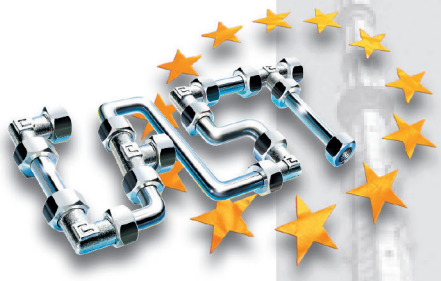
TECHNICAL BULLETIN 2021



Dear Clients, Technicians, Users, Universities, Academics e Students,

The purpose of this "Technical Bulletin 2021" is to update our interlocutors on the technologies, safety parameters and state of the art achieved by our Company in the use of hydraulic components in complex automated industrial systems where strength, safety and extreme precision in repetitive cycles are required.

WHAT IS IT?

It is a working tool. The goal is to help improve the quality of work and operator safety, which is imperative.

It is aimed at those who want to engage in personal technical development in terms of growth, knowledge and problem-solving.

It is born of the conviction that any improvement or result begins with knowledge, in compliance with regulations, and develops by operating correctly according to the instructions received from those legally empowered to issue them.

It is to be used, handled, experienced. Its objective is to generate new ideas and stimulate further reflection and personal responses to technical issues within the complex world of hydraulics and with a view to "Continuous Improvement".

It does not claim to solve all the technical complexities raised, nor does it delude itself that it has identified all the system issues that are worthy of attention. It seeks only to provide a technical, experiential pathway to be followed.

FINALLY

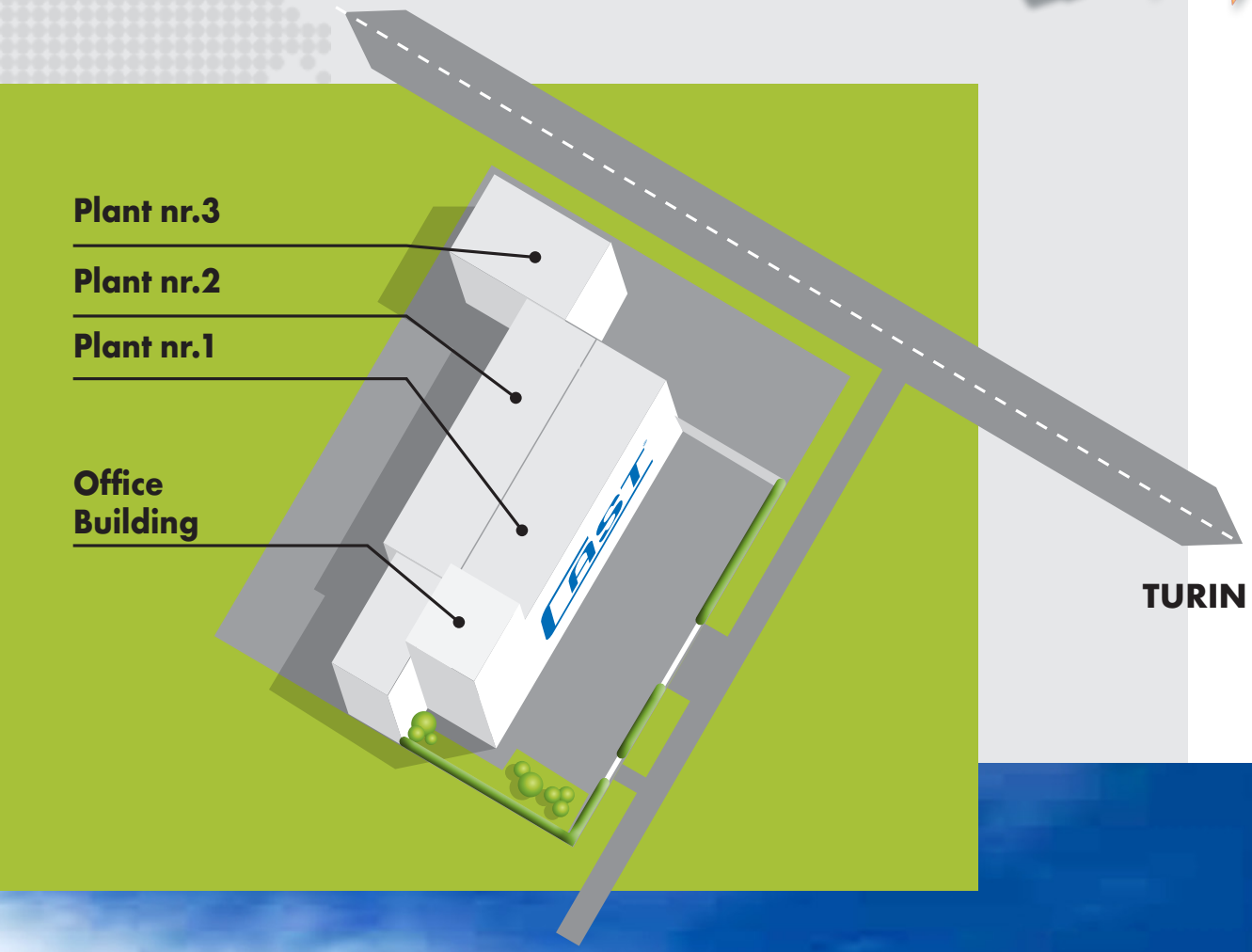
All the voices within Cast S.p.A.come together to create a story about men and women who are committed to leaving a mark that will last over time. We are not satisfied just with making excellent products, we want to convey our company ethos to our customers: a life choice, the art of living, within a context of constant collaboration.

CAST Spa

PRODUCTION FACILITY LOCATED IN VOLPIANO (TO)

- CAST S.p.A Registered Administrative Headquarters
- Working area of approximately 15,000 m2
- Approximately 6,500 m2 covered area
- 100,000 stock withdrawal positions
- 5,000 stock volume positions
- Worldwide shipping via air, sea and land
- International after-sales assistance
- Continuously updated Integrated Management System(QSA) ISO 9001, UNI EN ISO 14001, BS OHSAS 18001.

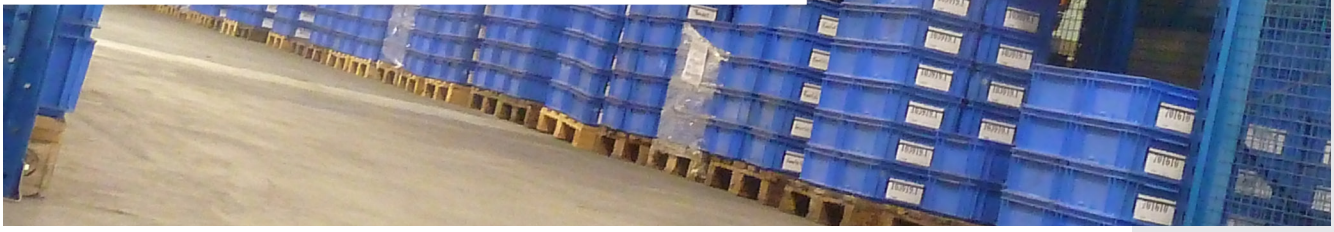
CASELLE



TURIN

PLANT 1

- Withdrawals Warehouse
- Shipping Department
- Packing Department



PLANT 2

- Arrivals
- Volumes Warehouse

PLANT 3

• Flexible Piping Stores

RESEARCH - INNOVATION - DEVELOPMENT: ISO 8434-1, DIN 2353 CONNECTION, SEQUENTIAL VARIABLE GEOMETRY "B7" MULTI-CUT RING

Stainless steel ring AISI 316 Ti (1.4571) Carbon steel ring 11SMnPb37/30

Three metal-to-metal sealing systems on a single load-bearing element, which interact with each other to create an original, innovative and reliable product.

Industrial patents pending with the deciding bodies.

PRODUCTION FACILITY LOCATED IN CASALGRASSO (CN)

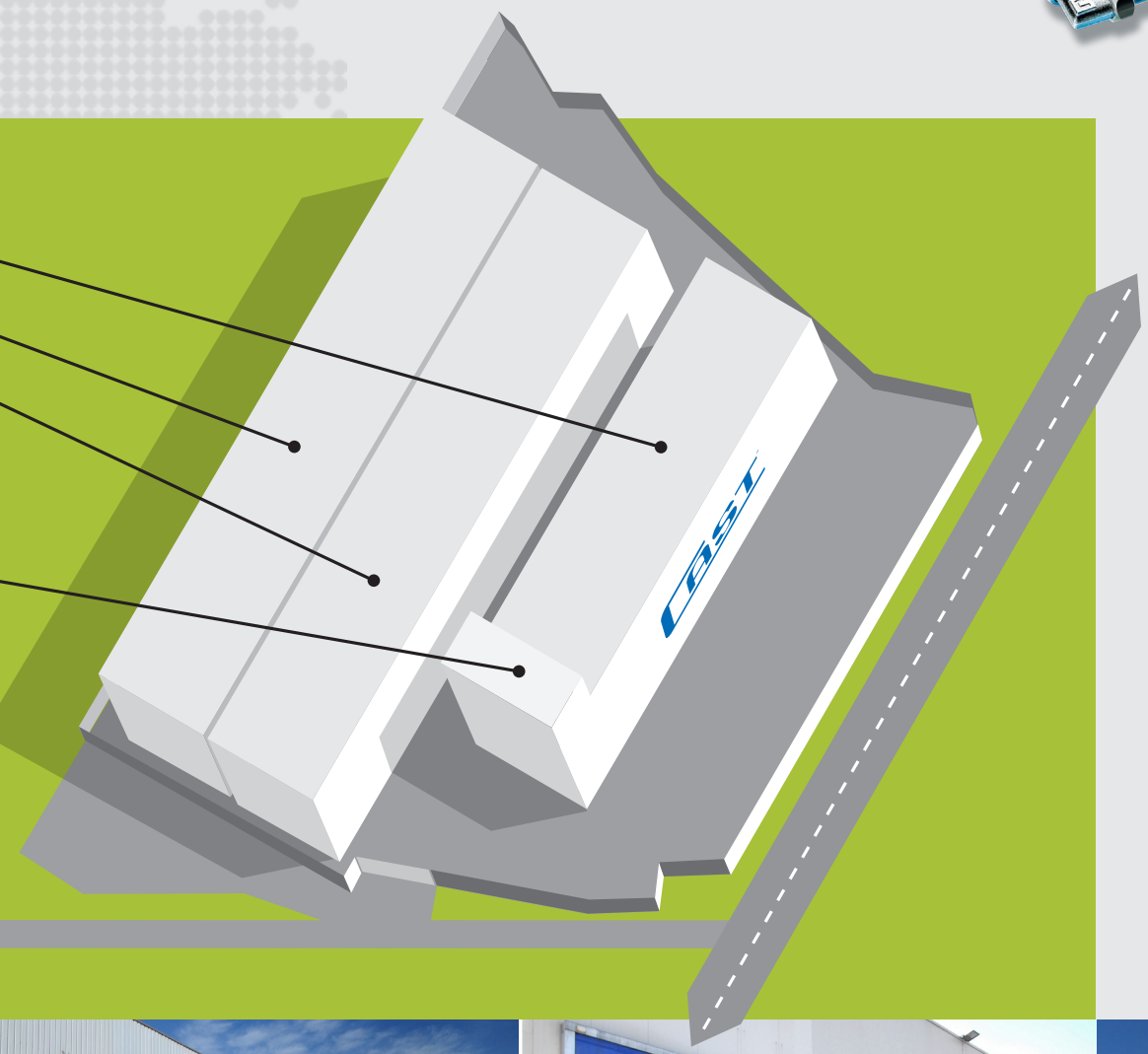
- CAST S.p.A. production facilities
- Working area of approximately 23,000 m2
- Approximately 11,000 m2 covered area
- Potential annual production of 75,000,000 pieces in three shifts
- Products manufactured according to ISO 8434-1/DIN 2353, ISO 8434-2/ SAE J514, ISO 8434-3/SAE J1453, ISO 1251, SAE J516.
- Productions in carbon steel and stainless steel
- Includes metrology room and one for testing up to 4,000 bar
- Continuously updated Integrated Management System (QSA) ISO 9001, UNI EN ISO 14001, BS OHSAS 18001

Plant nr.3

Plant nr.2

Plant nr.1

Office Building




RACCORDI IN ACCIAIO PER ALTE PRESSIONI
Strada Brandizzo, 404/408 bis - 10088 VOLPIANO (TO)

FITTINGS MANUFACTURED BY CAST

We believe in the human being; his internal flame, his potential for elevation and his desire for redemption.

PLANT 1

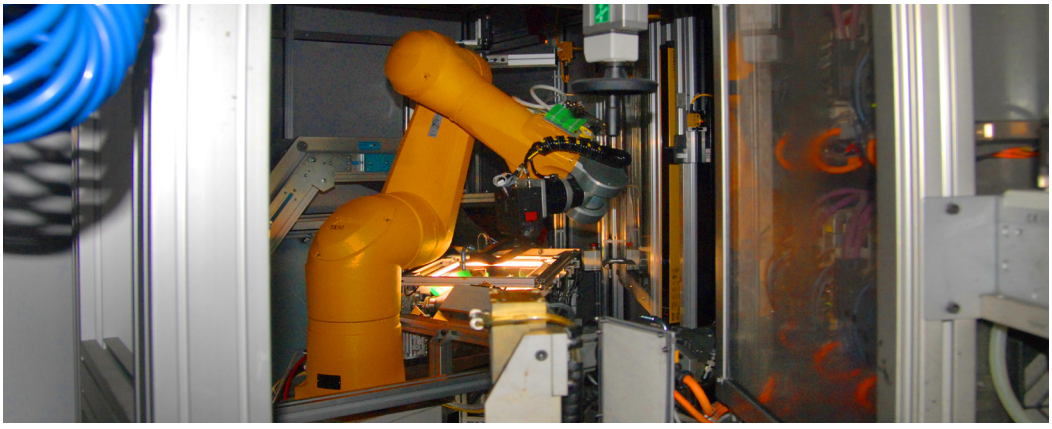
- 3000 m^2
- Numerical checks
- Multi-spindle machines
- Washing area
- Annealing
- Technical office

PLANT 2

- 3000 m^2
- Machining centres
- Transfers
- Metrology room
- Quality control

PLANT 3

- 2.500 m²
- Assembly machines
- Monitoring machines
- Anti-pollution machines
- Cap-insertion machines
- Component stores
- Shipping Department



PLANT 3
UNDERGROUND

- 2.500 m²
- Carbon steel raw material bars warehouse
- Stainless steel raw material bars warehouse
- Moulded carbon steel warehouse
- Moulded stainless steel warehouse
- Electrical and mechanical spares warehouse

TECHNICAL BULLETIN 2021

A Piedmont enterprise.
An Italian enterprise.

CUSTOMER SERVICE AND QUALITY CONTROL

CAST S.p.A., as a well-established enterprise, offers pre- and post-sales product support to provide comprehensive assistance to its partners. Constant technical and commercial support is provided by a range of printed and non-printed tools to provide a better understanding of the inherent practicalities of our product. At our customer's request, we organise training courses on the uses of our fittings.

The CAST S.p.A. service, via a series of highly detailed technical-informative catalogues and specifically trained consultants, provides clear and effective answers, all under the constant supervision of our Quality Service, which participates in the control and development of every area of the company and issues the CAST fittings fitter's diploma, subject to appropriate, detailed training.

The technical sales catalogue fully explains all the technical choices made, thus providing timely prior information and continuous updating, both of which are essential for the smooth operation of external relationships, by highlighting standards and reference ranges.

Where necessary, CAST S.p.A. intervenes personally, promptly sending its own specialised technicians anywhere in the world.

In drafting this Technical Bulletin, CAST S.p.A aims to create a technical tool that links the Manufacturer, Distributor and End User.

Continuous and constructive exchange of information provides all parties with the necessary knowledge to confront and jointly solve the problems that can sometimes arise within the world of plant engineering systems.

GERMAN BRANCH
DIETZENBACH (OFFENBACH)

- Dimensions: 1,500 m2
- Official CAST branch

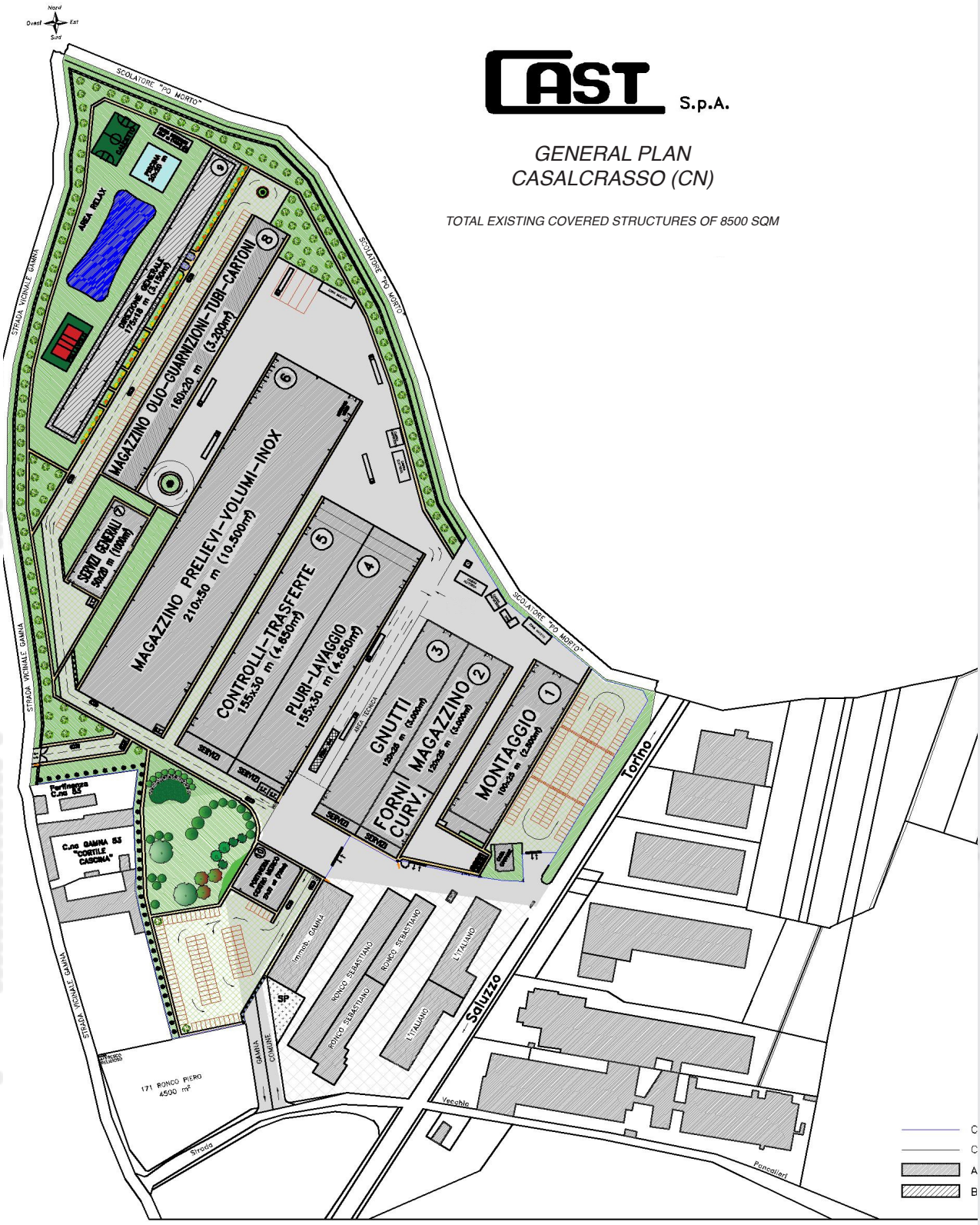
FRENCH BRANCH - OZAN
OZAN (AIN)

- Dimensions: 850 m2
- Official CAST branch

CAST S.p.A.

GENERAL PLAN
CASALCRASSO (CN)

TOTAL EXISTING COVERED STRUCTURES OF 8500 SQM



OUR PRODUCTS

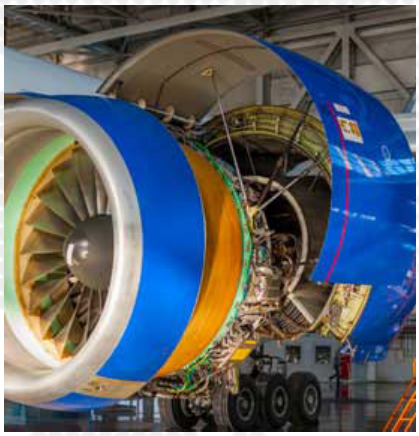
Cast fittings are used in various sectors requiring the transmission of energy via pressurised fluids, in particular hydraulic oil. The target sector is hydraulics.

TARGET SECTORS

Hydraulics, thanks to its extensive ability to handle considerable quantities of power using components of reduced size and weight, is widely applied in major sectors of the automation industry.







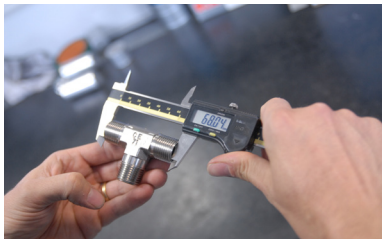

40 ANNIVERSARY CAST 1978 - 2018

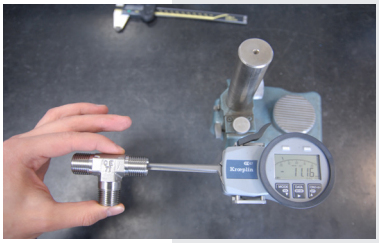
TESTING ROOM

To ensure that its products offer maximum reliability, CAST S.p.A., is equipped with its own test laboratory, which carries out dynamic, high pressure (up to 1,000 bar) static, and burst tests (up to 4,000 bar).
The testing room is equipped with a bench for static destructive tests, two benches for dynamic fatigue and vibration fatigue tests and a machine for tensile and pressure tensile tests. It also has all the necessary equipment to carry out tests as required by industry standards, such as cutters, staplers, edging machines, torque wrenches, strippers, etc.

METROLOGY QUALITY CONTROL ROOM

CAST S.p.A. internal Quality Service benefits from a metrology room equipped with all the necessary equipment to guarantee product quality control at all stages of production, including: hardness testers, digital microhardness testers, digital gauges, internal micrometers, roughness testers, profilometers, metallographic microscopes, salt chamber corrosion testing machines, machines for measuring the degree of contamination, machines for calibrating monitoring instruments, profile projectors, comparators, coatings testers, plug gauges, counter tops, etc.





CHOOSING A FITTING

Choosing the best technical solution at the design stage provides the best assurance for the system's operational capacity. When making a selection, consider the installation and subsequent maintenance implications, which represent a major cost component.
For maintenance operatives, these are strategic, delicate (and very expensive) components that need to be systematically checked. Therefore, the choice of a fitting that is suitable for the type of installation to be built must be carefully assessed.

The main parameters to be assessed are as follows:

1. TYPE OF APPLICATION

Steel hydraulic fittings are components used to connect carbon steel and stainless steel pipes in hydraulic systems. Given the high pressures used in this type of system, the pipes and fittings used must be of the highest quality, standardised, reliable, functional and interchangeable. Cast S.p.A markets fittings that are manufactured according to international reference standards, are easy to assemble, replaceable and their use in installations guarantees a high level of safety and functionality, due to strict and repetitive quality controls during production.
In order to avoid pipe unthreading, fluid leakage and unwanted breakages, identifying the type of fittings to be used becomes a very delicate operation. If, for example, the application requires very high pressures with maximum values of 630 bar, the use of DIN fittings in accordance with ISO 8434-1 and ORFS fittings in accordance with ISO 8434-3 are the most suitable solutions. If, on the other hand, you need to connect a fixed part with a movable part, you must use flexible pipe fittings in their various types and operating pressures as necessary.
The main types for rigid pipes are cutting-ring fittings, flared pipe fittings and welding fittings. In the area of flexible pipes, there are suitable fittings adapted for braided, spiral and thermoplastic rubber pipes.

It is important to choose the correct size of fittings and pipe diameter in order to minimise pressure losses, which are easily generated in a hydraulic system.
Finally, it is imperative to comply with all stipulations, standards, manufacturer's instructions and to comply with all applicable laws in respect of environmental protection and personal safety.

2. TYPE OF FLUID

A "fluid" is defined as that liquid or gaseous component of the system, which is responsible for transmitting energy from a generator to a utility. The main fluids used include oils, fresh water, sea water, air, steam and certain gases. Installations employing these last three means of transmission require a very specific design study from the point of view of safety since, as by using a compressible carrier, you should make an advance assessment of all the possible negative consequences resulting from the use of such a medium.
Mineral oil, on the other hand, is the fluid par excellence used in hydraulic systems; the peculiarities that make it preferable to its direct competitors, such as water, for example, are the multiple mechanical and hydraulic properties that are fundamental in power transmission systems:

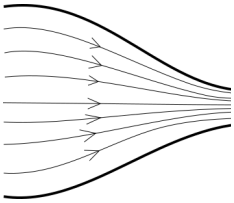
- Lubricating properties
- Greater resistance to degradation
- Greater viscosity
- Virtually unlimited resistance to pressure (being a liquid, it is considered virtually incompressible)
- Good thermal conductivity

However, the use of water is indispensable in particular installations such as fire-fighting systems or specific hydrodynamic systems with special safety requirements.
In marine or particularly corrosive environments, the use of AISI 316 Ti stainless steel fittings and pipes is recommended while, for normal industrial applications, carbon steel fittings are an excellent and economical solution.

3. PRESSURE

By definition, pressure is a force on a surface, i.e. how much force is needed to perform a given task. The principal units of measurement are 'bar' and 'Pascal'.
In the design phase, in order to establish the system pressure, you must know the force required by the user, consider all the various components, and any pressure drops while identifying possible pressure peaks.
The Cast S.p.A range offers various types of fittings with different pressures, the designer should identify the most suitable fitting for the needs of the system, without going overboard by choosing an over-performing fitting, but always considering the 4:1 and 2.5:1 safety factors.

4. FLOW RATE

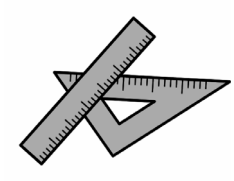


The flow rate is the quantity of fluid passing through a section in a unit of time. It determines the length of time in which the work is to be done and its unit of measurement is litres per minute.
Once the flow rate necessary for the system's correct operation has been established, you should identify the fitting and the pipes that have the appropriate internal passage, respecting the recommended fluid velocity of approximately 5 m/sec.

5. TEMPERATURE

The temperature of the hydraulic fluid should not exceed that stipulated by the supplier. At higher temperatures, the fluid may start to deteriorate, causing the viscosity level to drop too much to provide proper lubrication of the components, thus compromising the technical characteristics envisaged at design level. To ensure that the oil has a long service life, it is extremely important that the fluid remains clean and free of water.

6. OVERALL FOOTPRINT and MAINTENANCE



With a view to reducing costs and protecting the environment, more and more installations are being designed in small and limited spaces. It is therefore essential to use fittings and components with adequate dimensions and to avoid going overboard with oversized components. However, the choice should not penalise the installation phase or any future maintenance work, which must always be considered and safeguarded.

7. REFERENCE STANDARDS

Cast fittings are produced according to international standards. Depending on the characteristics of the system, it is advisable to choose the most appropriate reference standard and consequently use fittings that comply with it. The end user may, if deemed appropriate, request product approval certificates or other quality control documents.

