be pressed.
The **aesPRES** system stands out due to the following features:

- corrosion protection binding;
- suitable for treated, softened and desalinated water.

7.2.1 Bimetal corrosion (mixed installation)

The **aesPRES** system can be combined with different materials, ferrous and not. It is important to pay attention to the ratio between cathode and anode areas so as not to lead to conditions favourable to corrosion. Copper in fact in general is under cathode conditions and can lead to the component corrosion.
In the case of open loop installations, as to avoid corrosion in mixed installations, it is important to comply with the following general rules:

- consider the water flow, install copper and copper alloys downstream of installations made with ferrous materials;
- add non ferrous separators > 80 mm (ex. Check valves, bronze or brass joints) between the two sections of different materials.

7.2.2 Perforating corrosion

The dotted corrosion (pin-head tube holing), depends on the growing water pollution in the last decades strictly linked to industrialization. Such an issue was totally solved with the introduction of copper tubes with no carbon residues.

7.2.3 Outside corrosion

Copper and copper alloys stand the outside corrosion risk and nothing is to be done at the protection level, while in the presence of sulphurs, nitrites and ammonia, the tubes must be protected. **aesPRES** components can be protected against outside corrosion by means of:

- closed cell insulators;
- coating;
- painting;
- avoiding installation in areas where the risk of corrosion is higher (e.g., floor without cellar space underneath).

The planner or the fitter carries the responsibility for the selection and installation of the corrosion protection measures.

8.0 Testing and approvals

The fire prevention systems, unlike other types of systems, must be reliable and guarantee operation under potentially extreme operating conditions. To guarantee the use of the press fitting systems, RM has performed a careful analysis of the risks and problems that the fire prevention systems may be subject to, relying on the considerable experience gained over the years and with reference to what is required by the main fire prevention and product standards. The piping and components of the RM system have therefore been subjected to a series of tests under laboratory conditions, in accordance with procedures recognized internationally such as (indicative and non-exhaustive):

- pressure sealing tests;
- pull-out resistance tests;
- bursting test;
- high-temperature and flame sealing tests;
- fatigue tests with pressure cycles;
- impact tests;
- accelerated corrosion test;
- vibration test.

All tests were successful, maintaining the integrity and tightness of the system after the tests were carried out.
Shown below are the references of the tests performed. Any other supplementary documents must be requested from Raccorderie Metalliche.

TABLE 18: LABORATORY TEST

Recommended test	Standard / Body	LAB / Ref. document
Pressure test (FS=4)	Standards for the type approval of the mechanical piping joints - RINA January 2008	CETENA Rapp.10906 rev. 1 of 25/07/11
Tensile and pull-out test	ETA_NBK 12 Product rules (pt 3.4.2 Tensile Test) Standards for the type approval of the mechanical piping joints – RINA gen 2008	TTR INSTITUTE - Type test_NBK12 Product Rules CETENA Rapp.10906 rev. 1 of 25/07/11
Vibration resistance test	Italian Navy NAV 30-A002 _ triaxial vibration testing	CETENA Rapp.11379 of 6/9/2012
Torque resistance test	Water Mark – std. AS 3688 – pt H - Strength of Nut and Assembly	ANTL - Test Report # 4015.11 pt. 3.5
Impact test	Italian Navy NAV 30-A001 _ impact test	CETENA Rapp.11378 of 6/9/2012
Crushing test	Water Mark – std. AS 3688 – pt J - Watertightness while Bending	ANTL - Test Report # 4015.11 pt. 3.7
Sealing test	Water Mark – std. AS 3688 – pt D - Watertightness Pressure Test Standards for the type approval of the mechanical piping joints - RINA January 2008	ANTL - Test Report # 4015.11 pt. 3.1 CETENA Rapp.10906 rev. 1 of 25/07/11
Ovalisation test	Water Mark – std. AS 3688 – pt J - Watertightness while Bending	ANTL - Test Report # 4015.11 pt. 3.7
High temperature resistance (fire test with pressure seal)	RINA – ISO 19921:2005 (E) ISO 19922:2005 (E) fire resistance tests of metal piping components with elastomer seals	RINA – Rapp. 2010CS012987/1-2-3 2010CS01204/8

9.0 Guarantee

The **inoxPRES**, **steelPRES**, **aesPRES** and **marinePRES** press fitting systems produced and distributed by RM are covered by a guarantee.
For all the details related to the operative conditions, please contact our sales department.

Note

Note

The full references of our officials and business partners are available on our website.
raccorderiemetalliche.com

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