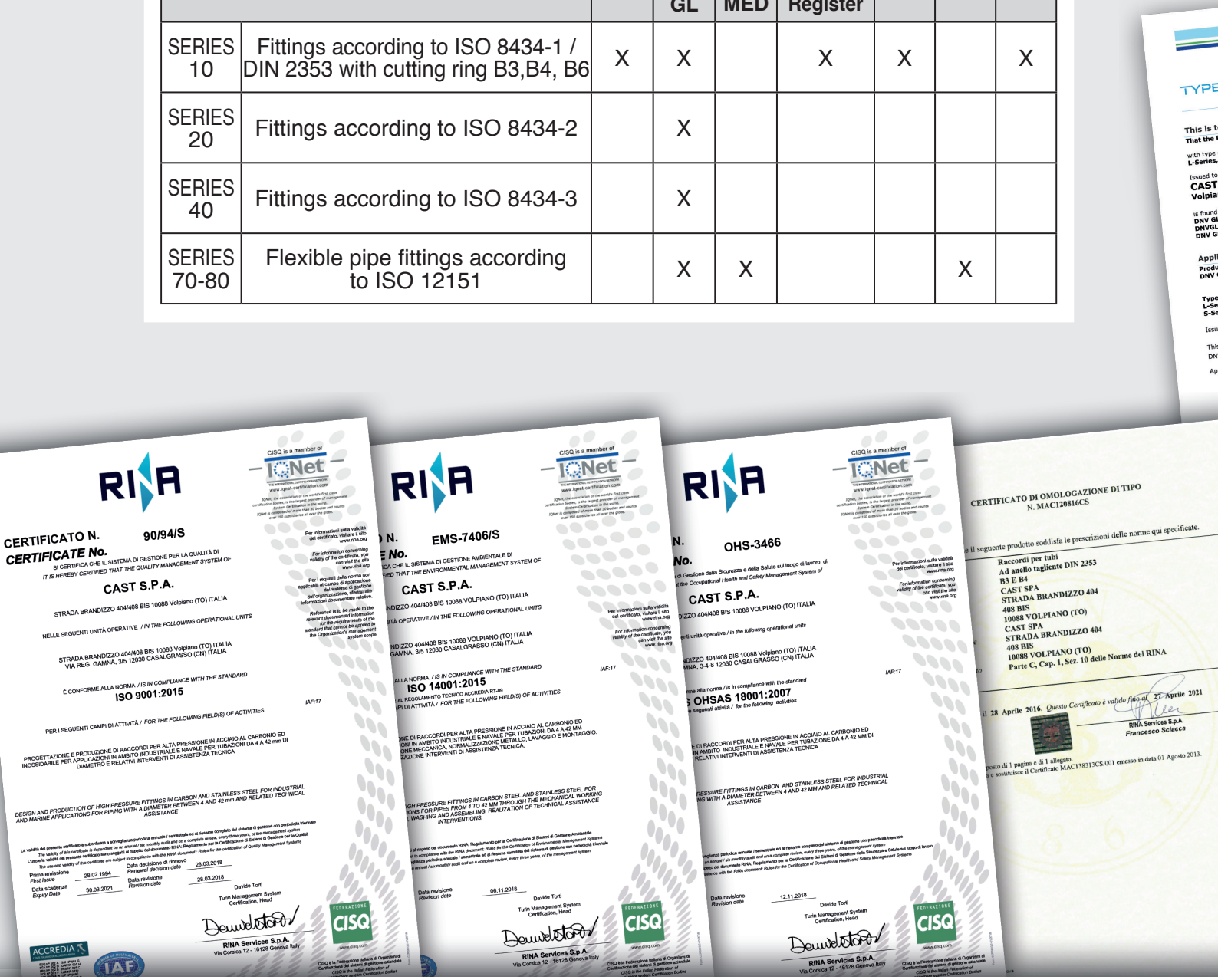
CERTIFICATIONS

Certifications are issued by authorised external bodies, confirming that the company's quality system or product complies with certain regulations.

Cast's integrated Environment-Quality-Safety Management System complies with the current UNI EN ISO 9001, ISO 14001 and BS OHSAS 18001 standards.
Certificates are issued by the RINA certifying body.

All types of fittings for connection to rigid or flexible pipes have been tested by third parties who have verified all reliability, functionality and safety requirements and issued the various product certificates.

TYPE OF CONNECTION FITTINGS		CERTIFYING BODY						
		Rina	DNV-GL	DNV MED	Lloyd Register	ABS	BV	CCS
SERIES 10	Fittings according to ISO 8434-1 / DIN 2353 with cutting ring B3,B4, B6	X	X		X	X		X
SERIES 20	Fittings according to ISO 8434-2		X					
SERIES 40	Fittings according to ISO 8434-3		X					
SERIES 70-80	Flexible pipe fittings according to ISO 12151		X	X			X	




DNV·GL
APPROVAL CERTIFICATE
Certificate No:
TAP00000C1
Revision No:
1
CAST S.p.A.
Volpiano TO, Italy
DNV·GL
PROVAL CERTIFICATE
Certificate No:
TAP00001U
Revision No:
1
DNV·GL
PROVAL CERTIFICATE
Certificate No:
TAP00001A
Revision No:
1
DNV·GL
PROVAL CERTIFICATE
Certificate No:
TAP00001NF
Marine & Offshore
TYPE APPROVAL CERTIFICATE
CAST SpA
Volpiano (TO) - ITALY
METALLIC HOSES (FLEXIBLE PIPES) ASSEMBLIES
Types 1SN, 2SN, 4SP, 4SH, 1SC, 2SC, R13, Power (2SC or 2SN-K) & Diamante (2SC).
This certificate will expire on: 11 May 2024
al Certificate
CAST SPA
Strada Brandizzo 404, Volpiano (To), 10088, Italy
Compression Fittings
Carbon steel and stainless steel pipe couplings, cutting ring types for B3 without and B4 with double elastomer seal (NBR or Viton) for L & S pipe series.
B3 and B4
General use in piping systems on ships classed or intended for Classification with Lloyd's Register, where the rotary flexure test is not required.
Restrictions for B4 cutting ring:
1. Starting/control air and CO2 systems.
2. Inside machinery spaces of category A or accommodation spaces for main lines of inert gas systems.
3. Water spray or sprinkler systems which are not always filled with water.
4. Scupper pipes below freeboard deck over board
LR Rules and Regulations for the Classification of Ships, 2020
Torsten Schroeder
Senior Specialist to Lloyd's Register EMEA
A member of the Lloyd's Register group
Design Assessment
CAST SPA
located at
ONE GAMNA, 3, CASALGRASSO CN, Italy, 12030
CERTIFICATE NUMBER 20-1995678-PDA
EFFECTIVE DATE 20-May-2020
EXPIRY DATE 19-May-2025
ABS TECHNICAL OFFICE Genoa Engineering Department
American Bureau Of Shipping
Cristina Generale,Engineer/Consultant
中国船级社
CHINA CLASSIFICATION SOCIETY
证书编号/Certificate No. ML19PTB00005
型式认可证书
CERTIFICATE OF TYPE APPROVAL
CAST S.P.A.
STRADA BRANDIZZO 404/408 BIS – 10088 VOLPIANO (TO)
Mechanical Joint
Certificate is valid until 2024年05月21日/May. 21,2024
签发日期 2020年05月22日
Date May. 22,2020

GENERAL POINTS REGARDING CAST CONNECTION FITTINGS

MATERIALS

Cast fittings are produced in carbon steel and stainless steel. The steels used are all of the highest quality and are sourced exclusively from leading European steel mills. All batches used have the 3.1 testing documentation showing the casting number, along with the chemical and mechanical properties of the steel.
The table below shows all the main materials used in the production of Cast fittings:

TYPE OF CONNECTION FITTINGS	MATERIAL	DESIGNATION	STANDARD
Cutting rings	Carbon steel	11SMnPb37/30	UNI EN 10277
Tightening nuts		11SMnPb37/30 C10C, C45 C35	UNI EN 10277 UNI EN 10263-2 UNI EN 10277
Straight		11SMnPb37/30 S235JR/0/2 (Fe 37C)	UNI EN 10277 UNI EN 10277
Forged		28SMnPb28 (PR60) 36SMnPb14 (PR80) C15, C35	- UNI EN ISO 683-4 UNI EN 10277
Cutting rings	Stainless steel	Aisi 316 Ti (1.4571)	UNI EN 10088-3
Tightening nuts		Aisi 316 Ti (1.4571) Aisi 316 (1.4401) Aisi 316 L (1.4404) Aisi 304 (1.4301)	UNI EN 10088-3 UNI EN 10088-3 UNI EN 10088-3 UNI EN 10088-3
Straight		Aisi 316 Ti (1.4571) Aisi 316 (1.4401) Aisi 316 L (1.4404)	UNI EN 10088-3 UNI EN 10088-3 UNI EN 10088-3
Forged		Aisi 316 Ti (1.4571) Aisi 316 (1.4401) Aisi 316 L (1.4404)	UNI EN 10088-3 UNI EN 10088-3 UNI EN 10088-3

TEMPERATURES

The permissible steel temperatures according to ISO 8434-1 are:
- Carbon steel: -40°C to +120°C
- Stainless steel: -60°C to +200°C

In the case of stainless steels, a reduction of the system operating pressure must be applied depending on the operating temperature as indicated below:
- -4 % with temperature >50°C
- -11% with temperature >100°C
- -20% with temperature =200°C

ELASTOMERIC SEALS (Gaskets and O-ring)

Gaskets and o-rings are components made of elastomer, commonly called rubber, which are used to make elastomeric seals when compressed into appropriate areas. They can be made in a wide range of compounds, suitably designed to meet a variety of requirements for fluid compatibility, operating pressures, operating temperatures and other factors including cost. Cast normally uses NBR (Perbunan) sealing elements on fittings made of carbon steel or FKM (a high-performance fluorinated elastomer) sealing elements when applied to stainless steel fittings, and others.


NBR O-ring


FKM O-ring


NBR gaskets


FKM gaskets

The o-ring consists of a circular ring with a round cross-section (toroid) while the gasket has a trapezoidal profile. Both are manufactured using the hot injection moulding process.

When an elastomer is mounted in a housing and subjected to fluid pressure, it is pressed against the bearing surface opposite the pressure, thus ensuring a seal.

The following table shows the temperature range and hardness of the o-rings and gaskets indicatively applied to the Cast fittings.

MATERIAL	TYPE	OPERATING TEMPERATURE min÷max	HARDNESS
NBR	Gaskets for terminal seals	-35°C ÷ +100°C	85 ±5 Shore
	O-rings for terminal seals		80 ±5 Shore
	ORFS O-rings for frontal seals		90 ±5 Shore
	O-rings for 24° and 60°cone seals		70 ±5 Shore
FKM	Gaskets for terminal seals	-25°C ÷ +200°C	80 ±5 Shore
	O-rings for terminal seals		80 ±5 Shore
	ORFS O-rings for frontal seals		90 ±5 Shore
	O-rings for 24° and 60°cone seals		75 ±5 Shore

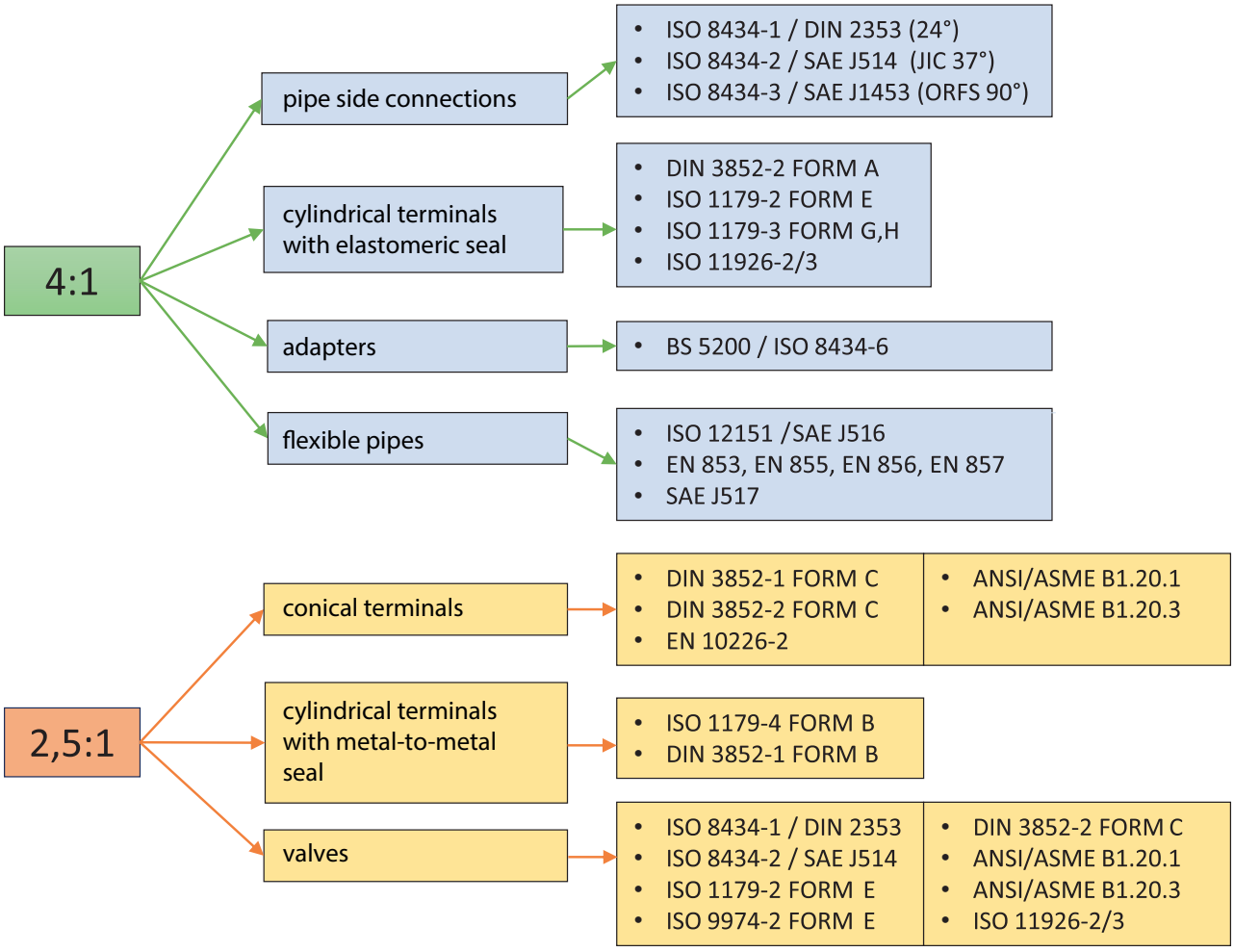
STOCK

During storage, rubber products can be damaged by the influence of oxygen, ozone, heat, light, moisture or chemical media. If this happens, it can lead to a shortened lifespan that renders them unusable due to excessive hardening, softening, warping or cracking.
Elastomeric products must be stored and handled according to DIN 7716.
Below are some storage tips based on our own experiences:

- Store products in a cool, dry, aired and dust-free environment
- The ideal temperature is +15°C and +25°C
- Protect products from sunlight and artificial light
- Storage rooms must not contain ozone layers
- Store products in hermetic packaging not subjected to loads
- Humidity must be less than 65%

SAFETY FACTORS

The safety factor is the coefficient that determines the minimum bursting pressure.
For CAST products it can be 4:1 or 2.5:1: :



Destructive test with AISI 316Ti stainless steel pipe, 038x4mm, according to UNI EN 10216-5. The pipe burst at 1270 bar, with no leaks or oozing at the sealing points.

Destructive test with spiral rubber pipe 4SP DN25, according to EN 856.
The pipe burst at 1480 bar, with no leaks or oozing at the sealing points.

GALVANIZING TREATMENT

All fittings, valves and carbon steel components manufactured by Cast S.p.A. undergo the following protective surface treatment: Fe/Zn8/C/T2 UNI EN ISO 2081 - 4520 galvanizing, plus topcoat sealer, equivalent to cathodic electrolytic galvanizing with trivalent chromium, minimum deposited thickness is 8pm* This minimum thickness value must be measured at any point on the significant surface (see drawings page 35). Values below this limit may be found on non-significant surfaces without affecting the product's quality and conformity.
In order to achieve an average of 350 hours resistance to white salts and an average of 700 hours to red salts, a sealant is applied which not only guarantees the required performance, but also facilitates installation.
The task of the sealant is to fill all the micro gaps in the galvanizing treatment, which represent the initial area of corrosion outbreaks. By sealing these micro defects, the galvanizing treatment significantly improves its protective performance up to the values indicated above. It has a pleasant visual appearance; silver in colour, with shades of straw. It is ecologically compliant with current European laws on hazardous waste and also according to the European EVL standard, as it uses Trivalent Chromium (CrIII), in compliance with current laws protecting people's health and the precautionary principle of protecting the environment in which we live.

The following gives our point of view on three topics, which we think it would be useful to elaborate and provide our technical input on the issues:

1° There has been a long-standing debate on the resistance that should be guaranteed by treatment subjected to salt spray tests in accordance with European Standard UNI EN ISO 9227-NSS without thermal shock, which has never reached agreement on the results to be obtained or an objective assessment of expectations, which often do not live up to expectations;
2° Potential damage to the environment and workers' health, in the face of the enormous use of "zinc nickel" in the context of large-scale industrial situations;
3° The controversy over how to perform salt spray tests and interpret their results is endless and it is very difficult to arrive at an objective and unambiguous assessment. It is also useful to remember that the salt spray corrosion test is only indicative and gives no guarantee as to the corrosive behaviour that might occur outside the test itself and in industrial use, including the fact that it is a destructive test.

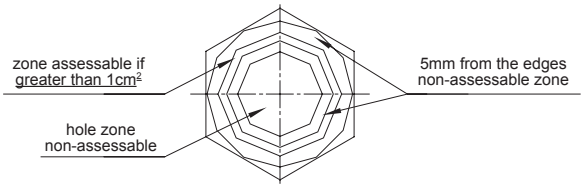
The introduction to ISO 9227 in fact states:
"There is rarely a direct relationship between salt spray resistance and corrosion resistance in other environments, as many factors influencing the progress of corrosion, such as the formation of protective layers, vary considerably depending on the conditions encountered. The test results should therefore not be regarded as a direct guide to the corrosion resistance of the metallic materials under test in all environmental conditions in which these materials may be used. The behaviour of different materials during the test should similarly not be regarded as a direct indication of the corrosion resistance of these materials in service.

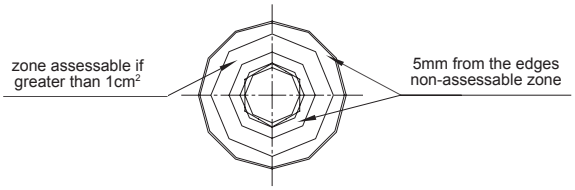
1° Point:
There is a minority of manufacturers on the market who believe that increasing the hours of resistance in salt spray is the solution to the problems that galvanizing treatment poses on a daily basis. Our company does not agree with this opinion.
The number of hours of resistance in salt spray (referring to red salts) has increased from 60/120 hours in the nineties to 500/600 hours today, but the problems with galvanizing in the nineties are more or less the same as those we are still debating today, despite the fact that the hours have increased tenfold.
What has happened over the last twenty years shows that the axiom "more hours, less problems" does not hold true, although we recognise that galvanizing treatment has improved considerably over the last twenty years and that significant progress has been made.

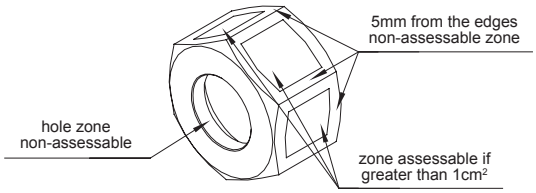
The reasons for this apparent contradiction are very simple: an excessive expectation of performance; little knowledge of the real characteristics of the treatment, which is inherently delicate; and an assessment of the structure of the base metal that is more aesthetic than technically protective.
The protective coating is on average 8pm, which means that the treatment can be damaged during transport, storage in the warehouse, handling during assembly, etc., leading to defects that will emerge during salt spray tests or on board the machine if the system is installed in areas with an aggressive microclimate.
From our production, most surfaces are composed of threaded, drilled areas, with edges, corners, etc., which are not considered significant for the purposes of the salt spray test (see Cast technical table) but which visually condition the assessor's judgement, even though this should not be taken into account.
The above makes it clear (in our opinion) that galvanization alone cannot solve all the problems of protecting machines and systems from oxidation, which, when deemed necessary, must be safeguarded with complementary measures such as sprays, paints or the use of stainless steel.
In conclusion: just increasing the number of hours of salt spray resistance does not solve the problems at all. More knowledge and training on the application is needed.

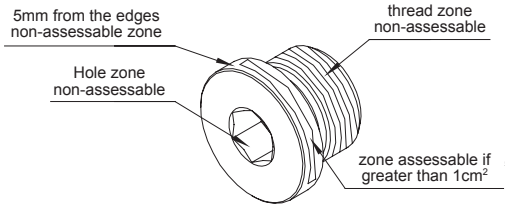
2° Point:
Cast S.p.A.'s position on the issue of the use of Zinc Nickel in galvanizing its own production is clear and definitive: it must not be used.
EC Directive 2000/53 of the European Parliament and the Council of 18 September 2000, Article 4 paragraph 2 sub A "PROHIBITS" all heavy and harmful metals as hazardous waste, as soon as technical knowledge permits.
Legislative Decree no. 81 of 9 April 2008 unequivocally refers to Art. 3 (scope) paragraph 1, the spirit of EC Directive 2000/53, as it states: "elimination of risks in relation to knowledge acquired as a result of technical progress by replacing all that is dangerous by that which is not dangerous or less dangerous".
Ni (Nickel) is universally recognised as a harmful substance and hazardous waste. It is prohibited by the aforementioned law and must NOT be used.
Ni (Nickel) must not be used for mere economic interests and bad civic conscience. It damages the health of workers, damages the environment in which we all have to live, and also damages the user, who may one day be called to account to the authorities for non-compliance with current European laws.
The European Commission states in point 4 of the document drawn up at its meeting on 27 June 2002: "that all substances defined as harmful and hazardous should be eliminated as soon as their use can be avoided".
With the entry into force of the new Regulation no. 1272/2008 (called CLP Classification, Labelling & Packaging), significant changes were made to the classification of many hazardous substances, including nickel salts and cobalt salts, which were classified as toxic, environmentally hazardous and carcinogenic.
In practice, for all components where there is an objective technical impossibility of replacement, the standard is waived, but, if the use of these harmful and dangerous substances is avoidable in the state of the art, the European Directive has the force of law and imposes this choice.
Ni (Nickel) is a harmful product; it can and MUST be replaced by CrIII (trivalent chromium). The technique is well known, industrialisation is feasible, and the laws in force must be respected. Those who fail to do so bear the full responsibility for acting against the principles of fair competition with regard to those who respect the law, and they shall have no recourse to grumble if at some point these considerations take the form of a complaint addressed to the investigating magistracy, the control bodies and the national and international press, not least to have their voice heard on a problem that concerns all the countries of the world and all the people living therein.
Cast S.p.A. "DOES NOT" intend to use zinc nickel because it is considered harmful and dangerous. In fact, our galvanizing treatment is carried out in accordance with current laws with trivalent chromium to protect people's health and in line with the precautionary principle to safeguard the environment in which we live.

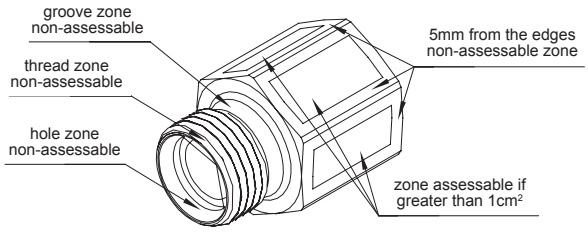
3° Point:
the problem of salt spray tests does not arise at cabin level and the parameters to be respected; you can be sure that the tests are carried out by everyone with the same standard values and in a context of absolute propriety, knowledge and efficiency.
It is a different matter when it comes to selecting products for testing, when you need to know exactly which areas can be checked (this also applies to checking deposited thickness).
Only those products with sufficiently large “corrosion detection zones” to be checked, should be identified and tested.
In accordance with ISO 10289 (Part 5 - Methods of Inspection, Note 1) defects within 5 millimetres of the ends and near the corners are not reported in the Test Report and are not considered significant for the terms of the test. Similarly, any marks at the points of contact with the frames used in the test, assembly holes, etc. are not considered ‘’defects’’.
According to ISO 10289 (Part 5 - Inspection methods, Note 2), in samples with machined parts such as grooves and threads, any corrosive deposits are not considered defects (see also Cast S.p.A. technical table). These rules are not always known and respected, so sometimes samples are tested which, for our type of product, are absolutely uncontrollable by traditional means.
The same concept applies to the evaluation of the test result; the overall visual impact of the item must not influence the operator, who must take into account only the areas that can be checked for corrosion and ignore everything else.
It is very important to bear in mind that the tests carried out in the salt spray chamber are “DISTRUCTIVE” tests and it is therefore only natural that defects will emerge during the tests. The important thing is that small anomalies remain within acceptable parameters predetermined according to the application requirements of the part being tested.

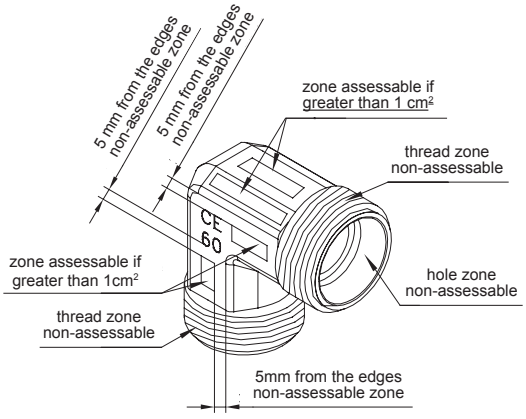












GAVLVANIZING SUMMARY DATA SHEET

PHYSICAL CHARACTERISTICS

Electrolytic galvanization, Cr VI free, in compliance with European regulations EVL (2000/53/EC), RoHS (2002/95/EC), RoHS II (2011/65/EU) and REACH (1907/2008/EC).
Fe/Zn8/C/T2 UNI EN ISO 2081 - UNI ISO 4520, plus topcoat sealant*.
The minimum deposited thickness is 8pm*. This minimum thickness value should be measured at any point on the significant surface (see drawings page 35). Values below this limit may be found on non-significant surfaces without affecting the product's quality and conformity.

CORROSION RESISTANCE TEST

The corrosion resistance tests accepted by CAST S.p.A. are NSS according to ISO 9227 without thermal shock**; or as an alternative ASS according to ISO 9227 without thermal shock**.
Test surface according to ISO 10289 (Section 5 - Inspection methods, Note 1 and Note 2), Cast S.p.A. technical table. Different surfaces, not agreed in advance, will not be taken into account and the test will be considered void.

ASSESSMENT CRITERIA

The assessment criteria are as follows: Cast assessment table, ISO 10289 standard.
Any different assessment criteria must be agreed in writing in advance with CAST S.p.A., failing which the test shall be null and void.

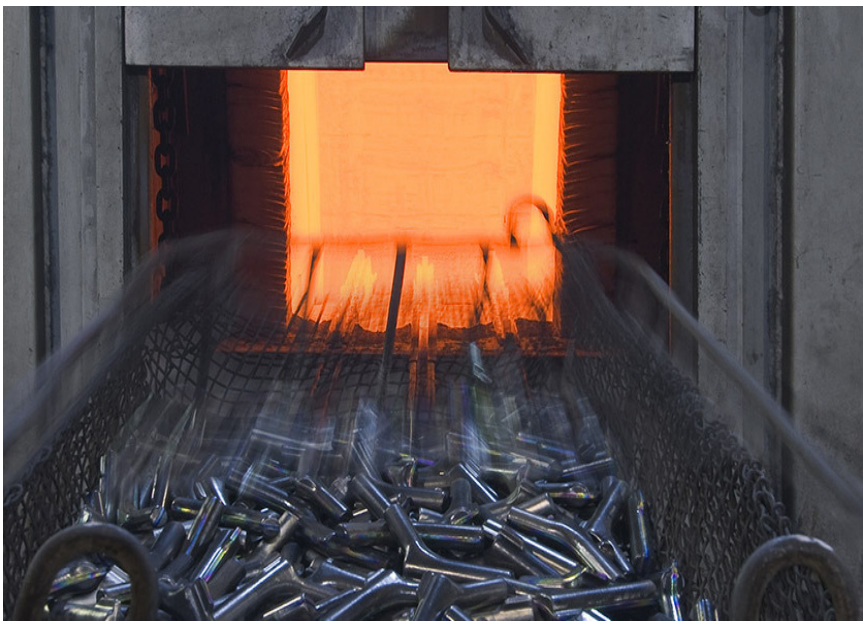
AVERAGE RESISTANCE PERFORMANCE***

NSS according to ISO 9227 without thermal shock.
350 hours (average): to white salts (according to the criteria in the previous point);
700 hours (average): to red salts (according to the criteria in the previous point);
ASS according to ISO 9227 without thermal shock.
50 hours Ra 7 Rp 10 (according to ISO 10289)****

1 Measurements taken with X-ray machines do not detect the thickness of the sealant unless the instruments are of the latest generation, specially prepared.. Before taking measurements, make sure that the machine is compatible with the measurements required.
2 * In case of tests with thermal shock, contact CAST S.p.A. for the necessary technical specifications. Tests carried out with thermal shock without the prior consent of CAST S.p.A. shall be considered invalid.
3 ** The introduction to ISO 9227 in fact states: "There is rarely a direct relationship between salt spray resistance and corrosion resistance in other environments, as many factors influencing the progress of corrosion, such as the formation of protective layers, vary considerably depending on the conditions encountered. The test results should therefore not be regarded as a direct guide to the corrosion resistance of the metallic materials under test in all environmental conditions in which these materials may be used. The behaviour of different materials during the test should similarly not be regarded as a direct indication of the corrosion resistance of these materials in service".
4 *** It should be recalled that white salts only occur in the form of slight grey traces and should not be confused, as is often mistakenly the case, with products of white corrosion accumulation (zinc oxide) due to efflorescence.

GENERAL THERMAL TREATMENTS

Thermal treatment is a heating cycle carried out under pre-established conditions and degrees of heat followed by cooling, more or less slowly, with the aim of making a metal or alloy material take on certain crystalline structures that give it the desired mechanical characteristics.



Thermal treatment furnace

HARDENING

The hardening treatment consists of heating the metal to the austenitizing temperature followed by rapid cooling which can be carried out in water, oil, salt solutions, molten metal or blown air. Abrupt cooling creates considerable stresses in the metal and generates an increase in structural hardness but at the same time an increase in brittleness. This critical situation can be modified by further specific heat treatments such as tempering, stress relieving, annealing and normalising

Tempering

It is carried out after hardening, so as to eliminate, at least in part, internal stresses and deformations. Tempering involves the transformation of the metal to a more balanced chemical and physical state. This sequence, hardening and subsequent tempering, is called “reclamation”.

Distension

It is used to decrease the level of residual internal tension due to machining or uneven cooling processes. The treatment is carried out at low temperatures, with moderate heating and cooling rates.

Annealing

A steel may contain various inhomogeneities:

• Segregations obtained at the end of solidification;
• Cold deformation cracking;
• Residual stresses due to welding.

The annealing treatment enables the steel to approach a state of thermodynamic equilibrium, thus eliminating or reducing the above-mentioned inhomogeneities.

The treatment consists of heating the steel to a certain temperature for an appropriate time, depending on the type of annealing desired, and letting it cool slowly and steadily in the furnace.

Normalisation

Normalisation follows the same thermal cycle as annealing, enabling the reduction of the internal stresses induced by forging and the homogenisation of the structure of the castings. Cooling takes place in still air and is faster than annealing. The resulting structure is optimised for subsequent thermal hardening treatments and special mechanical applications.

Cementation / Nitriding

These are thermochemical diffusion treatments. They aim to achieve increased hardness on the surface and good toughness at the core but do not provide for an abrupt change of crystalline state (as in the hardening process) and do not serve to reduce internal stresses.

In cementation, the piece is placed in contact with special fuel substances in high-temperature furnaces so that it is only enriched with carbon in the surface layer.

With nitriding, on the other hand, nitrogen is absorbed by the piece in contact with an ammonia bath at a temperature of approximately 500 °C.

CAST THERMAL TREATMENTS

Cast submits certain components to heat treatment in order to impart specific characteristics to be used in performing their functions.

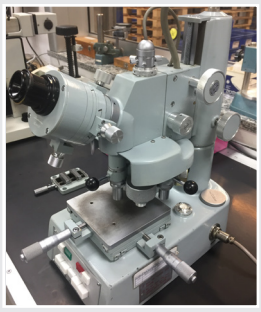
CUTTING RINGS SERIES ISO 8434-1 / DIN 2353

Cutting rings undergo a carbonitriding treatment if made of carbon steel or nitrocarburizing if made of stainless steel. The treatment produces surface hardness and core softness. The combination of hardness and softness enables the plastic distortion of the ring and at the same time the ability to etch the steel pipe, allowing for solid clinching.

Cast has all the tools for verifying the result of the treatment so as to place a highly functional and safe product on the market..

Anelli taglienti

Microscopio metallografico



Microdurometro

PRESS BUSHINGS AND BENDS FOR FLEXIBLE PIPES

Carbon steel press bushings and bends are heat-treated by annealing. This treatment gives them a high degree of plasticity, which is essential if they are to withstand, without breaking, the distortions they undergo during pressing and/or bending. The same components in stainless steel do not need to be annealed.

Boccole a pressare

Curva a pressare

Forno Cast per ricottura

BICUSPID WASHERS FOR DIN SERIES SWIVEL FITTING AND PRESSURE GAUGE HOLDER

The bicuspid washers undergo a cementation + tempering treatment. This treatment gives the washer a high degree of hardness, enabling it, for hydraulic sealing purposes, to incise the two surfaces between which it compressed

Proiettore di profili

Rondelle bicuspide

Durometro

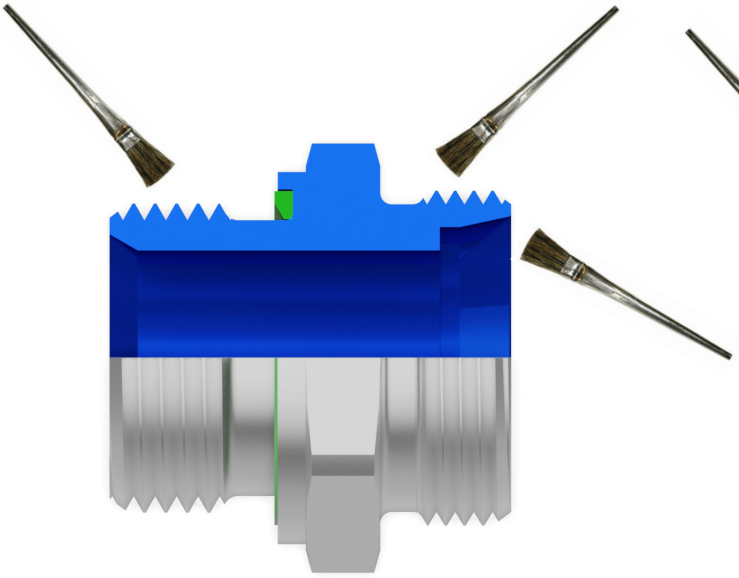
LUBRIFICAZIONE

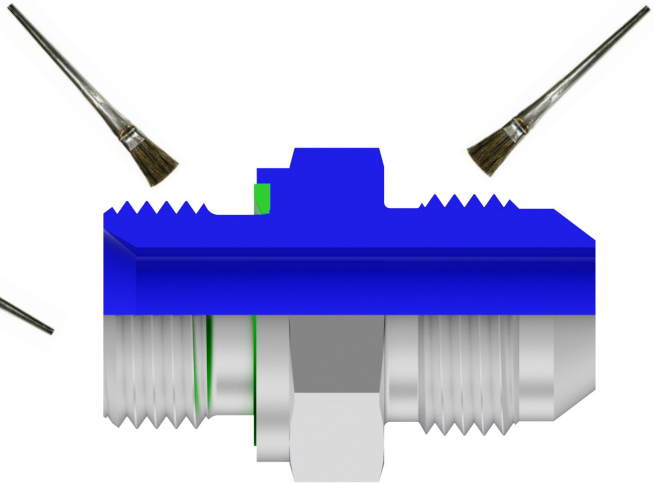
Lubrication of the threads is carried out to separate or protect the contact surfaces during tightening in order to limit the effects of friction. Lubricants offer better wear resistance, allowing surfaces to glide smoothly over each other. This is particularly important for certain materials such as stainless steel, which tend to cold-weld, causing flaying and embedding. Lubricants make disassembly much easier and prevent rust and corrosion, which can permanently weld surfaces.

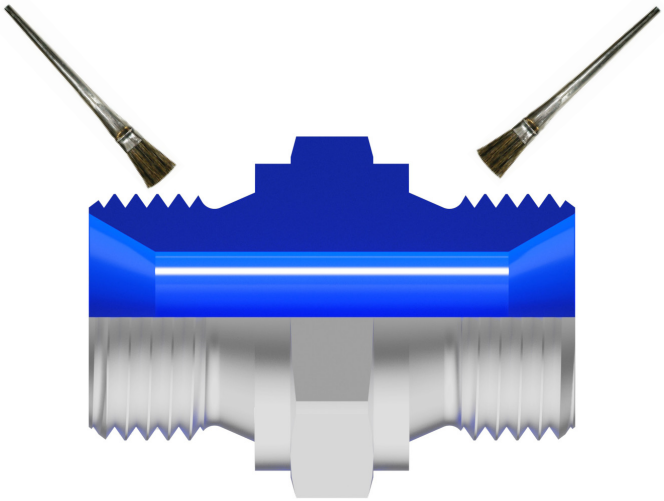
When tightening carbon steel fittings, we recommended using a mineral oil that is compatible with any elastomer seals on the fitting.
When tightening stainless steel fittings, we recommended using a specific high-temperature resistant anti-seize paste lubricant as mentioned on page 26 of the “Technical Sales Catalogue”.

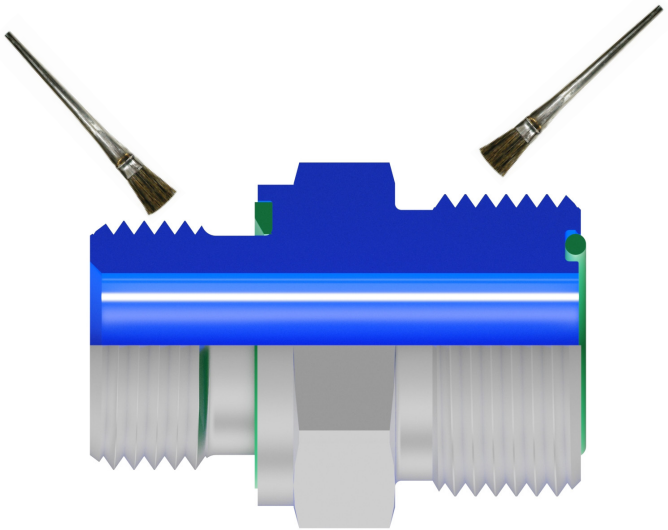
Acciaio al carbonio

Acciaio inossidabile









CARBON STEEL PIPES TO BE USED FOR ALL SERIES

• For carbon steel pipes we recommend using calibrated, cold-drawn weld-free pipes, standardised with inert gas, made of material E235 according to EN 10305-4 (ST 37.4 according to DIN 1630 / DIN 2391).
• The maximum permissible hardness measured on the outside diameter of the pipe is 75 HRB.
• The pressures given in the table below are generally valid with a constant load and a temperature between -40°C and +120°C.

Ø Tube mm	Tolerance EN 10305-4 mm	Thickness mm	Static DIN 2413-I pressure [bar]	Dynamic DIN 2413-III pressure [bar]	Weight Kg/m
4	±0,08	0,5	313	274	0,047
4		1	522	502	0,075
6	±0,08	1	389	374	0,123
6		1,5	549	528	0,166
6		2	692	665	0,197
8	±0,08	1	333	289	0,222
8		1,5	431	441	0,240
8		2	549	528	0,296
8		2,5	658	632	0,339
10	±0,08	1	282	249	0,222
10		1,5	373	358	0,314
10		2	478	460	0,395
10		2,5	576	553	0,462
10		3	666	641	0,518
12	±0,08	1 (1)	235	210	0,271
12		1,5	353	305	0,388
12		2	409	393	0,493
12		2,5	495	476	0,586
12		3	576	553	0,666
12		3,5	651	627	0,734
14	±0,08	1,5	302	265	0,462
14		2	403	343	0,592
14		2,5	434	417	0,709
14		3	507	487	0,814
14		3,5	576	553	0,906
15	±0,08	1,5	282	249	0,499
15		2	376	323	0,641
15		2,5 (3)	409	393	0,771
15		3	478	460	0,888
16	±0,08	1 (3)	176	161	0,370
16		1,5 (2-3)	264	234	0,536
16		2	353	305	0,691
16		2,5	386	372	0,832
16		3	452	435	0,962
18	±0,08	1 (3)	157	143	0,419
18		1,5 (1)	235	210	0,610
18		2	313	274	0,789
18		2,5	392	335	0,956
18		3	409	393	1,111
18		4 (3)	522	502	1,381

Ø Tube mm	Tolerance EN 10305-4 mm	Thickness mm	Static DIN 2413-I pressure [bar]	Dynamic DIN 2413-III pressure [bar]	Weight Kg/m
20	±0,08	2 (2-3)	282	249	0,888
20		2,5	353	305	1,079
20		3	373	358	1,258
20		3,5	426	410	1,424
20		4	478	460	1,578
22	±0,08	1,5 (3)	192	174	0,758
22		2 (1)	256	228	0,986
22		2,5	320	280	1,202
22		3	385	329	1,406
22		4 (3)	441	424	1,766
22		5 (3)	532	512	2,367
25	±0,08	2 (1)	226	202	1,134
25		2,5	282	249	1,387
25		3	338	294	1,628
25		4	394	379	2,072
25		4,5	437	420	2,275
25		5 (3)	478	460	2,466
28	±0,08	2 (1)	201	182	1,282
28		2,5	252	224	1,572
28		3	302	265	1,850
28		4 (3)	403	343	2,368
28		5 (3)	434	417	2,836
30	±0,08	2 (2-3)	188	171	1,381
30		2,5	235	210	1,695
30		3	282	249	1,998
30		4	376	323	2,565
30		5 (3)	409	393	3,083
32	±0,15	3 (3)	265	235	2,146
32		4 (3)	353	305	2,762
32		5 (3)	387	372	3,329
35	±0,15	2 (1)	161	147	1,628
35		2,5	201	182	2,004
35		3	242	216	2,367
35		4	322	281	3,058
38	±0,15	3 (2-3)	223	200	2,589
38		4	297	261	3,354
38		5	371	319	4,069
42	±0,2 (4)	3	201	182	2,885
42		4	269	238	3,749

(1) Pipes to which the reinforcement bushing must be fitted, only for fittings according to ISO 8434-1/DIN 2353
(2) For use with 37° fittings only, under ISO 8434-2/SAE J514
(3) To be used only for ORFS fittings according to ISO 8434-3/SAE J1453
(4) CAST S.p.A., by its own technical choice, manufactures the pipe seat 042L with tolerance B11..

PRESSURE CALCULATIONS

The pressure calculation with static stress is carried out in accordance with DIN 2413-I with unit yield strength K= 235N/mm2.
For pipes with an outer/inner diameter ratio >1.35 the calculation is carried out according to DIN 2413-III, but with unitary yield strength K= 235N/mm2.
The dynamic stress pressure calculation is carried out according to DIN 2413-III with permanent fatigue strength K= 226N/mm2.
Safety factors S=1.5
Reduction coefficient c= 0.8 for 4mm Ø pipe, c= 0.85 for 6-8mm Ø pipe, c= 0.9 for >8mm Ø pipe.
Corrosion: no correction factor is taken into account for the pressure calculation.

STAINLESS STEEL PIPES TO BE USED FOR ALL SERIES

• For stainless steel pipes we recommend using calibrated and polished pipes, cold drawn without welding, in material 1.4571 according to EN 10216-5 table 6, or ASTM 269, with dimensional tolerances according to EN 10305-1.
• The maximum permissible hardness measured on the external diameter of the pipe is 85 HRB.
• The pressures given in the table below are generally valid with a constant load and a temperature between -60°C and +200°C.

Ø Tube mm	Tolerance EN 10305-1 mm	Thickness mm	Static DIN 2413-I pressure [bar]	Weight Kg/m
4	±0,08	0,5	326	0,048
4		1	544	0,076
6	±0,08	1	406	0,125
6		1,5	572	0,169
6		2	721	0,200
8	±0,08	1	347	0,225
8		1,5	449	0,244
8		2	572	0,301
8		2,5	686	0,344
10	±0,08	1	294	0,225
10		1,5	389	0,319
10		2	498	0,401
10		2,5	601	0,469
10		3	694	0,526
12	±0,08	1 (1)	245	0,275
12		1,5	368	0,394
12		2	426	0,500
12		2,5	516	0,595
12		3	601	0,676
12		3,5	679	0,745
14	±0,08	1,5	315	0,469
14		2	420	0,601
14		2,5	452	0,720
14		3	529	0,826
14		3,5	601	0,920
15	±0,08	1,5	294	0,507
15		2	392	0,651
15		2,5 (3)	426	0,782
15		3	498	0,902
16	±0,08	1 (3)	183	0,373
16		1,5 (2-3)	275	0,544
16		2	368	0,702
16		2,5	402	0,845
16		3	471	0,977
18	±0,08	1 (3)	163	0,423
18		1,5 (1)	245	0,619
18		2	326	0,801
18		2,5	409	0,971
18		3	426	1,128
18		4 (3)	544	1,401

Ø Tube mm	Tolerance EN 10305-1 mm	Thickness mm	Static DIN 2413-I pressure [bar]	Weight Kg/m
20	±0,08	2 (2-3)	294	0,902
20		2,5	368	1,095
20		3	389	1,277
20		3,5	444	1,446
20		4	498	1,602
22	±0,08	1,5 (3)	200	0,764
22		2 (1)	267	1,001
22		2,5	334	1,220
22		3	401	1,427
22		4 (3)	459	1,802
22		5 (3)	555	2,402
25	±0,08	2 (1)	236	1,151
25		2,5	294	1,408
25		3	352	1,653
25		4	411	2,104
25		4,5	456	2,310
25		5 (3)	498	2,490
28	±0,08	2 (1)	210	1,301
28		2,5	263	1,596
28		3	315	1,878
28		4 (3)	420	2,403
28		5 (3)	452	2,878
30	±0,08	2 (2-3)	175	1,402
30		2,5	245	1,721
30		3	294	2,028
30		4	392	2,604
30		5 (3)	426	3,110
32	±0,15	3 (3)	275	2,177
32		4 (3)	368	2,803
32		5 (3)	403	3,378
35	±0,15	2 (1)	168	1,652
35		2,5	210	2,034
35		3	252	2,403
35		4	336	3,104
38	±0,15	3 (2-3)	232	2,628
38		4	310	3,405
38		5	387	4,131
42	±0,2 (4)	3	210	2,929
42		4	280	3,806

(1) Pipes to which the reinforcement bushing must be fitted, only for fittings according to ISO 8434-1/DIN 2353
(2) For use with 37° fittings only, under ISO 8434-2/SAE J514
(3) To be used only for ORFS fittings according to ISO 8434-3/SAE J1453
(4) CAST S.p.A., by its own technical choice, manufactures the pipe seat 042L with tolerance B11.

PRESSURE CALCULATIONS

The pressure calculation with static stresses is carried out in accordance with DIN 2413-I with unit yield strength K= 245N/mm2.
For pipes with an outer/inner diameter ratio of >1.35, the calculation is carried out according to DIN 2413-III, but with unitary yield strength K= 245N/mm2.
Pressures with dynamic stresses according to DIN 2413-III are not shown because the K-value of the permanent fatigue stress is not given in UNI EN 10216-5.
We recommend for the calculation according to DIN 2413-III to assume a K-value = 190N/mm2.
Safety factor S= 1.5 Reduction factor c= 0.9.
Corrosion: no correction factor is taken into account for the pressure calculation.
• Insufficient thickness of the pipe wall or the pipes' lack of transverse rigidity (particularly malleable steel) can create problems with the ring being clinched to the pipe, resulting in leakage and a drastic weakening of the safety factor. This latter aspect must also be taken into account when selecting the pipes to be used. A good rule of thumb is to ensure that the sag (constriction on the inner Ø of the pipe) does not exceed 3/10 of a mm up to the outer Ø of 16 mm and 4/10 of a mm in larger sizes.

OPINIONS ON CHEAP STEEL PIPES

Forty years in business, tens of thousands of systems built with our connection fittings all over the world and one billion fittings produced, allow us to make a considered and objective assessment of a subject that is currently on the agenda of users of hydraulic connection fittings.

Today, there is an undeniable need to contain industrial costs. Cast is well aware of this because it is a problem that affects all companies in the industry, whether they are manufacturers of components or build complex hydraulic systems.
But there is also a duty that goes beyond any legitimate economic need, and that is called "Safety", which cannot be renounced for any reason. We must therefore rationalise costs without, however, lowering safety parameters, whether standardised or not, which are the only guarantors of the correct operation of installations without exposing people, the environment and property to risks other than those intrinsic to the system.

In order to properly implement the above, you must have an in-depth knowledge of the function of clinching and sealing of the different standards and types of high-pressure hydraulic fittings.
The DIN 2353 fitting is a mechanical joint of the cutting ring type which is clinched onto a high quality steel pipe.

In order to ensure that the cutting ring is properly clinched to the carbon steel pipe, it is imperative to use calibrated, weld-free cold-drawn pipes, standardised with inert gas, made of material E235 according to EN10305-4 (ST 37.4 according to DIN 1630 - DIN 2391). The maximum permissible hardness measured on the external diameter of the carbon steel pipe is 75 HRB.
In order to ensure that the cutting ring is properly clinched onto the stainless steel pipe, it is imperative to use calibrated and polished, weld-free, cold-drawn pipes made of material 1.4571, according to EN 10216-5 or ASTM A 269, with dimensional tolerances according to EN 10305-1. The maximum permissible hardness measured on the external diameter of the stainless steel pipe is 85 HRB.

Using quality steel pipes is not simply compliance with the standard, it is an essential duty determined by the design of the DIN 2353 fitting itself, without which the pipe-ring joint system cannot function and thus will not be compliant.

If for any reason the pipe is not structured (wall too thin), it must be replaced with a compliant pipe, or a reinforcing bushing must be inserted at the end of the pipe. There can be no alternatives, the pipe must be able to withstand the "thrust" of the cutting ring during the clinching phase; an intrinsic feature of the DIN 2353 design, from which there can be no derogation.

A second characteristic that the steel pipe must absolutely have is total compliance with the "maximum permitted hardness" on the external diameter of the pipe itself because, if this value is exceeded even in the slightest, the cutting ring may not incise the pipe correctly but slide over it without achieving proper clinching between the pipe and the cutting ring, thus creating a non-compliant connection that must be rejected.

A third essential characteristic of the steel pipe is geometric homogeneity; the thickness of its wall must be uniform and there must be no ovalization on the external diameter of the steel pipe.
As can be seen from the above, the technical and functional characteristics of steel pipes used in high-pressure hydraulic systems with DIN2353 fittings are different and all "imperative", since the lack of even just one of them can affect the functionality of the connection, thus rendering it non-compliant.

These are the objective reasons that explain why you must use quality pipes. If the steel pipe does not meet the required characteristics, then knowing which brand of fitting you intend to use in building the system is unimportant, because the connection will not be compliant whatever fitting is used. Upon this there can be no doubts.

The assembly of DIN 2353 connections must be carried out in accordance with ISO 8434-1 (formerly DIN 3859-2). This is a very important operation that must be carried out in a skilled manner by properly trained personnel holding a diploma issued by a company within the industry, an organisation or a school qualified in the field of hydraulic systems. Cast issues the diploma referred to above.
Those who carry out pre-assembly and assembly of high-pressure hydraulic fittings must be aware that if they do not meticulously follow the precise stipulations indicated by the standard and by the manufacturer of the DIN 2353 fitting, they can cause serious accidents, with human casualties and serious damage to the environment and property. For this reason, all clinches must be 100% tested as prescribed by ISO 8434-1 (formerly DIN 3859-2).

The increasing tendency on the part of hydraulic technicians to use poorly structured stainless steel pipes, in derogation of the values required by the standard, prompted us, in 2002, to design, test and industrialise a single-cutting stainless steel ring called "BP" with working pressure according to DIN 2353 - ISO 8434-1, which is perfectly interchangeable with all rings (Italian and foreign) produced to the same standard. In 2016, again with a view to continuous improvement, a new single-cutting ring project called "B6" was developed, which thanks to its features intrinsic in the use of poorly structured, electro-united stainless steel pipes, completely replaced the "BP" ring, whose supplies were finished, and was no longer produced.

The installation instructions and related requirements are identical for B3 - B4 - B6. The B6 ring, thanks to its special geometry and heat treatment, reduces the thrust of the ring's cutting edge on poorly structured stainless steel pipe, facilitates the penetration of the ring's cutting edge on the outer diameter of the stainless steel pipe and limits, as far as possible, the radius of the pipe, thus achieving good clinching between pipe and ring and still ensuring the necessary seal for the correct functioning of the joint system.

The main differences between ring B6 and B3 are: lighter ring structure; single-cutting edge instead of double-cutting edge, the acute-angle cutting edge instead of the obtuse-angle cutting edge of B3. The "B6" single-cutting edge ring has already solved a number of problems for users struggling with non-compliant and poorly structured stainless steel pipes. In order to use non-compliant, poorly structured pipes on DIN 2353 connections, a "feasibility opinion" must be issued by the manufacturer of the DIN 2353 fittings used in the system; without this approval, the system cannot be wired.

In order to issue a "feasibility opinion", the manufacturer of DIN 2353 fittings is obligated to carry out practical assembly, static tightness and dynamic tightness tests to check whether, despite the use of a non-compliant pipe, there are still safety parameters broad enough to guarantee the functionality of the system, even in the presence of small anomalies that almost always exist at production or industrial performance level.

Unfavourable tolerance cross-overs, small differences in materials, flimsy assemblies, small anomalies in treatment processes, lack of uniformity in lubrication, etc. are some of the critical factors to be monitored. Without a "feasibility opinion" from the fittings manufacturer in accordance with DIN 2353 used in the system, no steel pipes may be used that do not fully comply with the parameters of the standard and the requirements of the fittings manufacturer. The "feasibility opinion" only concerns the individual installation whose technical and functional characteristics have been examined, and no other application not authorised in writing.

As far as the general context is concerned, we would like to make it very clear that, notwithstanding our willingness to look for technical solutions to solve user and market requirements, Cast S.p.A.'s position on the use of DIN2353 fittings has always been the following: whoever uses this type of product, whatever the system and the relative operating performance required, it is "compulsory" that they all comply with the requirements of the standard and those of the fittings manufacture, with no licenses or exceptions.

Without a "feasibility opinion" issued by the fittings manufacturer, products that do not comply with the standard requirements may not be used on the system. Whoever knowingly decides not to comply with this "obligation" assumes responsibility for the invalidity of all product warranties and will be jointly and severally liable for all consequences in the event of an accident or damage.

CLEANING THE FITTINGS

Cast S.p.A., within the context of “Continuous Improvement”, has developed an operating system to avoid contamination from dust or processing residues that could in any way compromise the cleanliness of the component and its functionality.
The system consists of a large number of machines, which automatically control pre-set parameters, entered into the computer system of each individual machine.

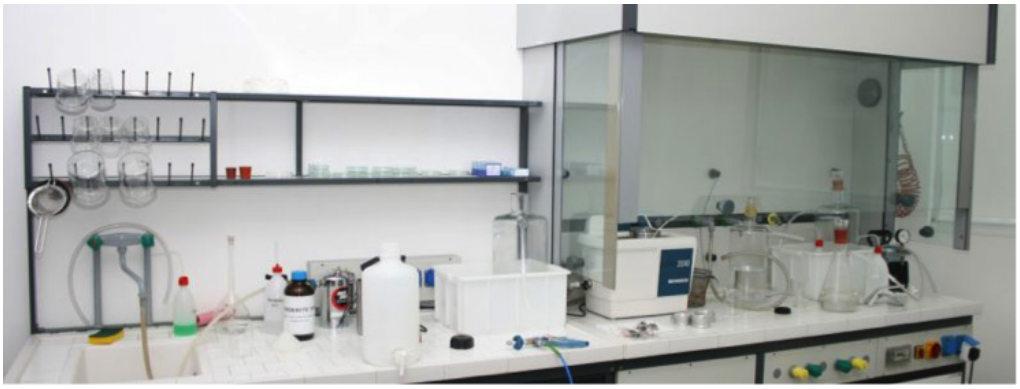
In a nutshell, the parameters to be observed are as follows: check the passage holes, which must be free of any impurities, check the threads, which must not have any burrs that could pollute the circuit fluids, check the correct positioning of the gaskets and the absence of dust, burrs or machining scraps.

In order to maintain the cleanliness of the components, as indicated above, the same operating machines that carry out the checks and cleaning of the fittings, also cap the products, thus safeguarding the threads from annoying micro-blemishes and preventing any impurities from entering the treated items at random.

For flexible sleeves and rigid hydraulic-shaped pipes, we recommended flushing before installation on the machine or system.
The reference standards used by Cast S.p.A. to check the cleanliness of its fittings are as follows:
ISO 16232-3 (Cleaning of fluid circuit components, part 3): method for removing contaminants by spraying.
ISO 16323-10 (Cleaning of fluid circuit components, part 10): expression of results.
Test method ISO 16232-3 is used for the extraction of contaminants from hydraulic circuit components; it describes the procedure to be adopted for the extraction of both residual particles from manufacturing processes (metallic particles) and environmental residues (non-metallic particles) by pressure rinsing.

The extracted particles are classified according to their nature (metallic and non-metallic), their size (class A, B, C, etc.), and quantity, and are catalogued according to the ISO 16232-10 standard requirement, in order to determine the contamination level of the component.

Particle counter



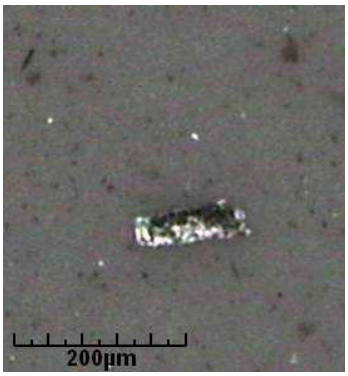
Filtration laboratory

Table 1: particle size coding (ISO 16232-10)

Size classes	Size (µm)
B	5≤ x <15
C	15≤ x <25
D	25≤ x <50
E	50≤ x <100
F	100≤ x <150

Size classes	Size (µm)
G	150≤ x <200
H	200≤ x <400
I	400≤ x <600
J	600≤ x <1000
K	1000≤ x

Particella metallica classe G



Particella metallica classe I

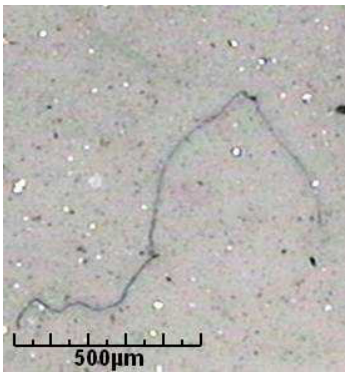


Tabella 2: Cleaning level (ISO 16232-10)

Cleaning level ISO 16232	Number of particles per 100 cm³ or per 1000 cm³	
	Greater	lesser or equa
0	0	1
1	1	2
2	2	4
3	4	8
4	8	16
5	16	32
6	32	64
7	64	130
8	130	250
9	250	500
10	500	1'000
11	1'000	2'000
12	2'000	4'000
13	4'000	8'000
14	8'000	16'000
15	16'000	32'000
16	32'000	64'000
17	64'000	130'000
18	130'000	250'000
19	250'000	500'000
20	500'000	1'000'000
21	1'000'000	2'000'000
22	2'000'000	4'000'000
23	4'000'000	8'000'000
24	8'000'000	16'000'000

The contamination level is expressed as a string, called CCC (cleanliness code of components), which summarises for each particle size range (table 1) the total number of particles found, expressed by the codes in table 2.

Analysis performed on random samples of Cast S.p.A. standard products.
Metallic particles CCC = V (B14/C12/D12/E10/F7/G5/H-K00)
means having found within the analysed samples, respectively:
- between 8,000 and 16,000 particles in sizes between 5 and 14 micron;
- between 2,000 and 4,000 particles in sizes between 15 and 24 micron;
- between 2,000 and 4,000 particles in sizes between 25 and 49 micron;
- between 500 and 1,000 particles in sizes between 50 and 99 micron;
- between 64 and 130 particles in sizes between 100 and 149 micron;
- between 16 and 32 particles in sizes between 150 and 199 micron;
- no particles in sizes above 200 micron.

If other levels of cleaning are required, Cast S.p.A. will meet the request, where possible, updating the quotations according to the specific requirements.

In order to keep process cleanliness under control, Cast S.p.A. currently uses external certified laboratories to carry out contamination tests on its products. Special tests are available upon customer request.

In order to monitor the issue of product contamination more closely, Cast S.p.A. is planning to set up an in-house analysis laboratory, in order to have total testing autonomy; from the extraction phase with rinsing of the fittings, to the preparation of the control filter for reading under the scanning electron microscope.

Gravimetric control scales

Contaminated filter

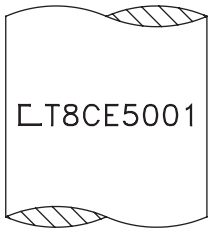
TRACEABILITY MARKS

Cast products are equipped with traceability marks that make it possible to trace back to all the necessary information for establishing: the producer, the production plant, the year of manufacture, the production area, the type of material used and the casting number of the steel used.

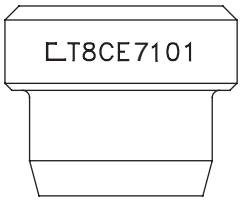
EXAMPLES OF TRACEABILITY MARKS

Mark details from round bars:

Standard Markings:

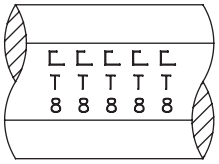


Anello DIN 2353:

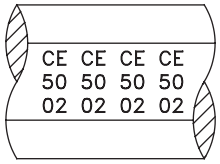


Mark details from hexagonal bars:

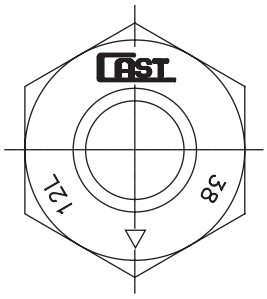
Side 1:



Side 2:

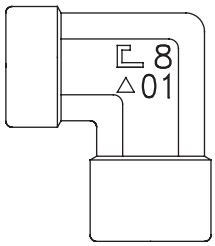


Moulded nuts:

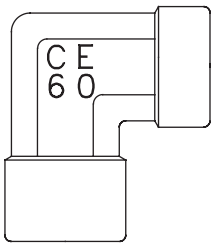


Details from forgings:

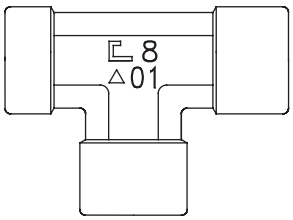
Side 1:



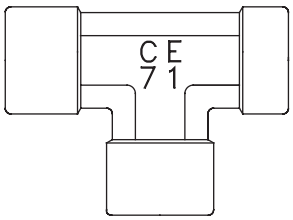
Side 2:



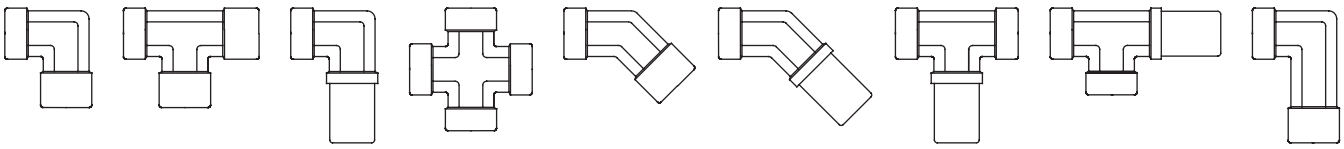
Side 1:



Side 2:

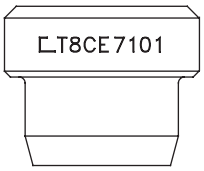


Types of forgings:



DECODING OF TRACEABILITY MARKS

Ring DIN 2353

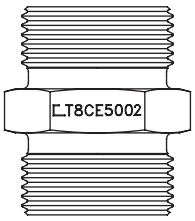


- = Manufacturer
- T = Production plant
- 8 = Year of manufacture
- CE = Production area
- 71 = Type of steel used
- 01 = N° of steel castings used

Nut DIN 2353

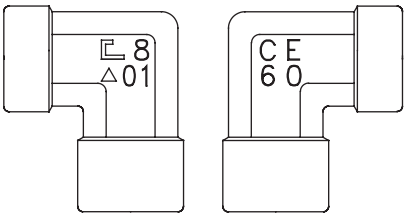
- = Manufacturer
- ▽ = Supplier symbol
- 12L = Pipe dimensions
- 38 = Type of steel used

Straight fitting



- = Manufacturer
- T = Production plant
- 8 = Year of manufacture
- CE = Production area
- 50 = Type of steel used
- 02 = N° of steel castings used

Forged



- = Manufacturer
- 8 = Year of manufacture
- △ = Supplier symbol
- 01 = N° of steel castings used
- CE = Production area
- 60 = Type of steel used

NB.: Any other alphanumeric references engraved on the piece do not concern traceability.

Coding of the year-of-manufacture mark

MARK	1	2	3	4	5	6	7	8	9	0
YEAR OF MANUFACTURE	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

MARK	Y	I	J	L	N	S	U	V	X	Z
YEAR OF MANUFACTURE	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

Every 10 years the identification number of the year of manufacture becomes a letter or vice versa

Coding of manufacturing materials

MARK	DESIGNATION
15	1.0401 (C15) - 1.1140 (C15R) - 1.1141 (C15E)
35	1.0501 (C35) - 1.1180 (C35R)
38	1.0303 (C4C) - 1.0214 (C10C) - 1.0501 (C35) - 1.0503 (C45) – C43
45	1.0038 (S235JR) - 1.0114 (S235J0) - 1.0117 (S235J2)
50	11SMnPb37/30 - 11SMn37/30
60	28SMnPb28 (PR60)
80	36SMnPb14 (PR80)
01	X5CrNiMo17-12-2 - 1.4401 (AISI 316)
04	X2CrNiMo17-12-2 - 1.4404 (AISI 316L)
05	X8CrNiS18-9 - 1.4305 (AISI 303)
07	X2CrNi18-9 - 1.4307 (AISI 304L) ; X5CrNi18-10 - 1.4301 (AISI 304)
71	X6CrNiMoTi17-12-2 - 1.4571 (AISI 316Ti)

PASSAPORTO RACCORDO

FITTING PASSPORT

ETICA

RICERCA

SVILUPPO

Il passaporto del raccordo CAST S.p.A., documenta con quanta serietà curiamo la certezza dei dati, la qualità del prodotto, la sicurezza dei nostri clienti, la sicurezza dell'ambiente e la sicurezza della conformità.

I marchi di rintracciabilità riportati su ogni singolo prodotto, ci permettono di risalire a tutti i dati storici costruttivi del manufatto, ed essere sempre in condizione di rispondere alle legittime domande che l'utilizzatore ci può porre sui materiali utilizzati, sulle conformità rilevate, sull'età del prodotto esaminato, in che stabilimento è stato prodotto e con che macchina è stato realizzato.

Tutta la documentazione prodotta è archiviata e conservata per dieci anni più uno ed è a disposizione del cliente che ne faccia regolare richiesta presso il Controllo Qualità CAST S.p.A.

The CAST SpA fitting passport, documents how seriously we take care of the certainty of data, product quality, healt and safety of conformity.

The marks given to each product traceability, allow us to retrace all the historical data construction of the building, and be able to answer the legitimate questions that the user can put us on the materials used, the compliance reported, on 'age of the product examined, in that plant and machinery that has been made.

All the documentation is filed and kept for ten years and is available to a customer who makes a regular request from the CAST Quality Control.

CAST® SpA

PER UN CONTINUO MIGLIORAMENTO

FOR A CONSTANT IMPROVEMENT

SEDE LEGALE, COMMERCIALE E MAGAZZINO: CAST S.p.A. - Strada Brandizzo 404/408 bis - 10088 Volpiano (TO) – ITALIA
TEL. +39 011 9827011 – FAX +39 011 9827025
SEDE PRODUTTIVA: Via Regione Gamna – 12030 Casalgrasso (CN) – ITALIA
www.cast.it - cast@cast.it

PASSAPORTO RACCORDO

FITTING PASSPORT

SICUREZZA

QUALITA'

AFFIDABILITA'

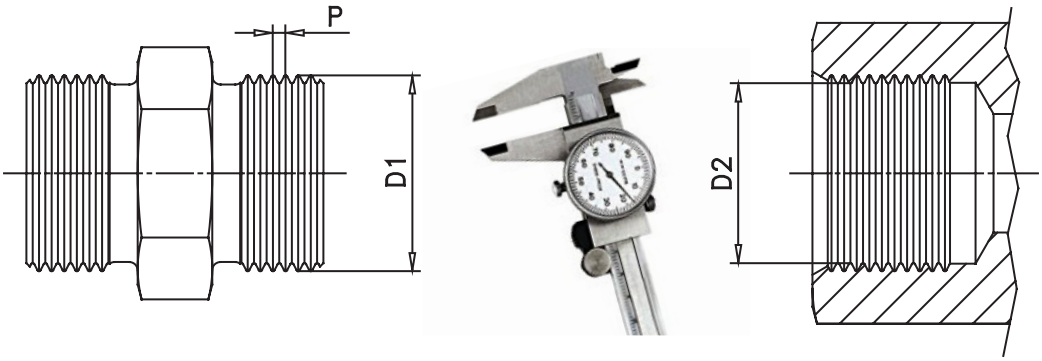
Codice raccordo:	404305
Nazionalità:	Italiana
Tipo di acciaio :	☐ Austenitico - Cert. 3.1 ☐ ☐ Carbonio - Cert. 3.1 ☐
Tipo di trattamento Superficiale	Zincatura bianca trivalente
Norme costruttive di fabbricazione	ISO 8434-3 ; SAE J1453
Anno di fabbricazione:	2013 Lotto Fabbr. Nr. 123456
Stabilimento produttivo:	Casalgrasso (CN)
Macchina utilizzata:	CNC n°4
Collaudo sostenuto:	Secondo norma UNI ISO 2859/1
Conformità rilevata:	Nessuna anomalia
Compilatore:	R.S.G.Q
Controllo documento:	R.S. PRODOTTO
Cliente richiedente:	

Rilasciato da CAST STRADA BRANDIZZO 406/408
10088 Volpiano, Torino – ITALIA Tel: +39.011.9827011 - www.cast.it

In data: 01/12/2019 Direzione:

Nr. documento: 19/0001

CYLINDRICAL THREADING



CYLINDRICAL GAS THREAD ISO 228

Thread	Ø External D1	Ø Internal D2	Pass P
G 1/8	9,62	8,71	0,91
G 1/4	13,03	11,67	1,34
G 3/8	16,54	15,17	1,34
G 1/2	20,81	18,90	1,81
G 5/8	22,77	20,86	1,81
G 3/4	26,30	24,39	1,81
G 1	33,07	30,61	2,31
G 1.1/4	41,73	39,27	2,31
G 1.1/2	47,62	45,17	2,31
G 2	59,43	56,98	2,31

THREADING UNF/UNS/UN ASME B1.1

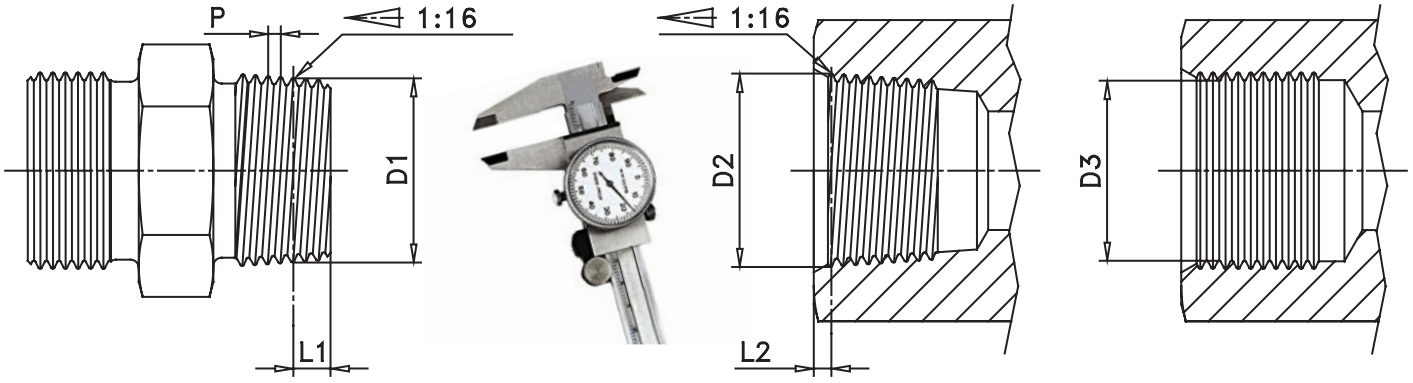
Thread	Ø External D1	Ø Internal D2	Pass P
7/16-20 UNF-2A	10,98	9,88	1,27
1/2-20 UNF 2A	12,56	11,47	1,27
9/16-18 UNF-2A	14,14	12,92	1,41
11/16-16 UN-2A	17,31	15,93	1,59
3/4-16 UNF-2A	18,89	17,5	1,59
13/16-16 UN-2A	20,48	19,1	1,59
7/8-14 UNF-2A	22,05	20,47	1,81
1-14 UNS-2A	25,23	23,64	1,81
1.1/16-12 UN-2A	26,8	24,92	2,12
1.3/16-12 UN-2A	29,97	28,09	2,12
1.5/16-12 UN-2A	33,15	31,27	2,12
1.7/16-12 UN-2A	36,32	34,44	2,12
1.5/8-12 UN-2A	41,08	39,22	2,12
1.11/16-12 UN-2A	42,67	40,79	2,12
1.7/8-12 UN 2A	47,43	45,57	2,12
2-12 UN-2A	50,61	48,74	2,12
2.1/2-12 UN-2A	63,31	61,44	2,12

METRIC CYLINDRICAL THREADING ISO/R 262

Thread	Ø External D1	Ø Internal D2	Pass P
M6x1	5,88	5,04	1
M8x1	7,88	7,04	1
M10x1	9,88	9,04	1
M12x1	11,88	11,04	1
M12x1,5	11,85	10,53	1,5
M14x1,5	13,85	12,53	1,5
M16x1,5	15,85	14,53	1,5
M18x1,5	17,85	16,53	1,5
M20x1,5	19,85	18,53	1,5
M22x1,5	21,85	20,53	1,5
M24x1,5	23,85	22,53	1,5
M26x1,5	25,85	24,53	1,5
M27x2	26,82	25,02	2
M30x1,5	29,85	28,53	1,5
M30x2	29,82	28,02	2
M33x2	32,82	31,02	2
M36x2	35,82	34,02	2
M38x1,5	37,85	36,53	1,5
M42x2	41,82	40,02	2
M45x1,5	44,85	43,53	1,5
M45x2	44,82	43,02	2
M48x2	47,82	46,02	2
M52x2	51,82	50,02	2

Note:
The values shown in the tables are in the middle of the tolerance

CONICAL THREADING



GAS CONICAL THREADING DIN 3858

GAS Thread	Ø External D1	Ø Internal		Measuring plan		PASS P
		D2	D3	L1	L2	
1/8	9,73	-	8,71	3	-	0,9
1/4	13,16	-	11,67	4,5	-	1,3
3/8	16,66	-	15,17	4,5	-	1,3
1/2	20,96	-	18,90	5	-	1,8
3/4	26,44	-	24,39	6	-	1,8
1	33,25	-	30,61	7	-	2,3
1.1/4	41,91	-	39,27	7,5	-	2,3
1.1/2	47,80	-	45,17	7,5	-	2,3

GAS CONICAL THREADING UNI EN 10226-1/-2 (formerly DIN 299, ISO 7)

GAS Thread	Ø External D1	Ø Internal		Measuring plan		PASS P
		D2	D3	L1	L2	
1/8	9,73	8,71	8,71	4	0,45	0,9
1/4	13,16	11,67	11,67	6	0,65	1,3
3/8	16,66	15,17	15,17	6,4	0,65	1,3
1/2	20,96	18,90	18,90	8,2	0,9	1,8
3/4	26,44	24,39	24,39	9,5	0,9	1,8
1	33,25	30,61	30,61	10,4	1,15	2,3
1.1/4	41,91	39,27	39,27	12,7	1,15	2,3
1.1/2	47,80	45,17	45,17	12,7	1,15	2,3
2	59,61	56,98	56,98	15,9	1,15	2,3

METRIC CONICAL THREADING DIN 158-1

Thread	Ø External D1	Ø Internal		Measuring plan		PASS P
		D2	D3	L1	L2	
M8x1 Keg	7,88	-	7,04	2,5	-	1
M10x1 Keg	9,88	-	9,04	2,5	-	1
M12x1,5 Keg	11,85	-	10,53	3,5	-	1,5
M14x1,5 Keg	13,85	-	12,53	3,5	-	1,5
M16x1,5 Keg	15,85	-	14,53	3,5	-	1,5
M18x1,5 Keg	17,85	-	16,53	3,5	-	1,5
M20x1,5 Keg	19,85	-	18,53	3,5	-	1,5
M22x1,5 Keg	21,85	-	20,53	3,5	-	1,5
M27x1,5 Keg	26,85	-	25,53	3,5	-	1,5
M33x1,5 Keg	32,85	-	31,53	4,5	-	1,5
M42x1,5 Keg	41,85	-	40,53	4,5	-	1,5
M48x1,5 Keg	47,85	-	46,53	4,5	-	1,5

THREADING NPT ANSI/ASME B1.20.1

Thread	Ø External D1	Ø Internal		Measuring plan		PASS P
		D2	D3	L1	L2	
1/8	10,24	8,74	-	4,1	1,13	0,9
1/4	13,62	11,36	-	5,8	1,57	1,4
3/8	17,06	14,80	-	6,1	1,55	1,4
1/2	21,22	18,32	-	8,1	1,94	1,8
3/4	26,57	23,67	-	8,6	1,97	1,8
1	33,23	29,70	-	10,2	2,35	2,2
1.1/4	41,98	38,45	-	10,7	2,37	2,2
1.1/2	48,05	44,52	-	10,7	2,34	2,2
2	60,09	56,56	-	11,1	2,37	2,2

Note:
The values shown in the tables are in the middle of the tolerance

REQUIREMENTS TO BE RESPECTED FOR ALL SERIES

- Use only CAST products and components to make the desired connection within the same cabling in order to avoid disputes and damage to property and persons.
- Fully apply the general instructions, rules of use, safety factors, assembly instructions and operating pressures of the fitting to be used in the installation.
- Strictly adhere to the specified temperature range, the associated pressure variations and remain within the prescribed values in bars.
- Observe the specified tightening values and the detailed, stipulated assembly instructions.
- Lubricate all components with the products as indicated in the assembly instructions.
- Carbon steel pipes must be preassembled before assembling on the machine. On-site assembly is not permitted.
- Stainless steel pipes must be preassembled or flared with hardened tools before assembly on the machine. On-site assembly is not permitted.
- Only use carbon steel and stainless steel pipes, as referred to on pages 36 and 37.
- Use reinforcement bushings on all thin-walled steel pipes.
- The coupling of carbon and stainless components is not recommended.
- Always check that all components to be used are free from defects.
- Always check the correct alignment of the system; pipes, connections and actuators.
- Always visually check that the ring is correctly clinched onto the pipe. Mandatory!
- Ensure a 100% check of the radius of the fitting hole (insert) with the prescribed “P-NP” plugs to ensure that the pipe, insert and bushing are properly seated, for series 80……
- Use of non-compliant pipes, fittings or connections is not permitted.
- It is not permitted to alter CAST products in any way.
- All instructions in the Technical Sales Catalogue and the current 2021 Technical Bulletin must be strictly observed.
- If in doubt, always follow the principle of utmost caution.

Failure to comply with any of the above stipulations may impair the functional safety of the products and lead to the loss of all claims and rights under guarantee.

It is not permitted to mix and use components from different hydraulic fitting manufacturers. Company and traceability marks on the product are key.

The user is not permitted to carry out modifications or repairs on the hydraulic fittings we manufacture. Should the user fail to comply with the foregoing, it will thus assume all responsibility for its actions and any damage caused to the environment, people and property.

Fluids under pressure can cause serious damage to people and property, therefore always exercise the utmost caution, ensure full compliance with regulations and follow the precautionary principle of prudence for yourself and others in order to avoid any accidents.

The use of non-compliant components (pipes, fittings, etc.) is prohibited.

PRODUCT RESPONSIBILITY FOR ALL SERIES

Presidential Decree 224 - EEC 85/347 states: “...liability shall be charged to the party found to have been negligent.... “.
In practical terms, the manufacturer shall only be held legally liable if the product is actually defective in design or execution/production, due to negligence or intent.
On the other hand, the distributor making the sale must have ensured that its customer is actually aware of all the technical issues relating to the product, such as the assembly instructions, and that it is used for the correct applications.
Similarly, the End-User shall be held liable if, through negligence, carelessness or wilful misconduct, it has not scrupulously followed the Manufacturer’s written stipulations (Technical Sales Catalogue) that must be provided as technical support by the Distributor who sold the product. Should you not be in possession of one, you can request it directly from our offices, which will provide it. By virtue of this law, CAST S.p.A. declines any and all responsibility if the user does not strictly and fully apply the GENERAL INSTRUCTIONS, OPERATING STANDARDS, SAFETY FACTORS, ASSEMBLY INSTRUCTIONS and OPERATING PRESSURES, as well as any other technical information clearly indicated in our Technical Sales Catalogue, and/or if the product has been modified or altered other than by CAST S.p.A. Failure to comply with these mandatory stipulations, or any modifications made, may alter the functional safety of the products and cause the loss of any rights under guarantee. In accordance with the aforementioned regulations, an excess of EUR 500.00 applies.

GOOD RELATIONSHIPS CREATE A NETWORK OF TRUST

Our desire is to leave the world a better place than we found it.

Source: new interpretation of the painting "The Fourth State" by Pelizza da Volpedo hanging in our facility in Volpiano (TO)

FORMAZIONE MONTATORE SPECIALIZZATO

Assembler specialist training

La Cast S.p.A. mette a disposizione della clientela i suoi tecnici docenti, per la formazione del personale addetto all'utilizzo delle proprie produzioni.

Il corso di formazione per cablatori, montatori e addetti alla manutenzione è composto di due sessioni, una teorica di otto ore e una pratica di sedici ore.

Al superamento del corso, verrà rilasciato dalla Cast S.p.A. un certificato di abilitazione al montaggio e all'utilizzo delle proprie produzioni.

The Cast S.p.A. makes available to its customers technical teachers, for the training of personnel involved in the operation of its productions.

The training course for pipes assembly and maintenance staff consists of two sessions, a theoretical session of eight hours and a practical one of sixteen hours.

Completing successfully the course, will be released by Cast S.p.A. a certificate of qualification as assembler and user of its products.

FORMAZIONE DOCENTE MONTATORE

Teacher assembler training

Il corso di formazione per i docenti che devono formare i cablatori, i montatori e gli addetti alla manutenzione è composto da due sessioni, una teorica di sedici ore e una pratica di ventiquattro ore.

Al superamento del corso, verrà rilasciato dalla Cast S.p.A. un diploma di abilitazione alla formazione degli addetti all'utilizzo dei prodotti della Società.

The training of teachers who are to form the pipes assembly and maintenance staff consists of two sessions, a theoretical session of sixteen hours and a practical one of twenty-four hours

Completing successfully the course, will be released by Cast S.p.A. an agreement to be a teacher for assemblers and users of Company's products.

I corsi devono essere concordati con Cast S.p.A., in termini di numero di partecipanti. La formazione e la documentazione didattica è gratuita mentre le spese di vitto e alloggio sono a carico dei partecipanti.

I corsi saranno svolti nei locali dello stabilimento Cast S.p.A. di Casalgrasso (CN) Italia.

The courses must be agreed with Cast S.p.A., in terms of number of participants. Training and training documentation is free of charge and the cost of meals and lodging are the responsibility of the participants.

The courses will be held in the premises of the factory Cast S.p.A. of Casalgrasso (CN) Italy.

CAST S.p.A.

PER UN CONTINUO MIGLIORAMENTO

FOR A CONSTANT IMPROVEMENT

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TEL. +39 011 9827011 – FAX +39 011 9827025
SEDE PRODUTTIVA: Via Regione Gamna – 12030 Casalgrasso (CN) – ITALIA
www.cast.it - cast@cast.it

ATTESTATO DI / *CERTIFICATE OF*

Nr. M – 12/0001

☒ "MONTATORE SPECIALIZZATO"
"ASSEMBLER SPECIALIST"

☐ "DOCENTE MONTATORE"
"TEACHER ASSEMBLER"

"MONTAGGIO DI RACCORDI CAST AD ALTA PRESSIONE"
"ASSEMBLY OF CAST HIGH PRESSURE FITTINGS "

Secondo norma /*according to:*

ISO 8434-1 ☑ ISO 8434-2 ☑ ISO 8434-3 ☑ ISO 8434-6 ☑ ISO 12151 ☑

EN 853 ☑ EN 855 ☑ EN 856 ☑ EN 857 ☑

Corso di formazione realizzato da: Responsabile Tecnico – R.S.G.I.:
Training developped by: *Technical Manager & Quality:*

A/*To*: Signor: ……
Mister:

Ditta: ……
Company:

Data Emissione: .../.../……
Issued on:

Data Validità: .../.../……
Expiring on:

Responsabile percorso formativo
Responsible training

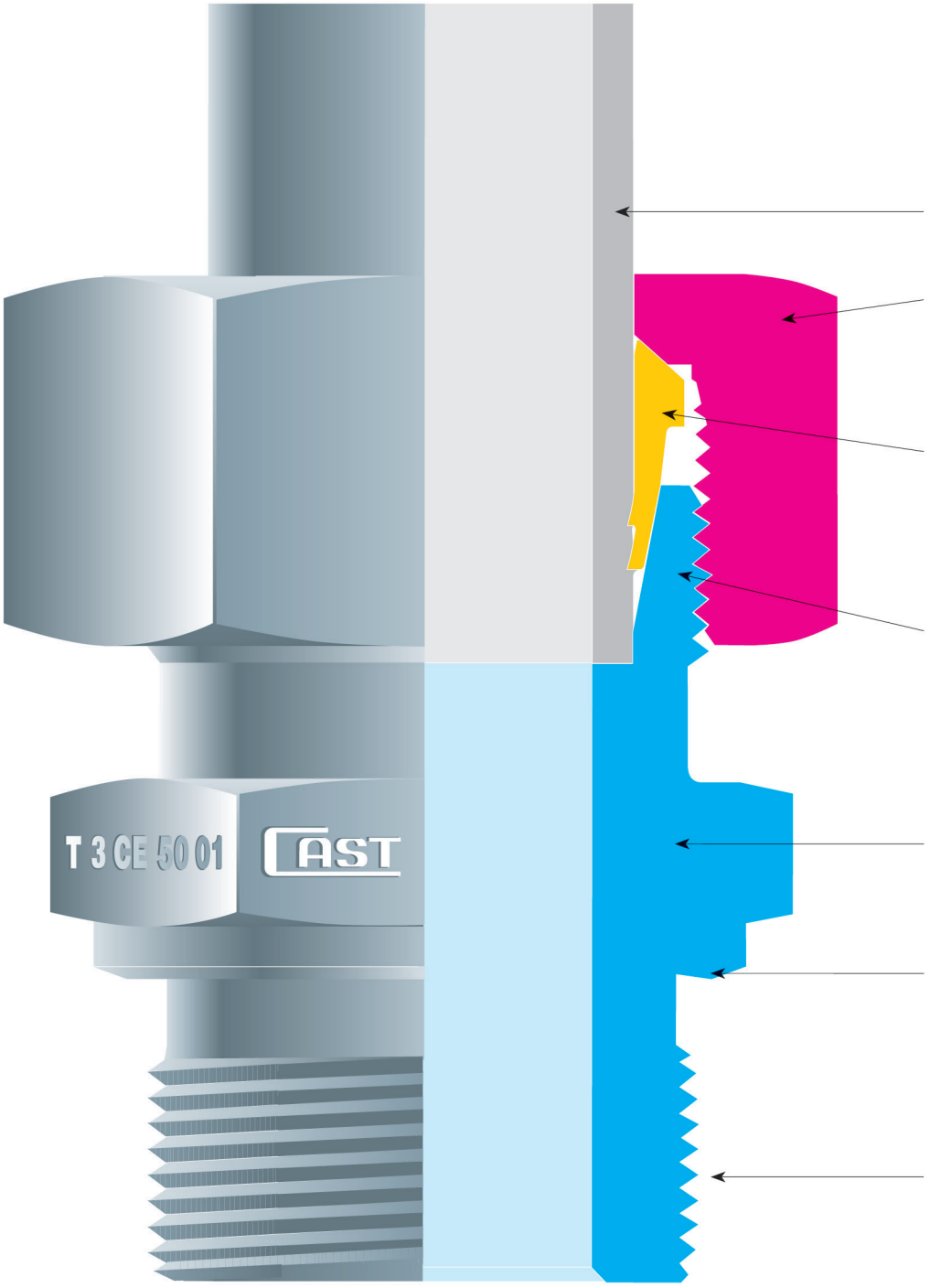
Rilasciato da CAST SpA
10088 Volpiano, Torino – ITALIA

STRADA BRANDIZZO 404/408 bis
Tel: +39.011.9827011 - www.cast.it

In data: .../.../…… Direzione:

ISO 8434-1, DIN 2353 JOINT FOR CUTTING RING

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-1, DIN 2353 WITH B3 CUTTING RING



Reference standards:

Pipe E 235
EN 10305-4

Nut
DIN 3870

Cutting ring
DIN 3861-B

Seat shape
DIN 3861

Fitting body
ISO 8434-1

Metal-to-metal seal seat
ISO 1179-4

Threaded end
ISO 1179-4

PRELIMINARY PRE-ASSEMBLY OPERATIONS ACCORDING TO ISO 8434-1 (formerly DIN 3859-2) VALID FOR «B3-B4-B6» CUTTING RINGS

1. CHECKING INSTRUMENTS TO BE USED

- Before starting the assembly of CAST “B3”, “B4” and “B6” cutting rings, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that do not comply with the manufacturer’s standards and instructions.
- Check the taper of the 24° seat of the hardened pre-assembly block with its 24° plug as shown in the figures below, for every 45-50 pre-assemblies undertaken. Mandatory!

Fig. 1

COMPLIANT 24° SEAT

Holding the plug in line with the hardened block/ indenter, insert the “P” side into the 24° seat.
The “P” side conical end must be fully contained in the seat being checked.

24° P-NP seat checking plug

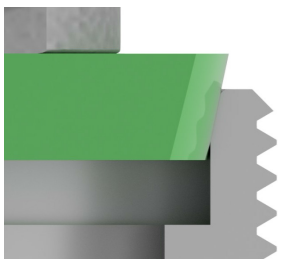
Hardened, pre-assembly block/indenter

Holding the plug in line with the hardened block/ indenter, insert the “NP” side into the 24° seat.
The conical end on the “NP” side must not exceed the edge of the seat being checked.

Fig. 2

NON-COMPLIANT 24° SEAT

This represents a case where the 24° seat is too small. The “P” side does not enter up to the point where it is flush with the block/indenter.



24° P-NP seat checking plug

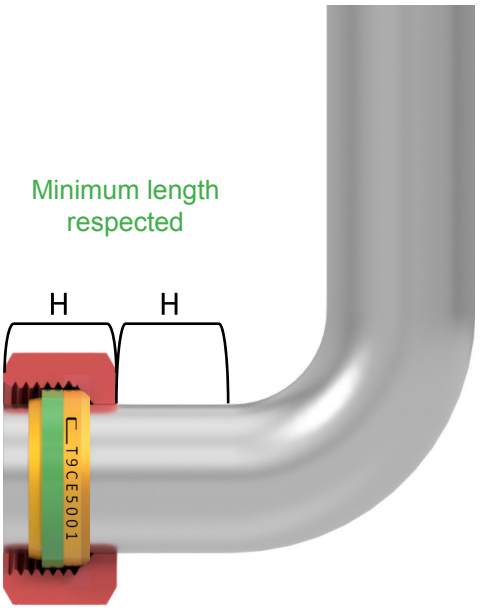
Hardened, pre-assembly block/indenter

This represents a case where the 24° seat is too large. The “NP” side enters beyond the flush point with the block/indenter.

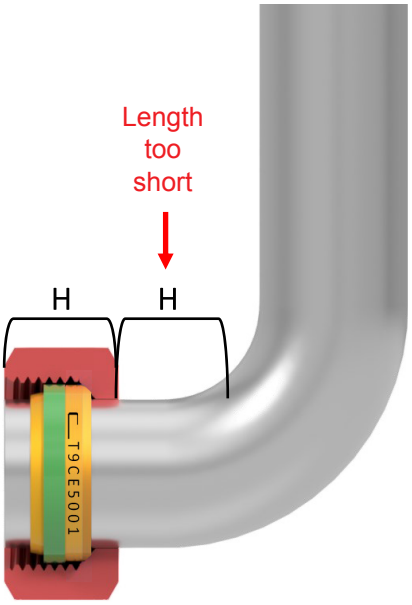
N B: The 24° seat check should always be performed with both sides (P -N P) of the plug.

2. PREPARATION OF THE PIPE VALID FOR B3, B4 AND B6 CUTTING RINGS

• The straight pipe segment where pre-assembly is to be carried out must be at least twice the length of the nut (lengthH). The roundness of the pipe must comply with EN 10305

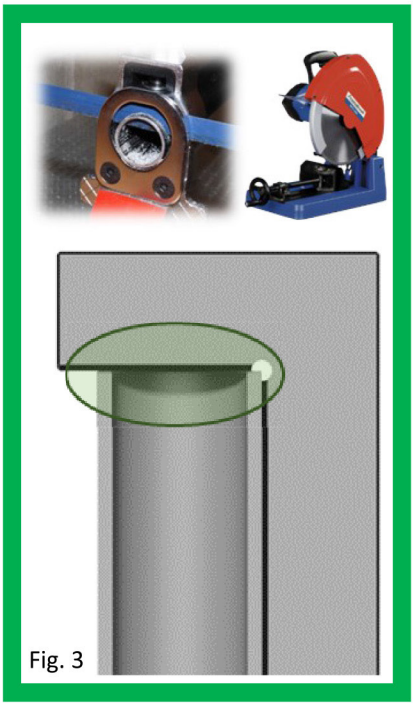


COMPLIANT

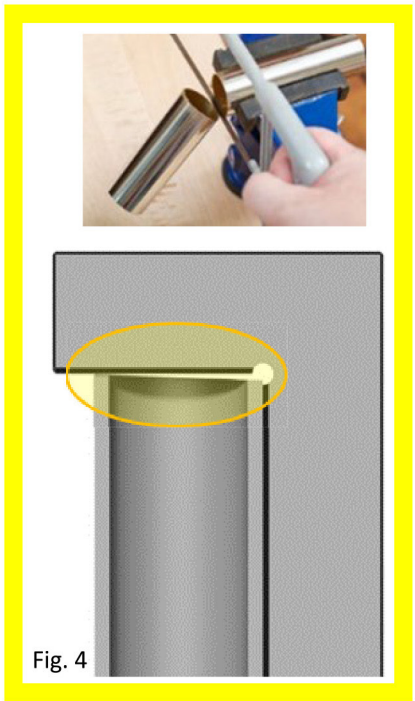


NON-COMPLIANT

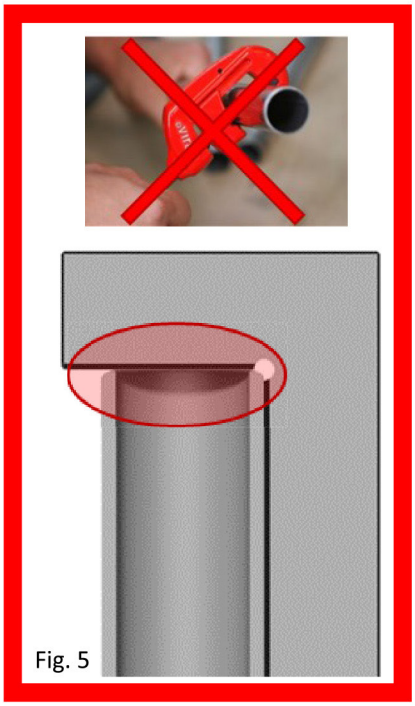
• Cut the pipe with the appropriate hacksaw (fig. 3 and 4) and do not use a roller pipe-cutter (fig. 5). Check that the cut has been made correctly at 90°. Lightly remove internal and external burrs with the deburring tool and remove internal and external processing residues.



COMPLIANT



COMPLIANT



NON-COMPLIANT

3. LUBRICATING COMPONENTS

Before starting pre-assembly, lubricate the 24° conical seat and the thread of the pre-assembly block, the cutting ring, the thread and the contact surface of the thrust nut with the cutting ring, with appropriate products for carbon steel and stainless steel.

4. PREPARING COMPONENTS

Only fit the nut and ring on the pipe with the head of the ring (larger diameter with stamped markings) facing towards the inside of the thrust nut (see Fig. 6).
DO NOT fit the cutting ring to the pipe with the head of the ring (larger diameter) facing the outside of the thrust nut, as this is absolutely not compliant (see fig. 7).

A compliant installation performed as shown in Figure 6 ensures the high performance and safety standards of the 24° DIN system.

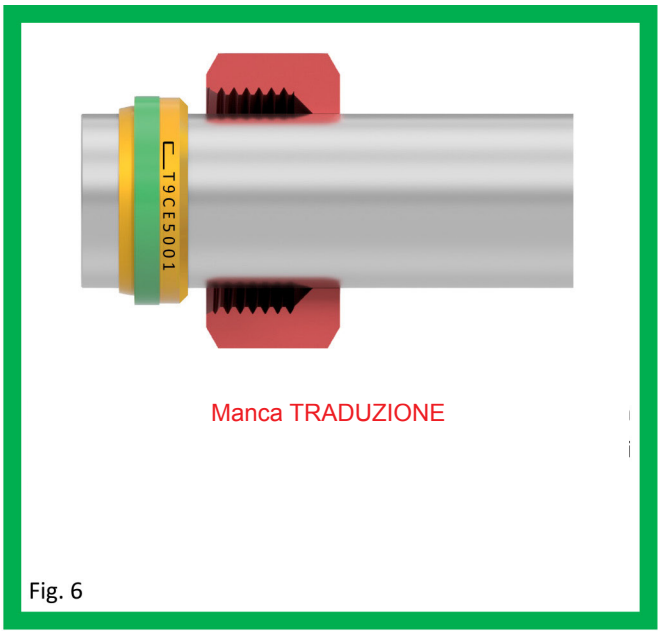


Fig. 6

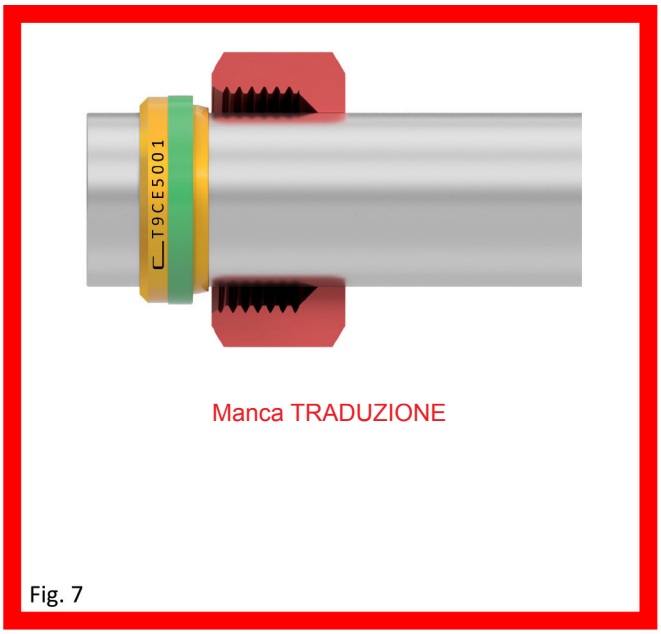


Fig. 7

COMPLIANT

NON-COMPLIANT

To safely identify the largest diameter of the cutting ring, which must face (enter) the inside of the thrust nut (tightening), simply identify the traceability codes incised on the largest diameter of the cutting ring. In other words: “traceability marks = larger diameter of the cutting ring”, which must absolutely always face the inside of the thrust nut.

5. PRE-ASSEMBLY

4), continue with the pre-assembly of the cutting rings B3, B4 and B6 according to the pre-assembly methods chosen from among the following:

• MANUAL PRE-ASSEMBLY ON HARDENED BLOCK (see page 57);

• MANUAL PRE-ASSEMBLY WITH TIGHTENING TORQUES (see page 58);

• MACHINE PRE-ASSEMBLY (see p.60).

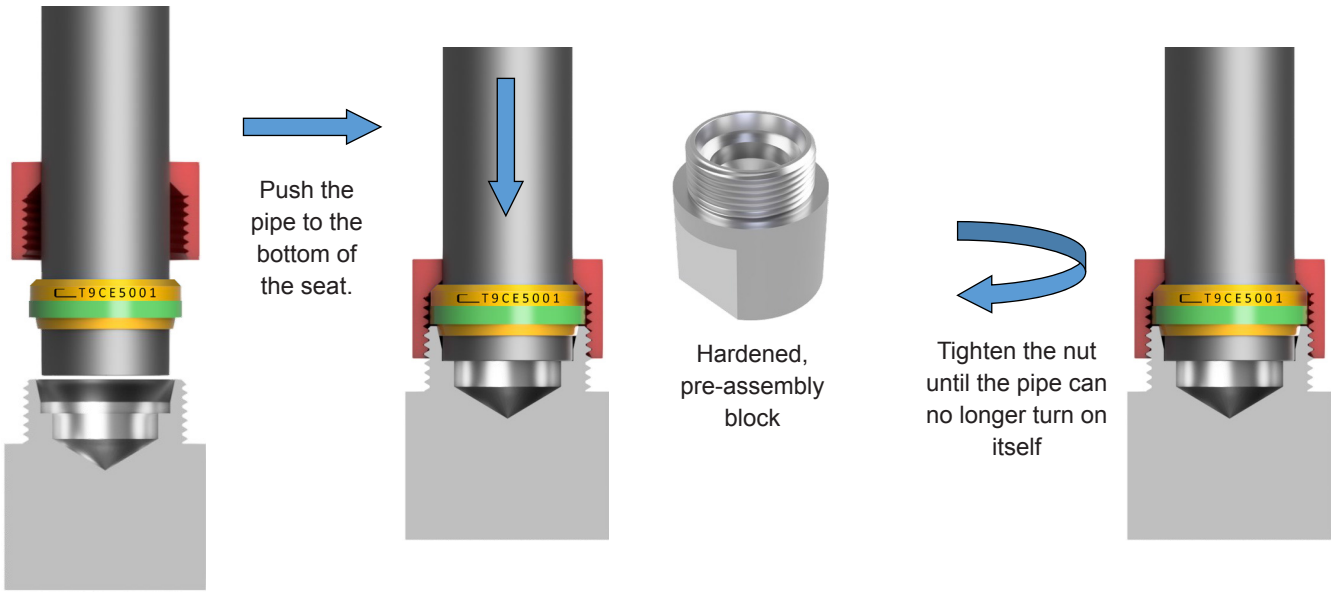
6. CHECKING PRE-ASSEMBLY

A 100% check must be carried out on each type of pre-assembly (see page 62).

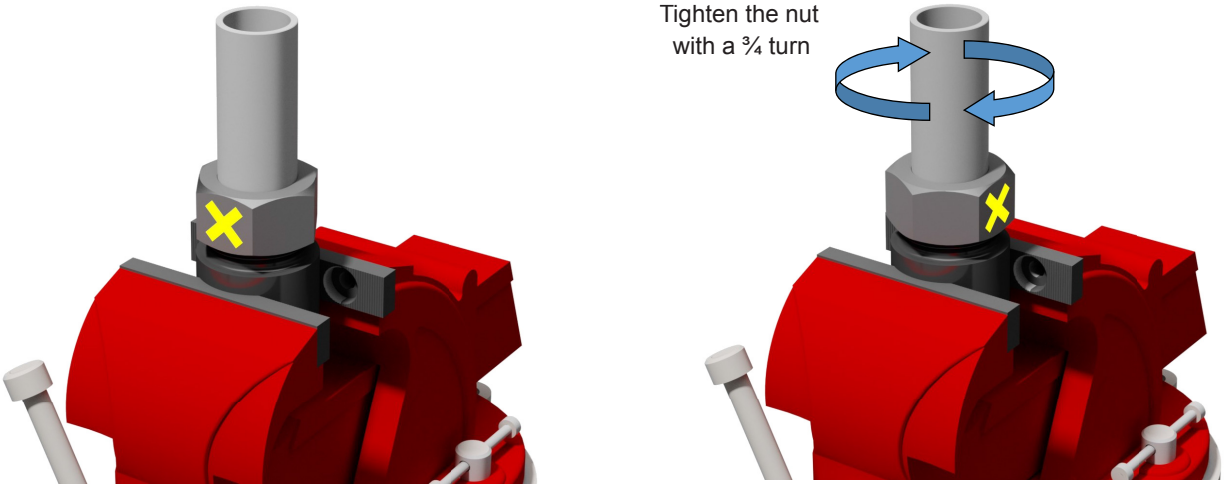
MANUAL PRE-ASSEMBLY INSTRUCTIONS ON HARDENED BLOCK

- Insert the pipe into the 24° cone of the block until it rests on the block stop. Then screw the nut on firmly by hand until the ring is in good contact with the nut. Then tighten the nut using a spanner until the ring, compressed in the 24° seat, prevents the pipe from rotating.

- During this operation, known as “clearance recovery”, it is important to keep the pipe in contact with the bottom of the block and prevent it from rotating..



- Tenendo il tubo contro il suo arresto ed evitando che ruoti su se stesso, avvitare il dado di 3/4 di giro. In tal modo lo spigolo tagliente dell’anello incide con la profondità necessaria la parte esterna del tubo e solleva del materiale creando un bordo rialzato. Nello stesso momento, anche il secondo tagliente, nel caso di utilizzo dell’anello B3 e B4, graffa il tubo.
  In questa operazione, cruciale per il corretto funzionamento della connessione DIN 24°, è fondamentale mantenere il tubo in battuta sul fondo del blocchetto ed impedirne la rotazione.



NOTE:

- ISO 8434-1 (Ex DIN 3859-2) also provides for direct pre-assembly on carbon steel fittings.
  In this case, the fitting must be replaced each time it is tightened. The 24° seat of the fitting used must be checked beforehand in accordance with the instructions in point 1 on page 54.
- On the other hand, pre-assembly of stainless steel fittings must be carried out with hardened blocks, without exception.

INSTRUCTIONS FOR MANUAL PRE-ASSEMBLY WITH TIGHTENING TORQUES

CHECKING TORQUES FOR CLINCHING THE CUTTING RING TO THE PIPE

Notwithstanding the mandatory conformity checks on the equipment, before continuing with series assembly, check the tightening torques in the following way:

- For each pipe size, carry out some manual pre-assemblies on hardened blocks according to the specific procedure (see Manual assembly instruction according to ISO 8434-1 on p.57).
- Examine the cutter marks by cutting all the rings lengthwise.
- Make 5 tightening turns with the torque wrench to the torque indicated in the table below and examine the cutter marks by cutting all the rings longitudinally.
- The incisions obtained by tightening with the torque wrench must be equivalent to those found by manual tightening in accordance with ISO 8434-1 (formerly DIN 3859-2). If this proves to be the case, proceed to the next step, otherwise vary the tightening torque until the incisions are equivalent.
- Clearly display the measured torque values..

Tightening torques for manual pre-assembly on hardened block:

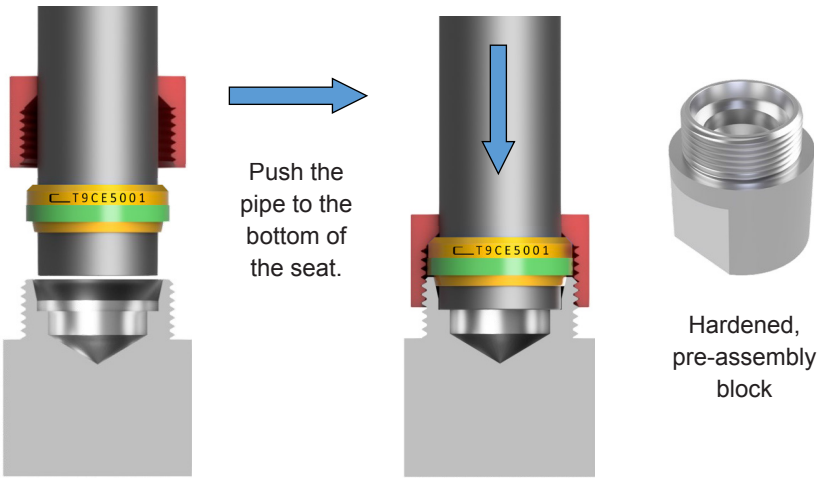
Series	ØPipe	Metric thread	Carbon steel [Nm] $^{+10\%}_{0}$		Stainless steel [Nm] $^{+10\%}_{0}$		
			B3	B4	B3	B4	B6
L	6	M12x1,5	20	20	45	45	35
	8	M14x1,5	30	30	70	70	60
	10	M16x1,5	40	40	85	85	70
	12	M18x1,5	65	65	140	140	100
	15	M22x1,5	80	80	170	170	140
	18	M26x1,5	120	120	270	270	200
	22	M30x2	200	200	400	400	340
	28	M36x2	270	270	540	540	450
	35	M45x2	420	420	1000	1000	800
	42	M52x2	620	650	1200	1200	1000
S	6	M14x1,5	25	25	60	60	45
	8	M16x1,5	35	35	70	70	65
	10	M18x1,5	50	50	100	100	75
	12	M20x1,5	70	70	120	120	80
	14	M22x1,5	95	95	190	190	150
	16	M24x1,5	100	100	250	250	200
	20	M30x2	190	190	420	420	330
	25	M36x2	300	300	620	620	530
	30	M42x2	400	400	860	860	730
	38	M52x2	580	680	1200	1200	1100

NOTE:
The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values expressed in Nm represent the tightening torques required to perform the required pre-assembly correctly and to raise an edge all around the pipe, covering 80% of the cutting ring face.

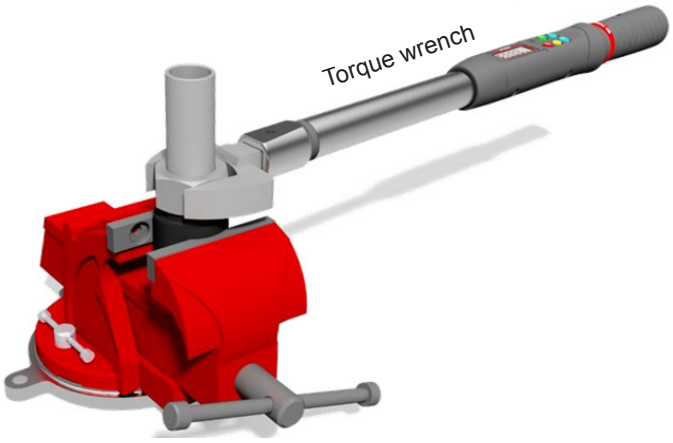
MANUAL PRE-ASSEMBLY ON HARDENED BLOCK WITH TORQUE WRENCH

- Insert the pipe into the 24° cone of the block until it rests on the block stop. Then screw the nut on firmly by hand until the ring is in good contact with the nut. Then tighten the nut using a spanner until the ring, compressed in the 24° seat, prevents the pipe from rotating.

- During this operation, known as “clearance recovery”, it is important to keep the pipe in contact with the bottom of the block and prevent it from rotating.



- While holding the pipe against its stop and preventing it from rotating on itself, tighten the nut with a torque wrench according to the previously checked torque values. In this way, the sharp edge of the ring incises to the correct depth into the outside of the pipe and lifts some material, creating a raised edge. At the same time, the second cutting edge, when using the B3 and B4 ring, also clinches the pipe.
  In this operation, which is crucial for the correct functioning of the DIN 24° connection, it is essential to keep the pipe in contact with the bottom of the block and prevent it from rotating..



NOTE:
- ISO 8434-1 (Ex DIN 3859-2) also provides for direct pre-assembly on carbon steel fittings.
  In this case, the fitting must be replaced each time it is tightened. The 24° seat of the fitting used must be checked beforehand in accordance with the instructions in point 1 on page 54.

- On the other hand, pre-assembly of stainless steel fittings must be carried out with hardened blocks, with no exception.

- The tightening torques to be used for direct pre-assembly on fittings must be checked in accordance with the procedures on page 58.

PRE-ASSEMBLY INSTRUCTIONS WITH PRE-ASSEMBLY MACHINE

SETTING-UP THE PRE-ASSEMBLY MACHINE

Notwithstanding the mandatory conformity checks on the equipment, before continuing with automatic series assembly, calibrate the machines in the following way:

Pre-assembly machine

Hardened indenter

Support plate

- For each pipe size, carry out some manual pre-assemblies on hardened blocks according to the specific procedure (see Manual assembly instruction according to ISO 8434-1 on p.57).
- Examine the cutter marks by cutting all the rings lengthwise.
- Tighten 5 times with the machine set to the appropriate pressure in line with the values indicated in the settings table below.
- Calibrate the machine until the incisions are equivalent to manual tightening.
- Clearly display these values on the machine.

Settings table:

Series	ØPipe	Nut thread	Machine pressure for carbon steel [Bar]		Machine pressure for stainless steel [Bar]	
			ring B3-B6	ring B4	ring B3-B6	ring B4
L	6	M12x1,5	25	30	35	40
	8	M14x1,5	30	35	40	45
	10	M16x1,5	35	40	45	50
	12	M18x1,5	40	45	50	55
	15	M22x1,5	50	55	60	65
	18	M26x1,5	55	60	65	70
	22	M30x2	60	65	75	80
	28	M36x2	70	75	90	100
	35	M45x2	115	125	140	155
	42	M52x2	140	155	180	200
S	6	M14x1,5	25	30	35	40
	8	M16x1,5	30	35	40	45
	10	M18x1,5	35	40	45	50
	12	M20x1,5	40	45	50	55
	14	M22x1,5	50	55	60	65
	16	M24x1,5	60	65	70	75
	20	M30x2	70	75	90	95
	25	M36x2	90	100	110	120
	30	M42x2	115	125	140	155
	38	M52x2	140	155	180	200

Note:
The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components and pre-assembly machine used.
The values expressed in Bar represent the machine pressures necessary to perform the required pre-assembly correctly and to raise an edge all around the pipe, covering 80% of the cutting ring face.

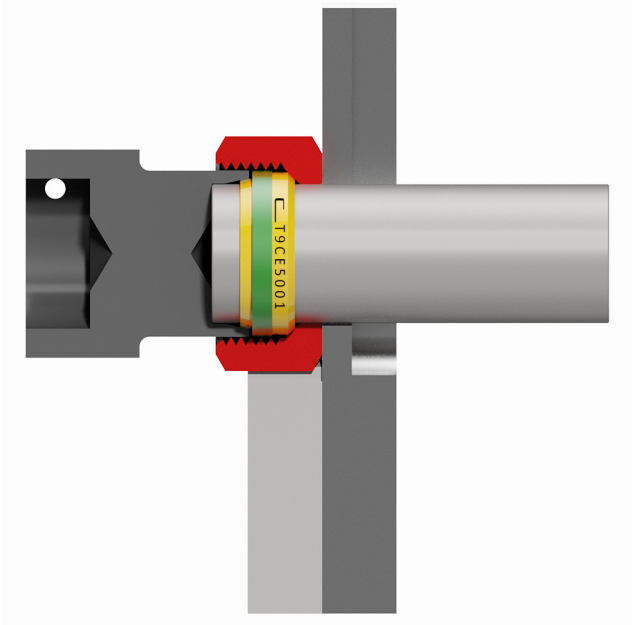
MACHINE PRE-ASSEMBLY

• Install the indenter and support plate for the diameter and series of the pre-assembly to be carried out.

• Input the setting pressure on the display, or with the analogue selector, in accordance with the values validated beforehand (according to the pre-set table and the manual tightening tests carried out).

• As previously prepared in point 4 of page 54, insert the pipe, complete with nut and ring, inside the 24° cone of the indenter, resting the nut on the support plate.

• Hold the pipe firmly in place and against the bottom of the indenter cone and press the start command to operate the machine.



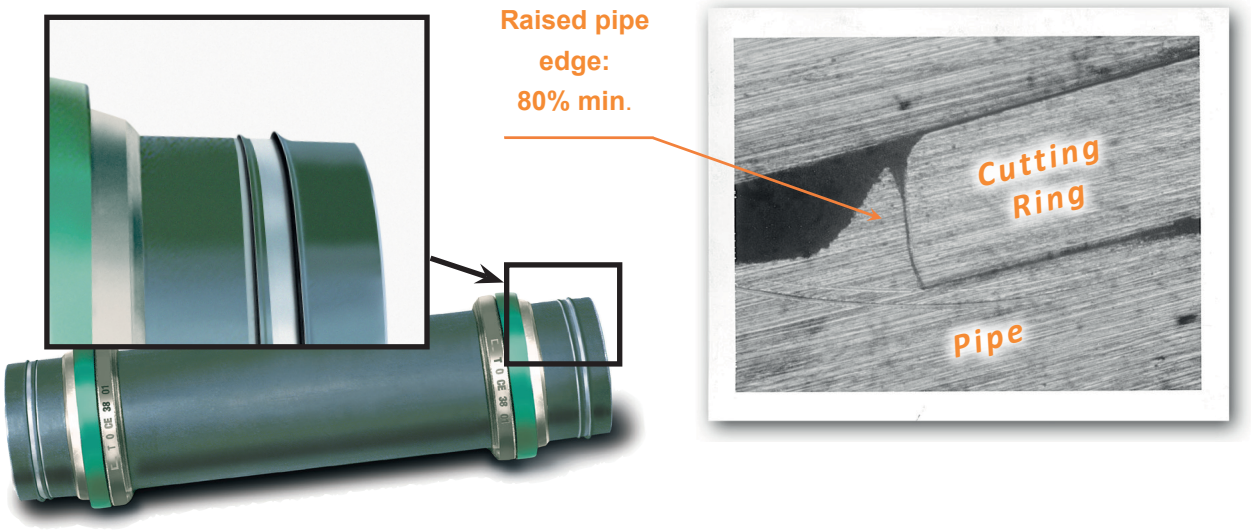
• Continue to hold the pipe firmly down in place during pre-assembly. In this way, the sharp edge of the ring incises to the correct depth into the outside of the pipe and lifts some material, creating a raised edge. At the same time, the second cutting edge, when using the B3 and B4 ring, also clinches the pipe.

• The pre-assembly operation will be completed when the thrust cylinder has returned to its initial starting position.

NOTE:
Some operations may differ slightly depending on the type of machine used. However, the initial calibration certifies its suitability for use.

A 100% PRE-ASSEMBLY CHECK MUST BE CARRIED OUT ON EACH TYPE OF PRE-ASSEMBLY

- Unscrew the nut, remove the pipe and visually check that there is a raised edge in front of the ring face. This edge must cover at least 80% of the face of the cutting ring in accordance with ISO 8434-1 (formerly DIN 3859-2). This check is **MANDATORY** and in the interests of everybody's safety. If the raised edge is less than 80%, it is mandatory to reassemble with new components and on a new pipe.

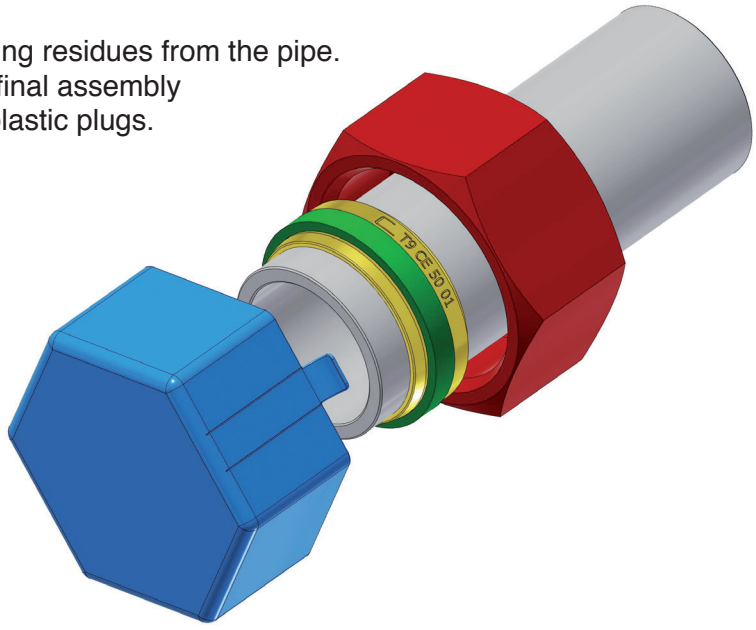


FINAL PRE-ASSEMBLY CHECK

- The last, but no less important, check to be made before proceeding to the final tightening on the machine is to check the radius of the pipe.
- Insufficient thickness of the pipe wall, insufficient transversal rigidity, the wrong type of pipe and errors in pre-assembly, can create problems clinching the ring to the pipe causing related seal leaks and drastic reduction in safety. This must also be taken into account when designing the system and selecting the components to be used!

A good rule of thumb is to ensure that the sag (constriction on the inner Ø of the pipe) does not exceed 0.3 of a mm up to the outer Ø of 16 mm and 0.4 mm in larger sizes.

- Remove internal and external processing residues from the pipe.
- If the pipe is not used immediately for final assembly on the machine, protect the end with plastic plugs.



FINAL INSTRUCTIONS FOR ASSEMBLY ON THE MACHINE VALID FOR CUTTING RINGS «B3-B4-B6»

1. CHECKING COMPONENTS TO BE USED

- Before starting the final tightening of the pre-assembled pipe with nut and ring on the machine, you must ensure that the necessary components (nuts, rings, fittings, pipe and gaskets, if present) are 100% efficient, compliant and free of defects. Replace those that are unsuitable.

- Remove any plastic plugs from the ends of the pipes.

- Check all pipes to be assembled for grooves, making sure that there is an edge in front of the face of the pre-assembled ring. This edge must cover at least 80% of the face of the cutting ring. Replace non-compliant pipes.

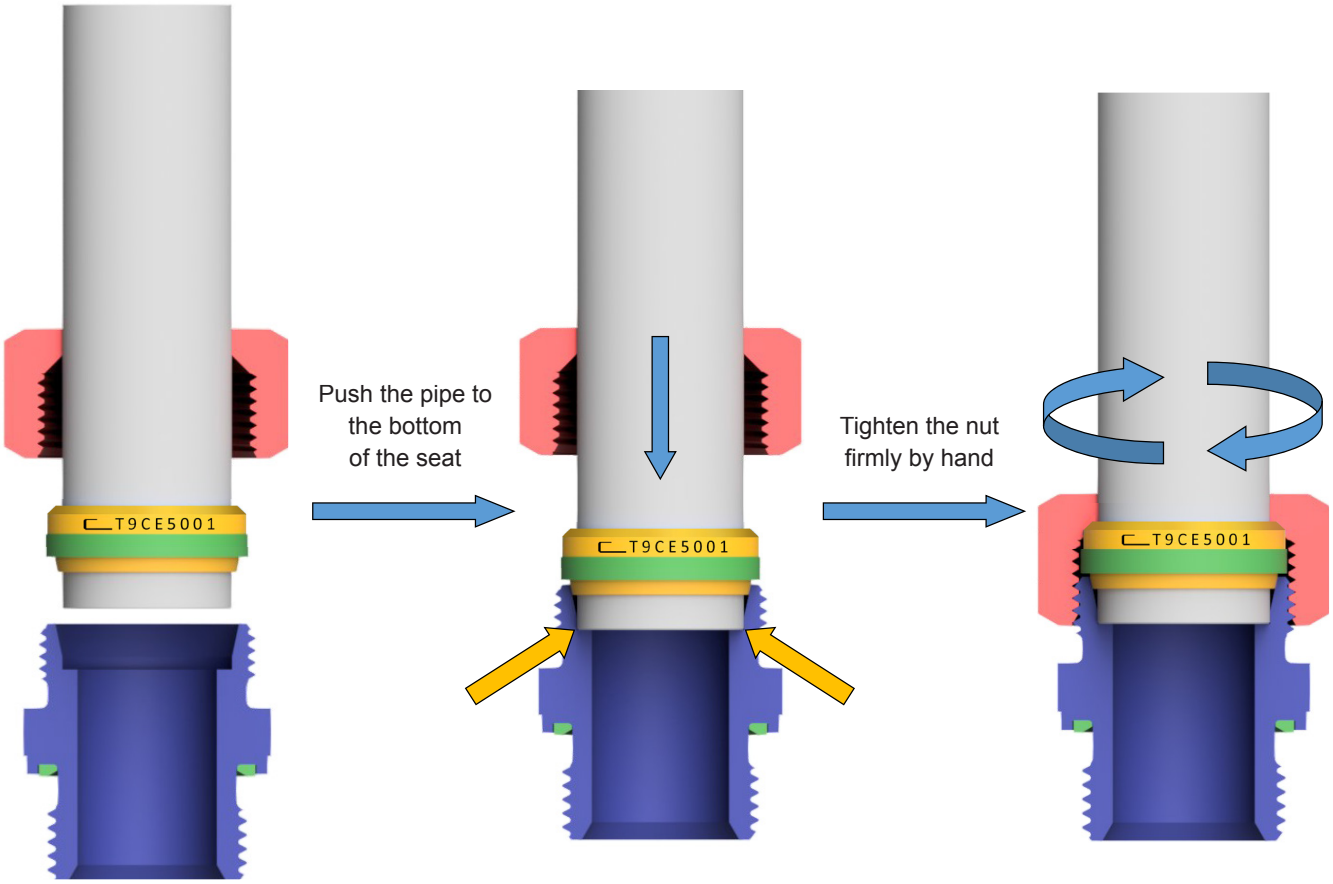
- Check that the pipes to be assembled are free from occlusions, constrictions or damage caused during the various preparation processes. Replace non-compliant pipes.

- Check that the pipes are free from internal impurities resulting from the various processes.

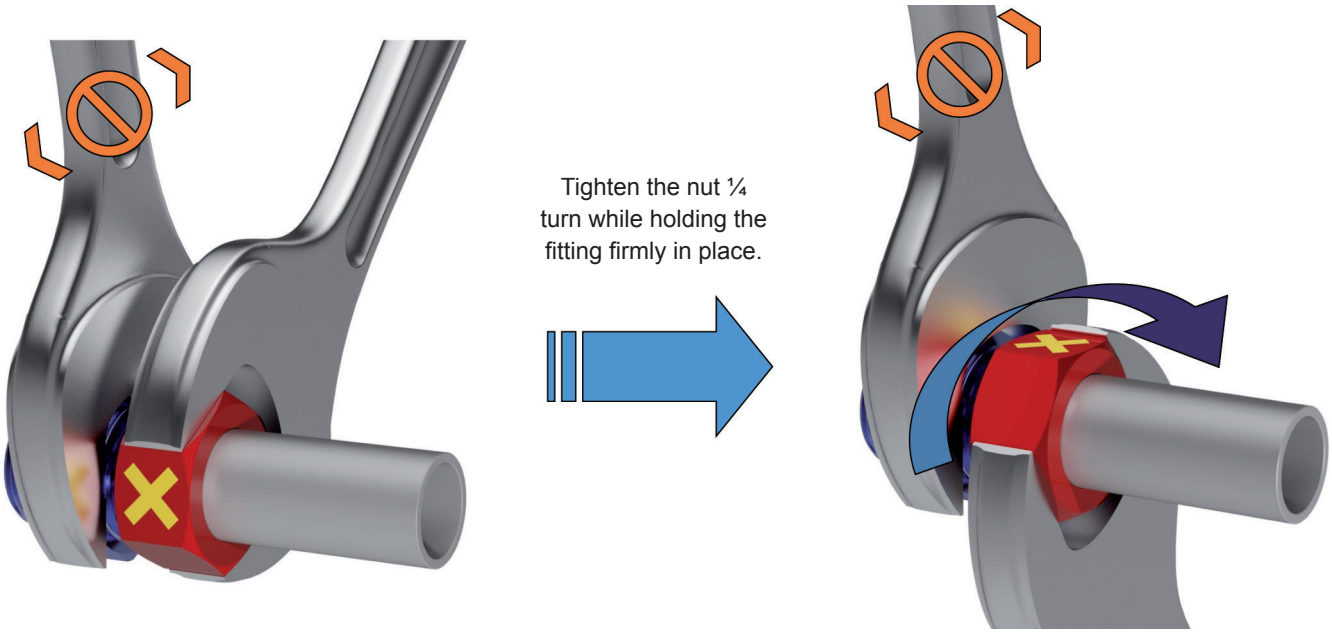
- It is forbidden to fit non-conforming components or manufactured pieces.

2. FINAL ASSEMBLY ON THE MACHINE

- Insert the pipe into the 24° cone of the fitting until it rests on the bottom stop. Holding the pipe against its stop and keeping it aligned with the fitting, tighten the nut firmly by hand until the ring is in good contact with the nut.



- Tighten with a wrench until resistance is felt; from this point, tighten by a further ¼ turn, wrench against wrench.



As an alternative to tightening by ¼ turn, the tightening torques in the table below can be used with the appropriate torque wrench

Tightening torques for final on-machine wiring with torque wrench:

Series	ØPipe	Metric thread	Carbon steel [Nm] +10% 0		Stainless steel [Nm] +10% 0		
			B3	B4	B3	B4	B6
L	6	M12x1,5	20	20	45	45	35
	8	M14x1,5	30	30	70	70	60
	10	M16x1,5	40	40	85	85	70
	12	M18x1,5	65	65	140	140	100
	15	M22x1,5	80	80	170	170	140
	18	M26x1,5	120	120	270	270	200
	22	M30x2	200	200	400	400	340
	28	M36x2	270	270	540	540	450
	35	M45x2	420	420	1000	1000	800
	42	M52x2	620	650	1200	1200	1000
S	6	M14x1,5	25	25	60	60	45
	8	M16x1,5	35	35	70	70	65
	10	M18x1,5	50	50	100	100	75
	12	M20x1,5	70	70	120	120	80
	14	M22x1,5	95	95	190	190	150
	16	M24x1,5	100	100	250	250	200
	20	M30x2	190	190	420	420	330
	25	M36x2	300	300	620	620	530
	30	M42x2	400	400	860	860	730
	38	M52x2	580	680	1200	1200	1100

Note:
The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.

COMMON SENSE BEHAVIOUR

Throughout this newsletter we have documented who we are, how we work, we talked about standards, instructions, mistakes, procedures, what can be done and what cannot be done, expressed opinions and so on. We make no apologies for anything that is serious, documented or repetitive, because safety is imperative and must always be pursued with tenacity and care. Nevertheless, we would like to make a further important recommendation.

In working life, situations often arise that require a pause for reflection before taking action, in order to avoid sloppy choices, which then prove to be wrong and detrimental to all. It is not difficult to run hydraulic systems in a workmanlike manner. Of course, you must have basic technical training, the necessary equipment, quality components and compliant products, but the most important thing is the use of "common sense". It is this that makes you see things at 360° and makes you realise the correct thing to do. We do not get mental block; we can think calmly and ask for advice when necessary. Common sense enables us to tune into the environment around us or the situation we are experiencing, preventing us from making choices that are overly risky or even wrong.

"Common sense" is not magical, but we cannot do without it. If it is not used, problems grow to the point of exploding. It is not just recommended, it is simply indispensable for living a better life and always being "up to the job" at work.

It facilitates growth. The ancient Greeks used the term harmony to describe the jointing that held boat planks together. Thus, harmonic describes everything that connects, that unites, that allows individual parts to become a whole. In the light of harmonious, individual and collective development, both staff and company can grow in parallel: the organisation builds its assets on individuals' experience and knowledge; skills that once they are included in the organisational circuit, find each other and are revitalised.

<< To do with ease what others find difficult is "Talent". To do what others find impossible is "Genius" >>

(cit. Amiel)

WHAT IS HYDRAULICS?

Hydraulics is a branch of fluid dynamics that is applied in mechanical engineering and deals with the study of energy transmission by means of pressurised fluids, in particular hydraulic oil.

The systems necessary to transmit energy by means of fluids (hydraulic systems, generally working with hydraulic oil) are made up of pumps (one or more), filters, valves, hydraulic motors, actuators, rigid and/or flexible pipes, fittings, hydraulic accumulators, instruments for measuring parameters and controlling the system, etc. and enabling the transmission of power, by means of oil under pressure, in many fields, such as the railway sector, airports, agriculture, earth-moving machinery, offshore, naval, automotive, industry, etc.

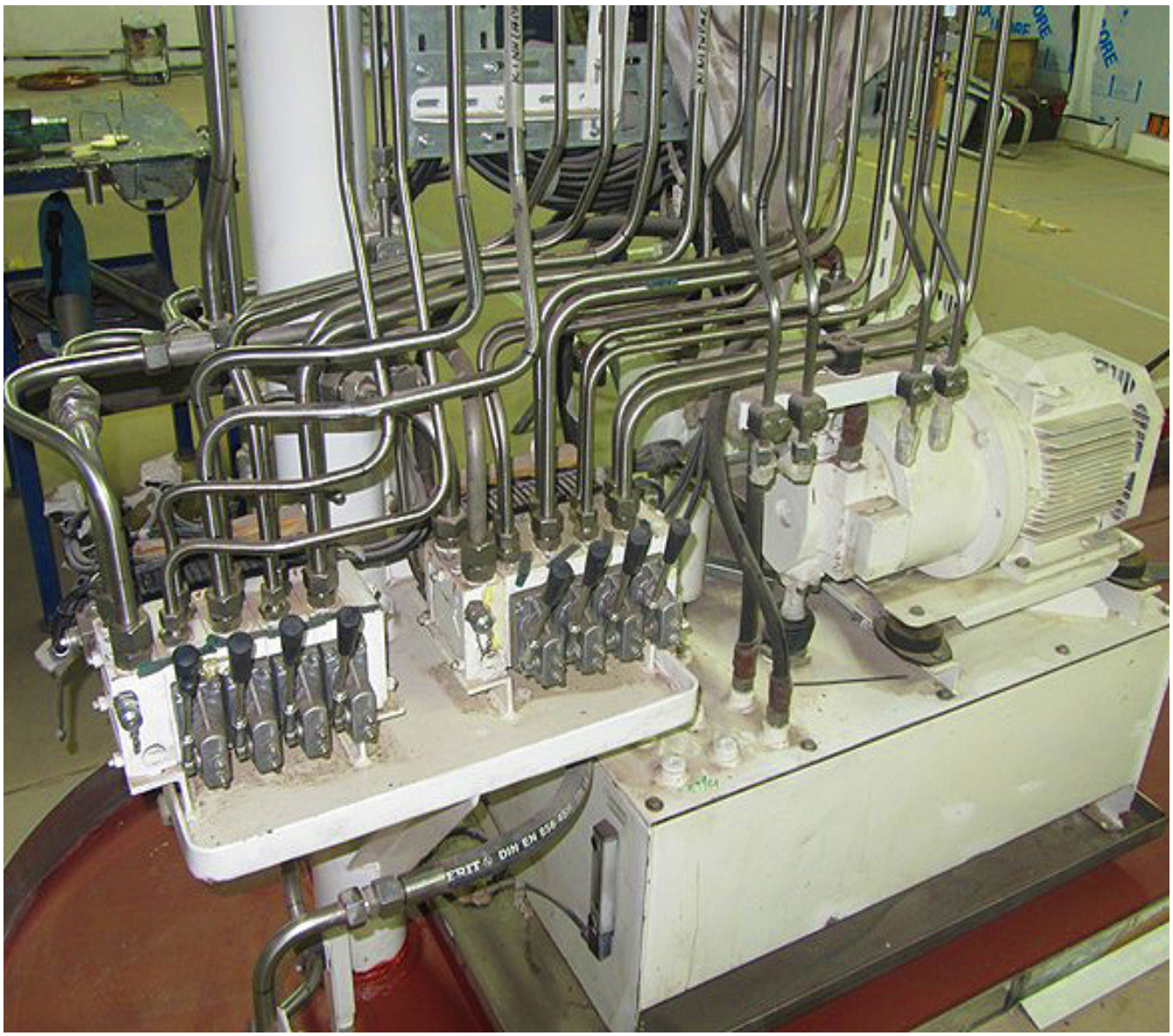
This type of system is designed to transmit power which, via specific uses, will be converted into movement or whatever is required. And yet, despite the enormous forces involved, it is possible to maintain high precision, progressiveness in movement, and contain the space and complexity of the system, by exploiting the intrinsic incompressibility of the oil.

Example of a small hydraulic control unit.
Regardless of whether it is a large or a small system, the main components are always the same: tank, pumps, accumulators, filters, pipes, valves, fittings, pressure gauges, etc.

FITTINGS IN THE HYDRAULIC SYSTEM

Designed to meet a huge range of requirements in terms of applications and project types, CAST fittings can be used for high and very high pressure hydraulic systems, painting plants, fire-fighting, braking, lifting and handling systems, etc., within the limits laid down by regulations.

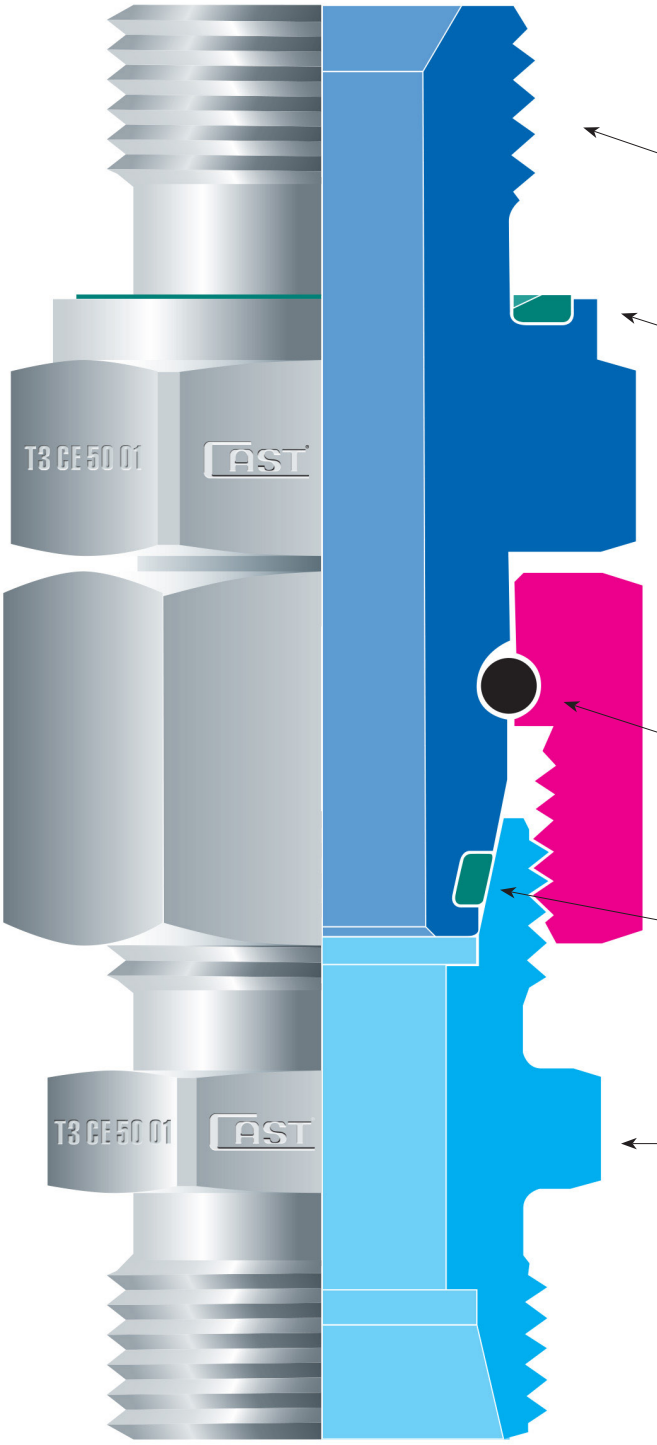
In a hydraulic system, the transmission vector is the oil conveyed within pipes, rigid or flexible, which connect the various components of the system to each other in order to transmit energy. These connections are made possible by our fittings.



Example of a hydraulic control unit.

ISO 8434-1 JOINT
WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINTING SYSTEM ISO 8434-1, WITH BARBED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Barbed body

Barbed swivel
nut

Pinning

O-ring seal

Fitting body
ISO 8434-1

ASSEMBLY INSTRUCTIONS FOR SWIVEL FITTINGS SERIES 60...

Before proceeding with the coupling of the 24° seat and 24° shank with barbed swivel nut, you must carry out a few simple and quick steps to ensure simple and durable assembly:

- Ensure that the necessary components (nuts, fittings, o-rings and gaskets, if any) are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

- Carefully clean the 24° conical seat and lightly lubricate the the stainless steel thread with the products previously indicated;

- Check the presence and integrity of the o-ring on the barbed shank and the correct rotation of the nut;

- Screw the barbed swivel nut onto the fitting body by hand and check the alignment of the parts. Tighten the barbed swivel nut using a torque wrench in accordance with the tightening torques given in the table below, by contrasting wrench against wrench.

Series	ØPipe	Metric thread	Torque $^{+10\%}_{0}$ (Nm)
L	6	M12x1,5	20
	8	M14x1,5	35
	10	M16x1,5	40
	12	M18x1,5	45
	15	M22x1,5	55
	18	M26x1,5	110
	22	M30x2	130
	28	M36x2	200
	35	M45x2	220
	42	M52x2	240
S	6	M14x1,5	40
	8	M16x1,5	45
	10	M18x1,5	50
	12	M20x1,5	60
	14	M22x1,5	80
	16	M24x1,5	100
	20	M30x2	160
	25	M36x2	240
	30	M42x2	260
	38	M52x2	350

Note:
The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the tightening torques on the swivel nut represent the torque required for correct tightening..

ASSEMBLY TYPES FOR 24° FITTINGS

In this section we can see the various assembly types that can be achieved with a 24° seat fitting in accordance with ISO 8434-1 / DIN 2353:

1. Figure 1 shows a connection between a 24° seat fitting and a rigid pipe. This connection is made using a cutting ring type B3, B4 or B6 and a tightening nut.

2. Figure 2 shows a connection between a fitting with a 24° seat and a flexible pipe. The coupling is achieved by using a press insert with a 24° cone, commonly referred to as a “DKO L/S” type flexible pipe fitting.

3. Figure 3 shows a connection between a 24° seat fitting and a 24° barbed fitting. In this case, the connection is made between two fittings without the use of a rigid or flexible pipe.

4. Figure 4 shows a connection between a 24° seat fitting and a rigid pipe. This is done by means of a solder shank and a tightening nut. The shank is positioned in the 24° seat on one side and welded to the rigid pipe on the other side.

Fig.1

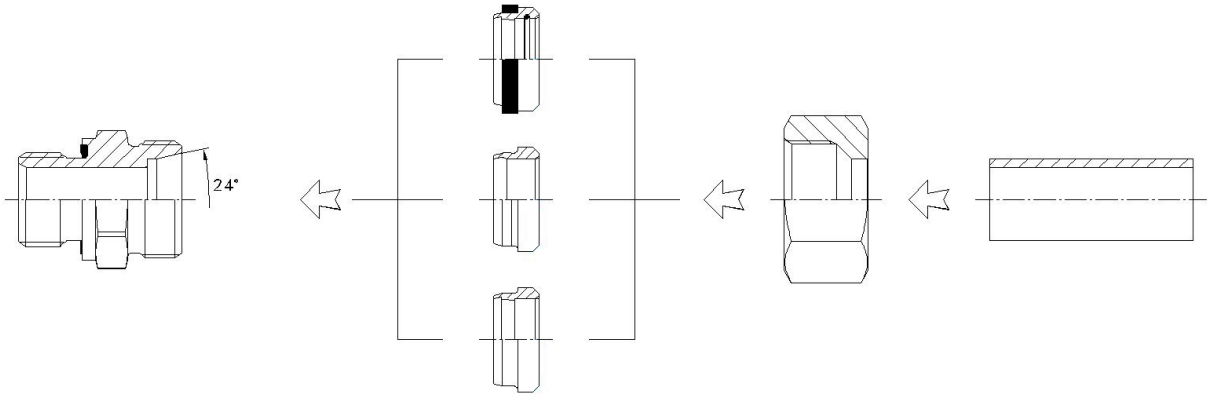


Fig.2

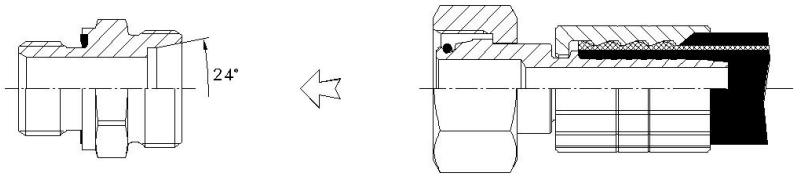


Fig.3

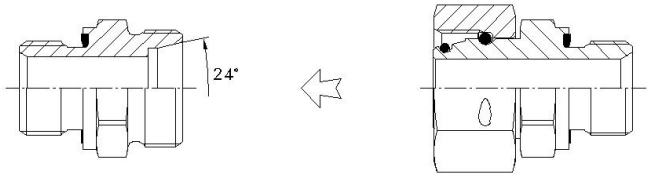
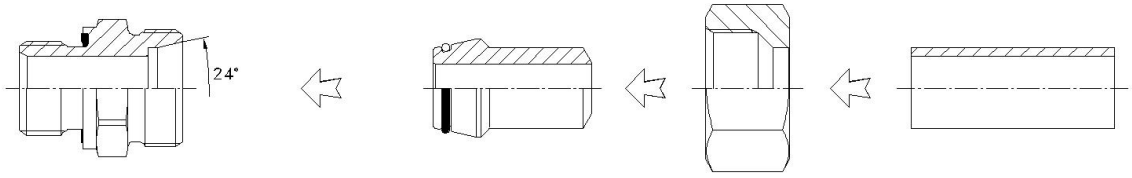


Fig.4



EXPERIENCE IN SERVICE OF OUR USERS

All hydraulic components require that special attention is paid to safety. Our company, operating in the production of high-pressure hydraulic fittings, is intent on making its knowledge available in order to limit, as far as possible, any errors, design oversights or carelessness.. We should never forget that this product is inherently dangerous, given the pressures it reaches. One of the most delicate phases is assembly, where the operator works directly on the components and which, if carried out correctly, guarantees seal safety and performance. In this article we have brought together our years of experience in the field, indicating the most common fitting errors and their consequences, and then giving indications on how to correct the error. All this is for the benefit of installers and end users, who will have a tool to improve and simplify the quality of their work, thus avoiding the small and large setbacks so typical of large-scale industrial wiring. In the cases considered, we also wanted to provide a useful comparison between the standard product, derived from the standard, and those products specifically manufactured by CAST S.p.A. which, in our opinion, exceed and improve on the standard itself.

Ring B3
Carbon and stainless steel produc

STANDARD DIN 2353
Interchangeable
ISO 8434-1

Ring B4
Carbon and stainless steel produc

Cast Project
Interchangeable
ISO 8434-1

Ring B6
Stainless steel product

Cast Project
Interchangeable
ISO 8434-1

SAFETY IS IMPERATIVE

1. Always check, before starting work, that the equipment to be used is 100% efficient and complies with the requirements, standard and technical instructions.

2. Before starting work, always check that the products to be used comply with the standard: it is never permissible to deviate from this basic requirement.

3. In order to comply correctly with points 1 and 2, it is essential that operators have received correct and in-depth technical-cultural training on the work to be carried out.

4. DIN cutting rings must be mounted on the steel pipe immediately before assembly on the machine or, in any case, no later than one week before assembly on the machine.

5. Technical training is of course necessary in order to be able to carry out the required checks on the tools and components/manufactured pieces to be used and to be able to carry out the planned installations in a workmanlike manner.

6. Cultural training is imperative. Operators need to be aware that their work, their decisions to operate in one way rather than another, have a normal and natural impact on the outcome of the functionality and safety of any facility/plant. They must be aware of the possibility of producing immense economic damage, disasters and tragedies with innocent victims, responsible only for having trusted the professionalism and preparation of the operators.

7. It is clear that, as far as safety is concerned, it is not possible to leave all the responsibility to the plant operators who, even if they are adequately trained, need “Managers” to monitor their work and proper compliance with the standards and instructions for use provided by the manufacturer.

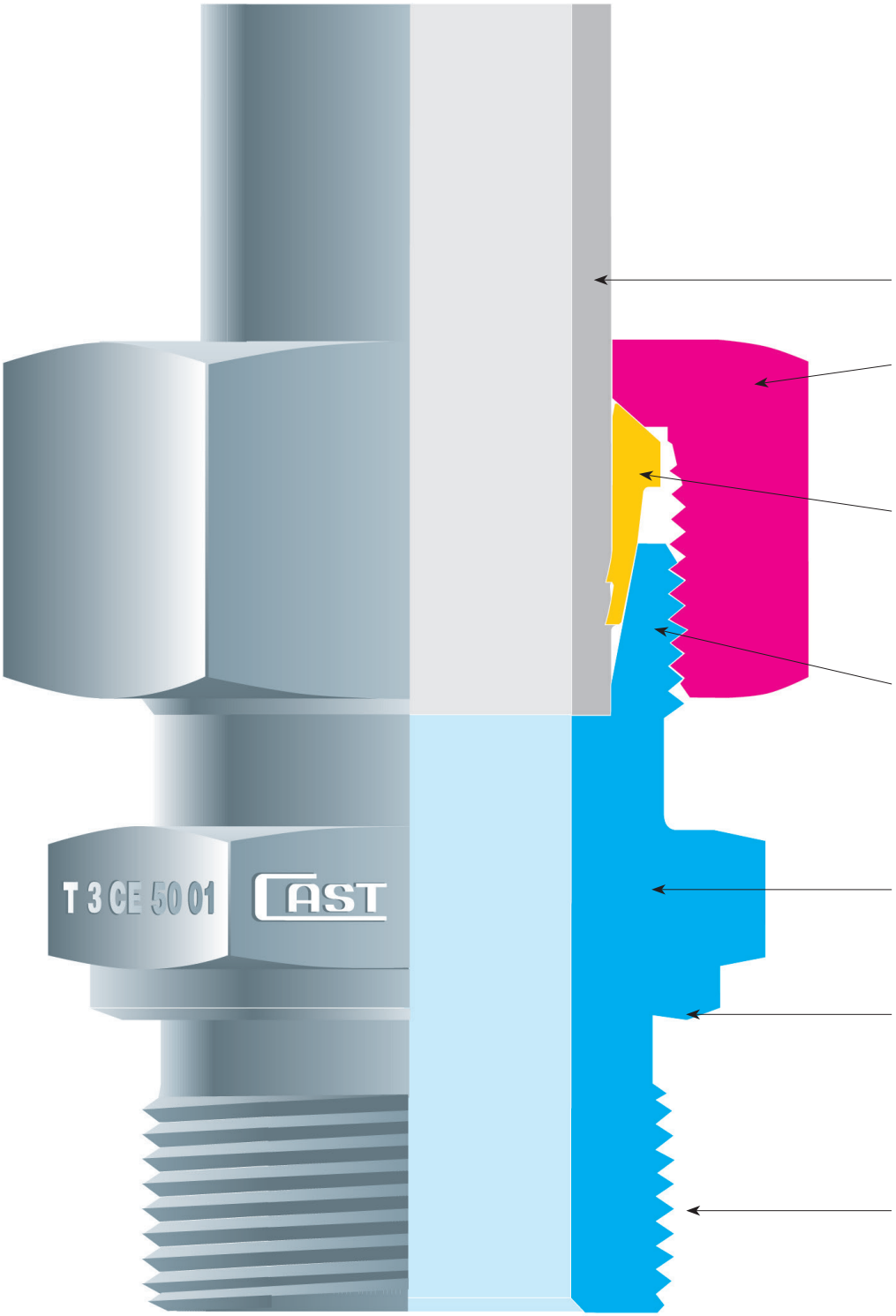
8. As has already been emphasised at length, “Security is imperative” and does not permit exceptions of any kind. It must be implemented and maintained with all the tolerances required by current legislation and the manufacturer’s strict instructions for use.

9. On the following pages we document some of the most common errors and anomalies, explaining their causes and solutions.

Destructive test with 28x3 carbon steel pipe.
The pipe burst at 1050 bar, with no leaks or oozing at the sealing points.

JOINT ISO 8434-1, DIN 2353
FOR B3 CUTTING RING

SCHEMATIC DIAGRAM FOR JOINT SYSTEM SO 8434-1, DIN 2353 WITH B3 CUTTING RING



Reference standards:

Pipe E 235
EN 10305-4

Nut
DIN 3870

Cutting ring
DIN 3861-B

Seat shape
DIN 3861

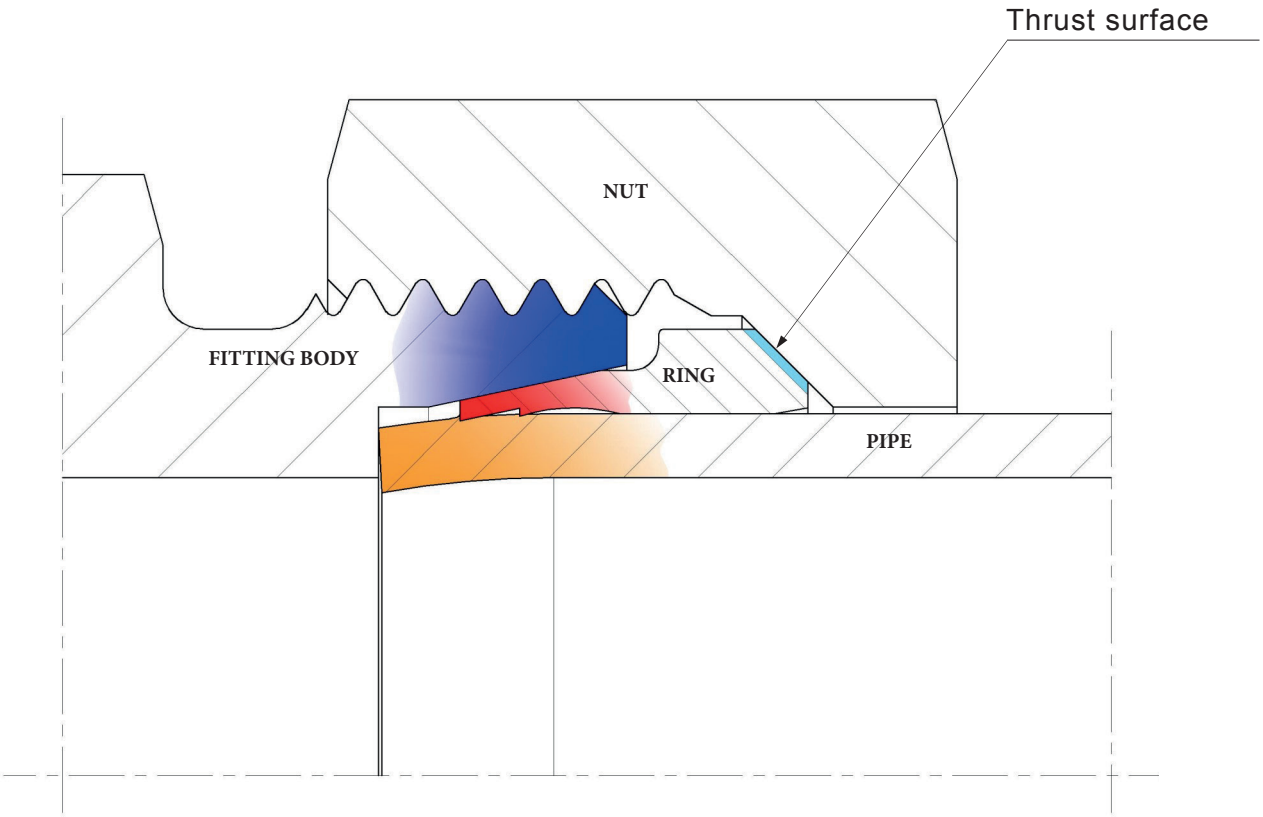
Fitting body
ISO 8434-1

Metal-to-metal seal seat
ISO 1179-4

Threaded end
ISO 1179-4

"B3" CUTTING RING FITTINGS

MONTAGGIO SU SEDE A 24° MAGGIORATA (NON CONFORME)



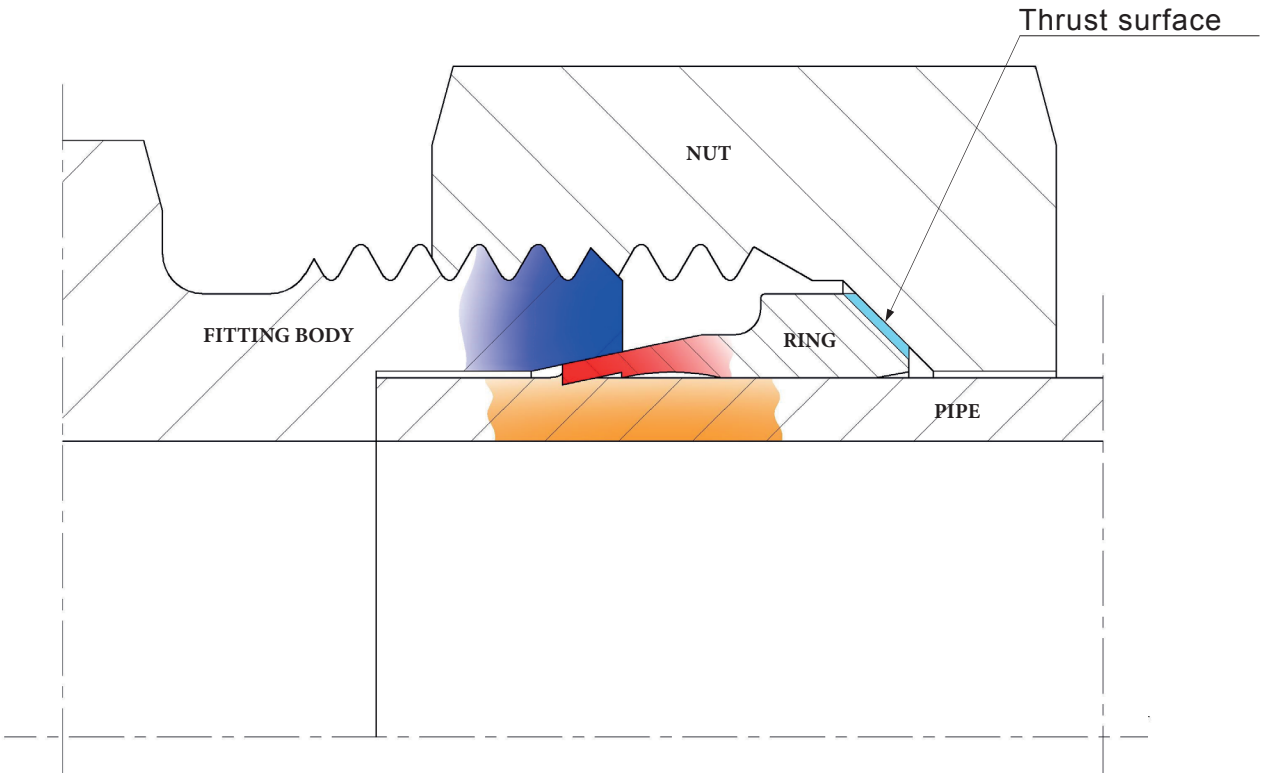
ASSEMBLY BEHAVIOUR:
An oversized (non-compliant) 24° seat causes excessive cutting ring feed, failure of the pipe end and incorrect clinching of the cutting ring to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B3" CUTTING RING FITTINGS

MONTAGGIO SU SEDE A 24° MINORATA (NON CONFORME)



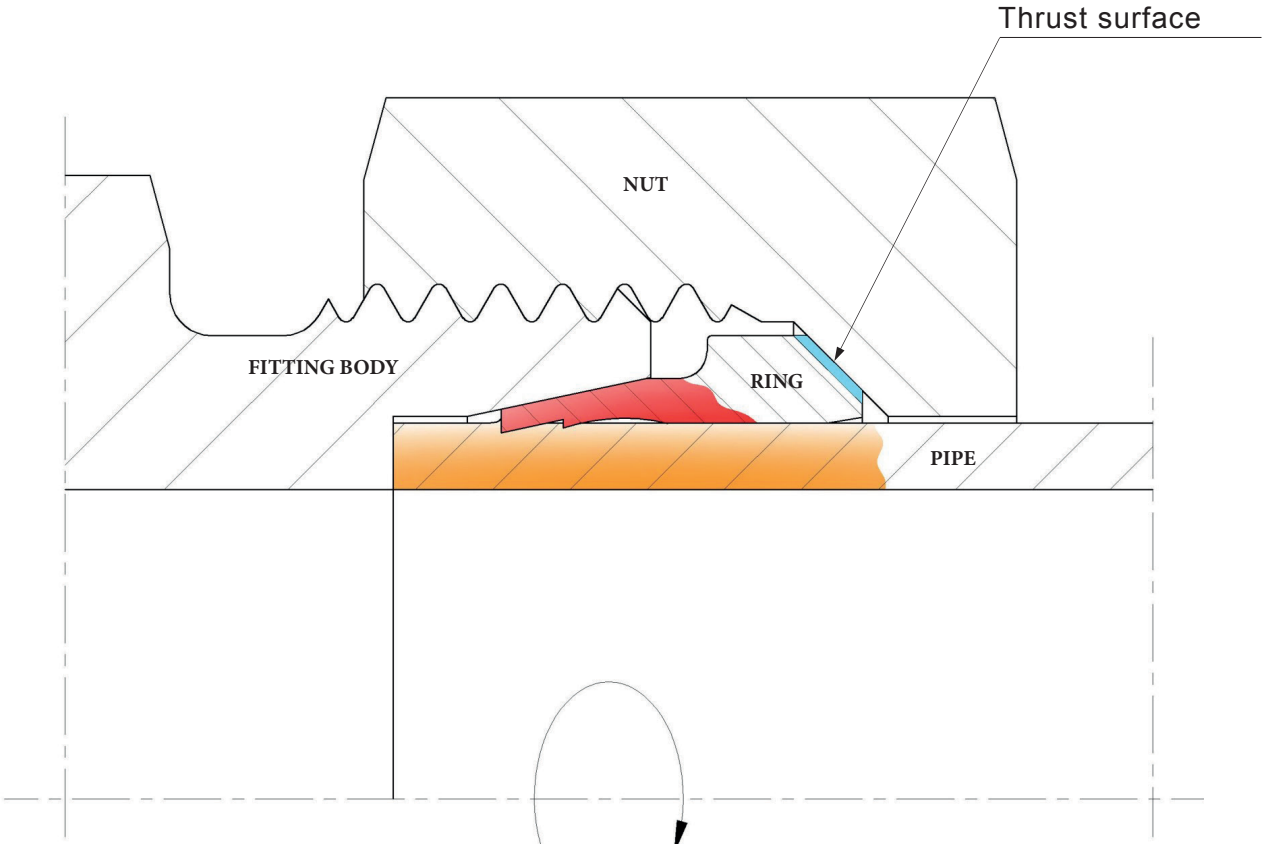
ASSEMBLY BEHAVIOUR:
An undersized 24° seat (non-compliant) causes the ring to be positioned too far back from the pipe face and the cutting ring is incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B3" CUTTING RING FITTINGS

PIPE ROTATING DURING TIGHTENING



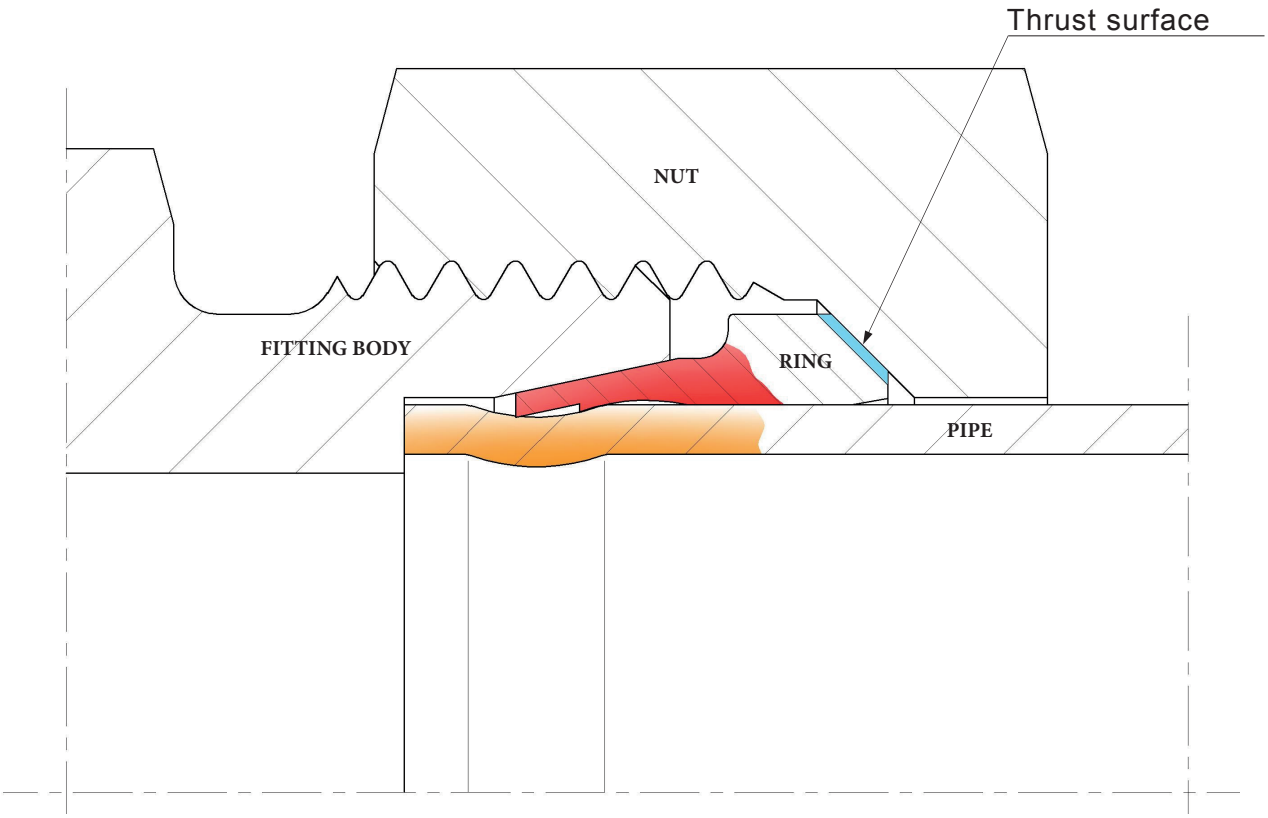
ASSEMBLY BEHAVIOUR:
The rotation of the pipe does not allow the cutting ring to clinch the steel pipe properly.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble, preventing rotation of the steel pipe.

"B3" CUTTING RING FITTINGS

TUBO CON PARETE SOTTILE (NON CONFORME)



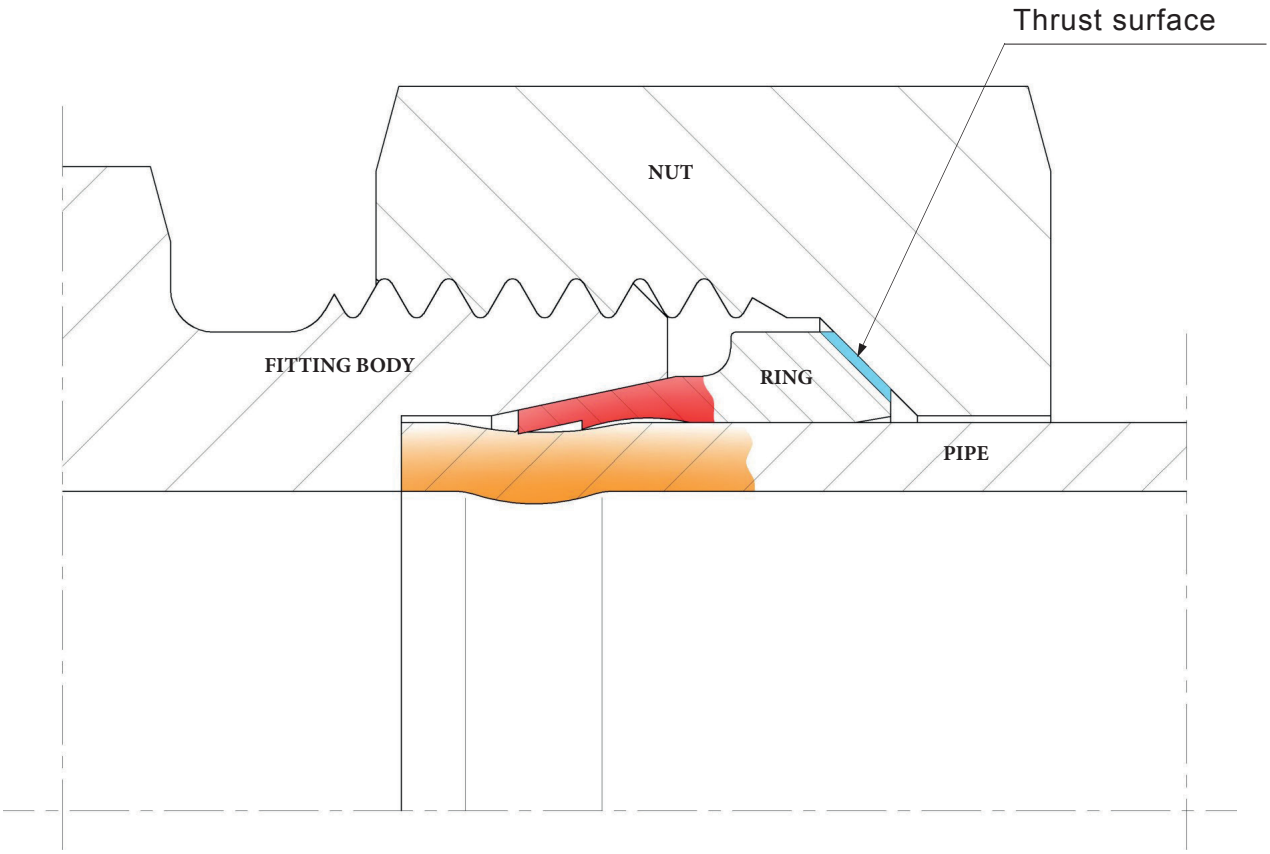
ASSEMBLY BEHAVIOUR:
A thin-walled pipe does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using an appropriate reinforcing bushing or replace the pipe with a compliant one (see pp. 36-37).

"B3" CUTTING RING FITTINGS

PIPE WITH LESS HARDNESS THAN PERMITTED (NON-COMPLIANT)



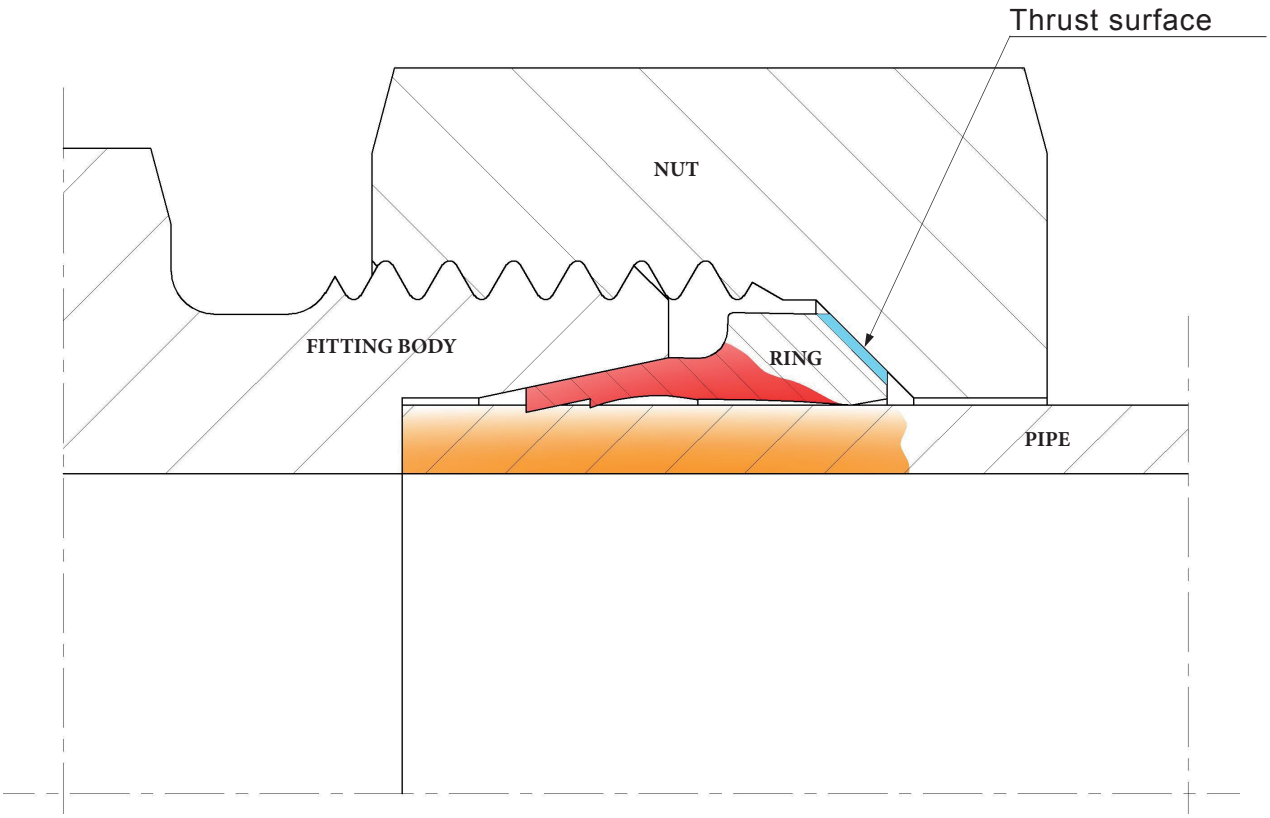
ASSEMBLY BEHAVIOUR:
A pipe with reduced hardness on the outside diameter is also normally poorly structured and does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see pp. 36-37).

"B3" CUTTING RING FITTINGS

DUREZZA ECCESSIVA DEL TUBO (NON CONFORME)



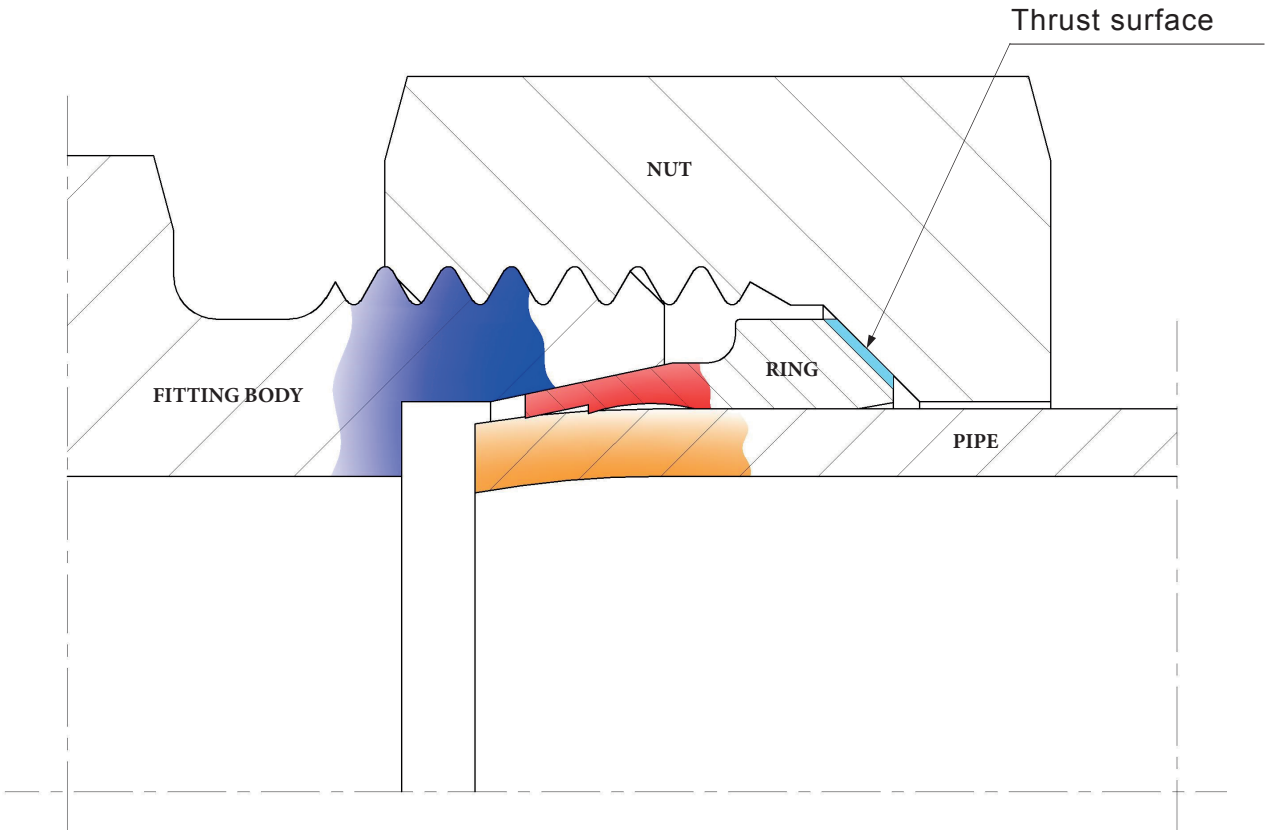
ASSEMBLY BEHAVIOUR:
A pipe with excessive hardness on the external diameter does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see pp. 36-37).

"B3" CUTTING RING FITTINGS

TUBO NON INSERITO A FONDO SEDE 24°



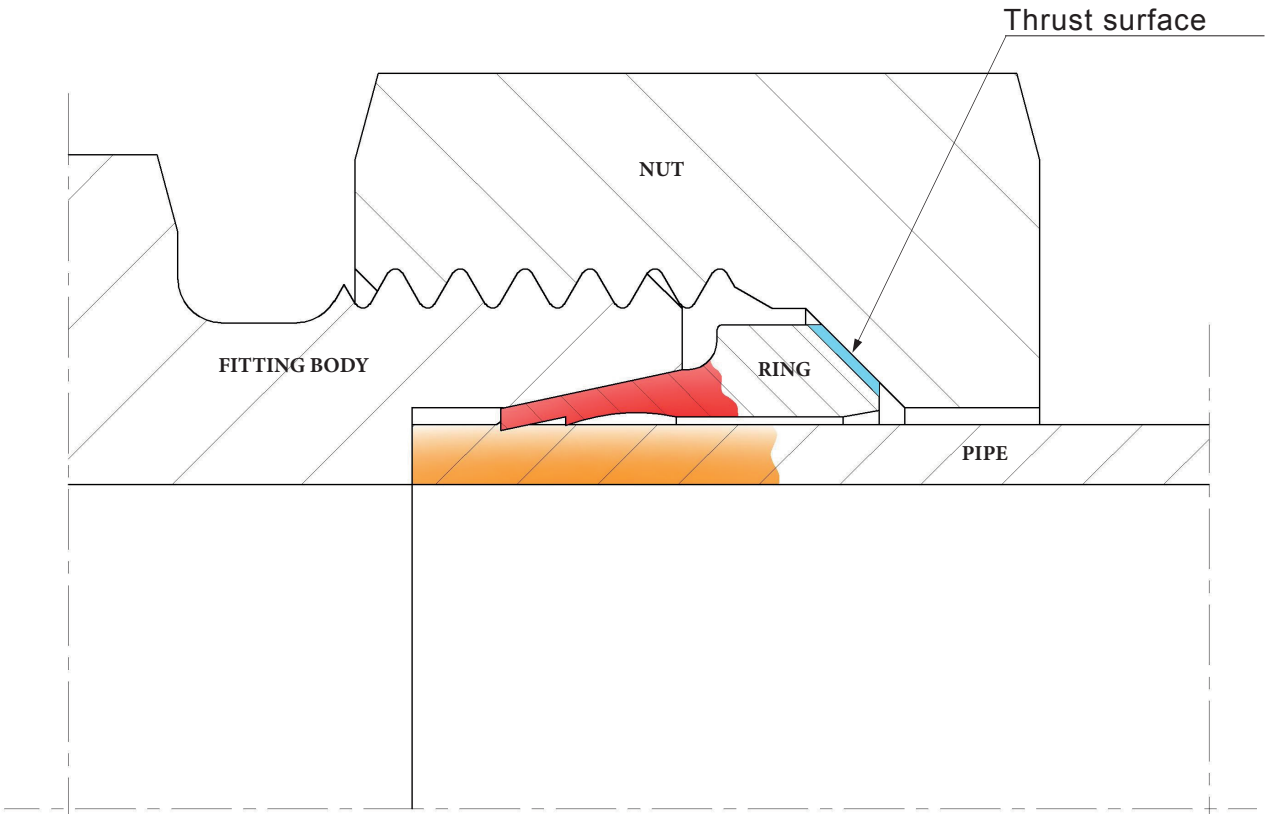
ASSEMBLY BEHAVIOUR:
A pipe not inserted up as far as the stop causes the end of the pipe to yield and the cutting ring is thus incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the pipe is in as far as the stop.

"B3" CUTTING RING FITTINGS

EXTERNAL DIAMETER OF PIPE BELOW NOMINAL SIZE (NON-COMPLIANT)



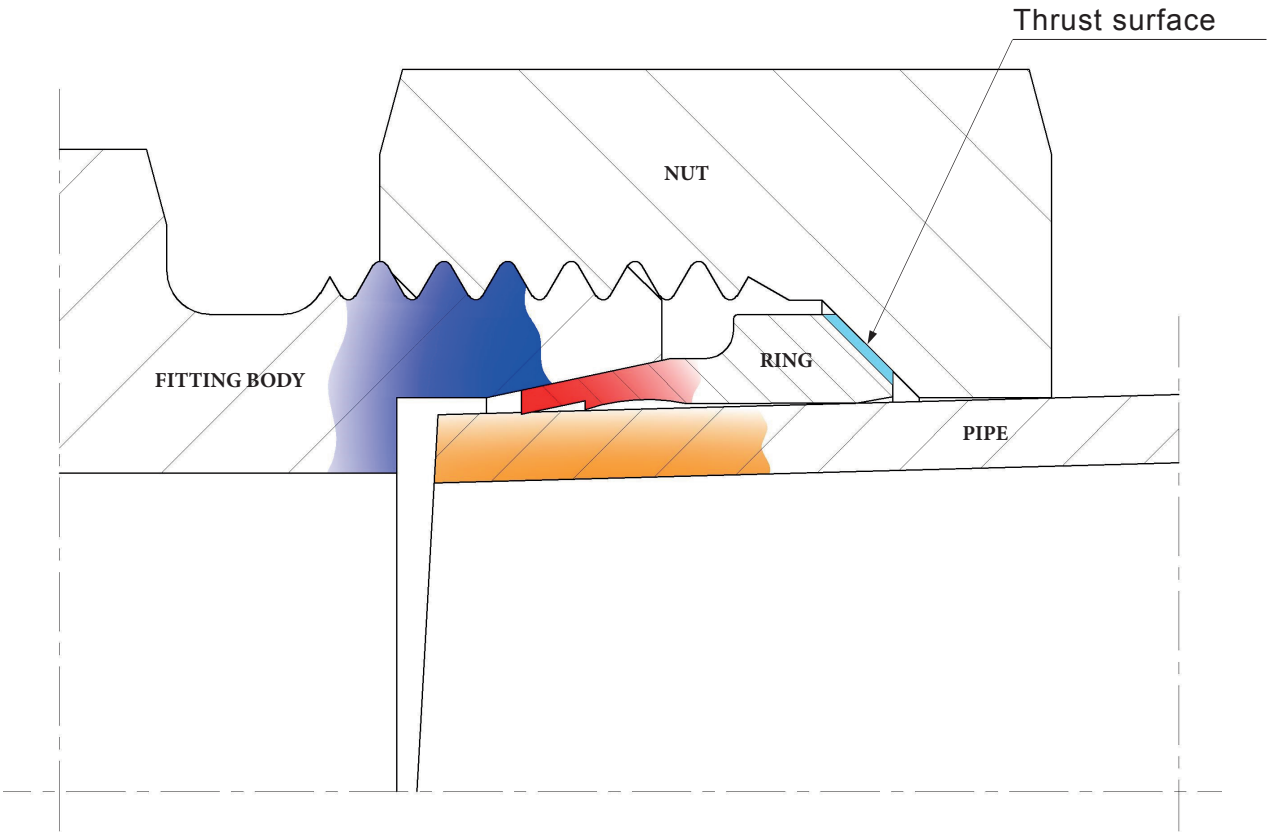
ASSEMBLY BEHAVIOUR:
A pipe with a smaller external diameter does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant dimensions (see pp.36-37).

"B3" CUTTING RING FITTINGS

PIPE CUT OUT OF SQUARE (NON-COMPLIANT)



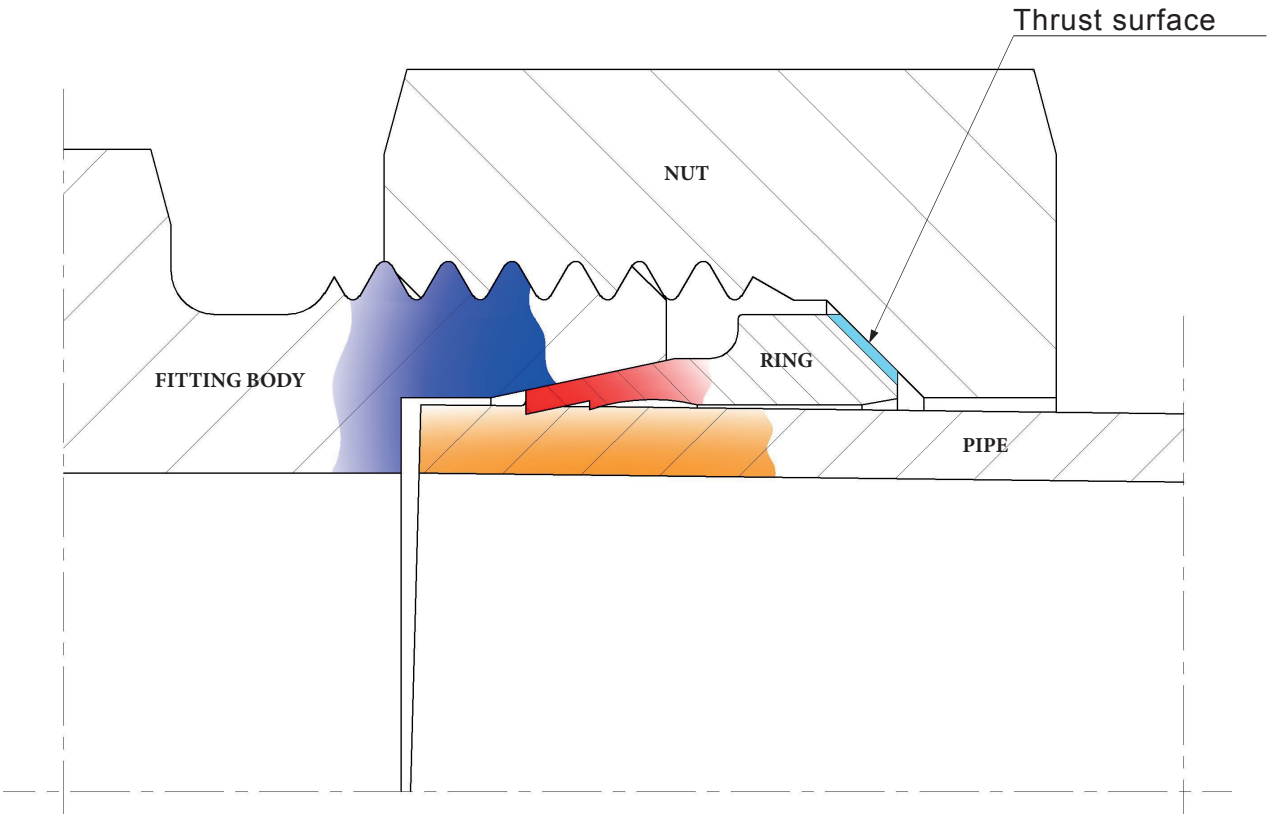
ASSEMBLY BEHAVIOUR:
A pipe cut out of square does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the steel pipe is cut perpendicular to its axis.

"B3" CUTTING RING FITTINGS

PIPE NOT ALIGNED WITH THE AXIS OF THE FITTING AND NOT BRACKETED



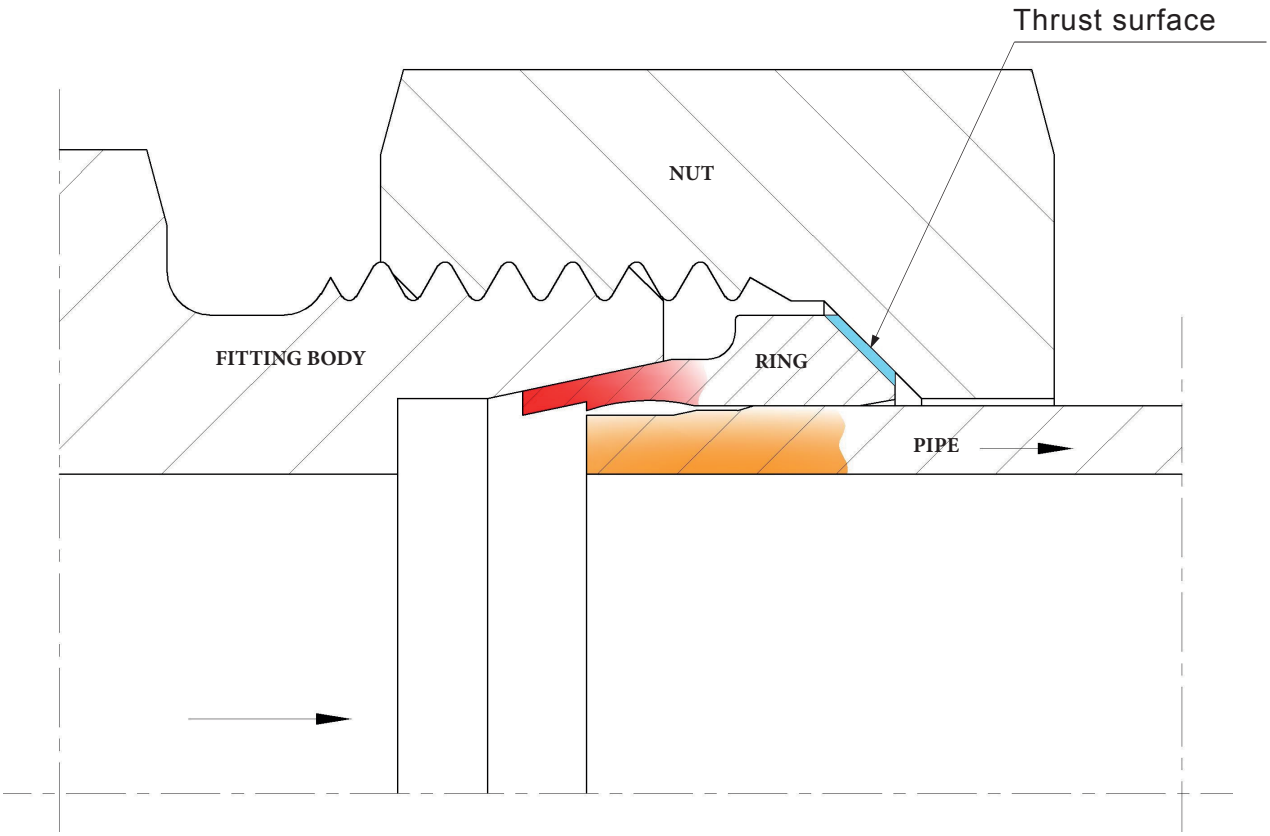
ASSEMBLY BEHAVIOUR:
A pipe that is not aligned with the axis of the fitting, does not guarantee correct sealing of the joint between the cutting ring clinched to the steel pipe and the 24° seat of the fitting.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
The pipe must be aligned with the axis of the fitting and secured with the appropriate brackets.

"B3" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURE PEAKS



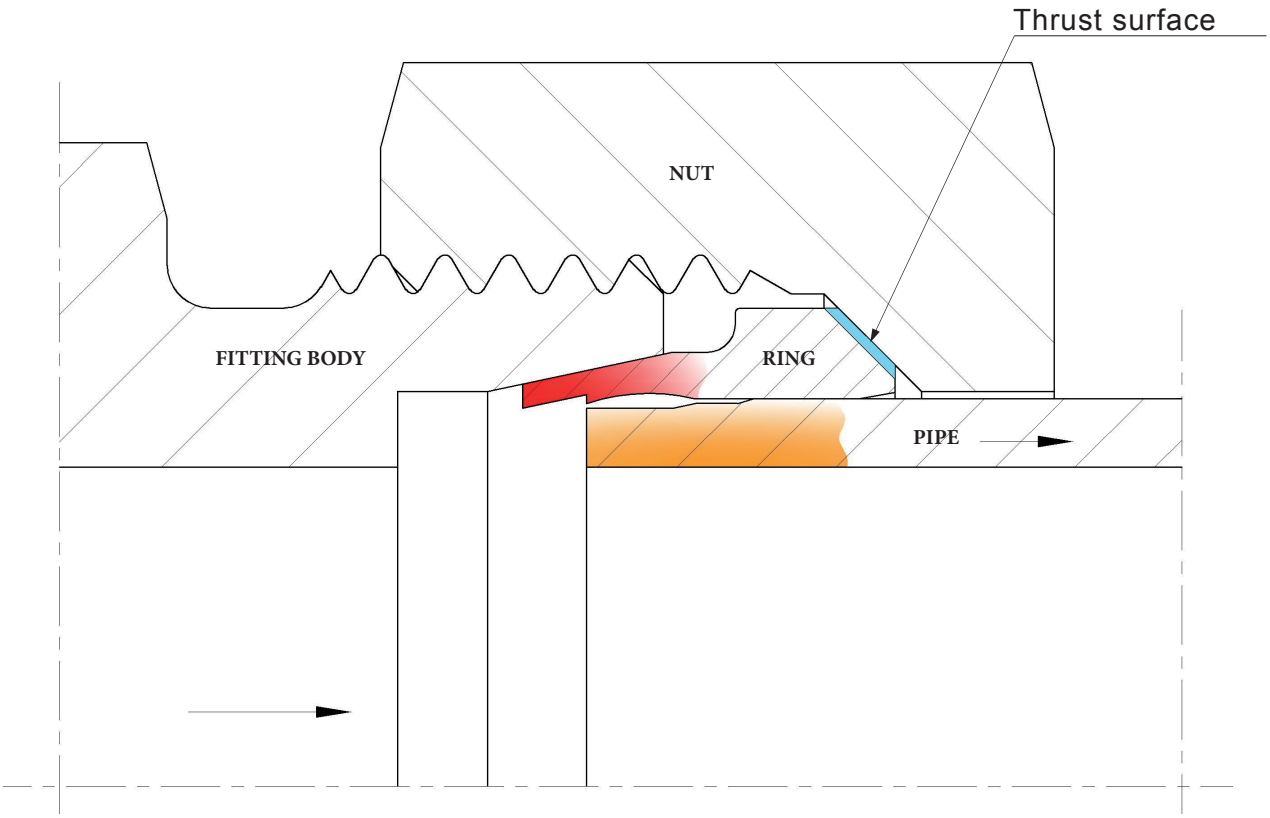
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressure peaks that are higher than those permitted.

"B3" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURES



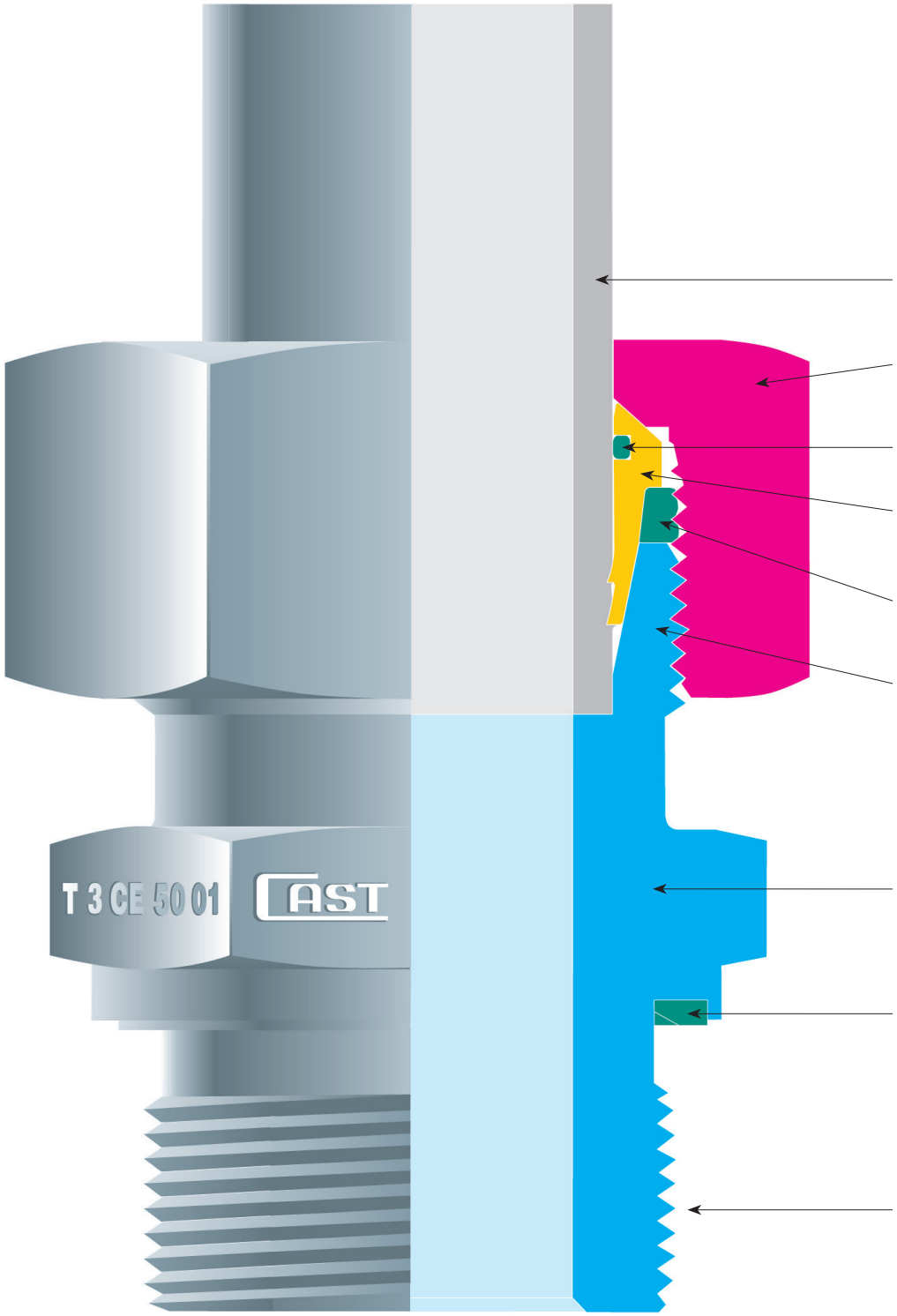
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressures that are higher than permitted.

ISO 8434-1, DIN 2353 JOINT FOR B4 CUTTING RING

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-1, DIN 2353 WITH B4 CUTTING RING



Reference standards:

Pipe E 235
EN 10305-4

Nut
DIN 3870

O-Ring seal
CAST

Cutting ring
DIN 3861-B

flat seal
gasket CAST

Seat shape
DIN 3861

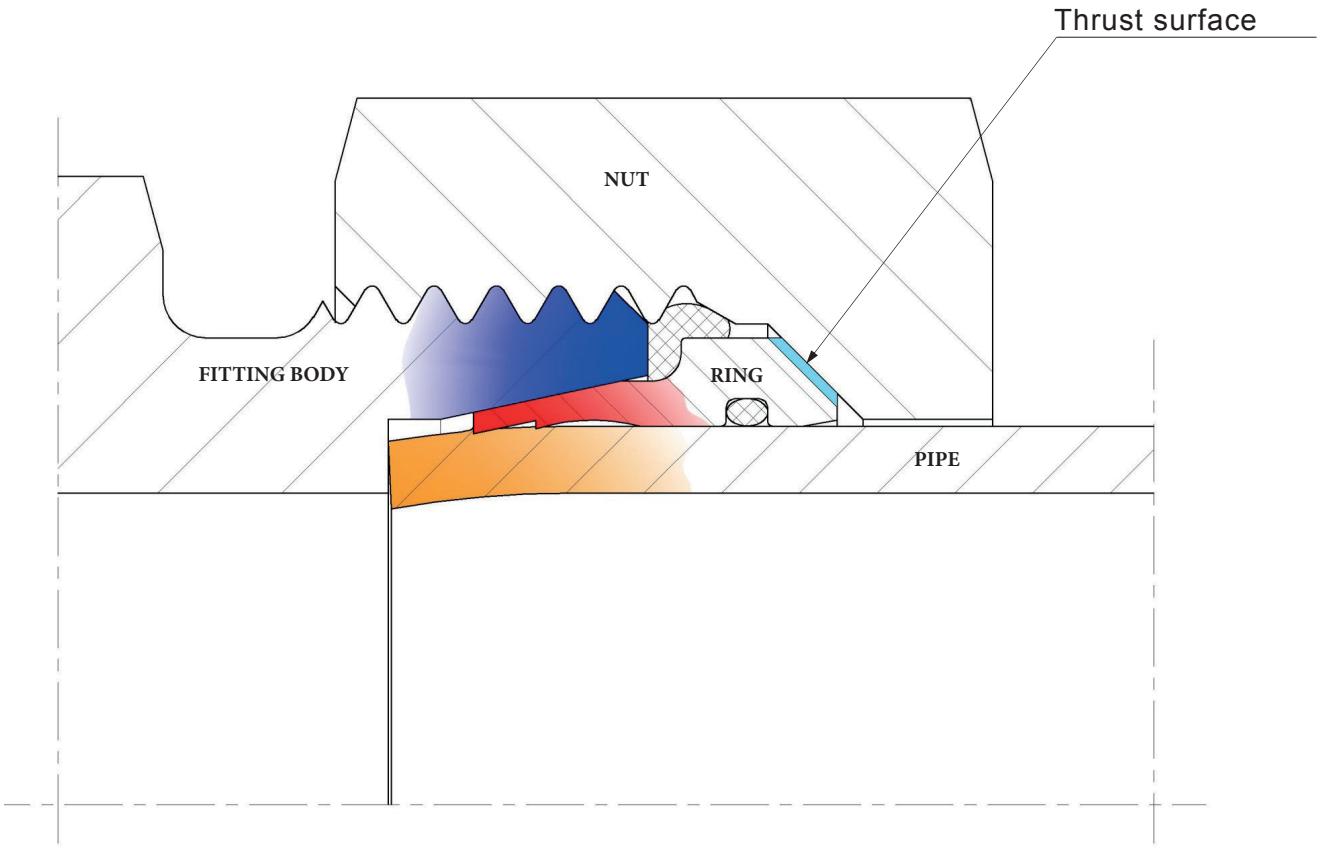
Fitting body
ISO 8434-1

Flat gasket
seat ISO 1179-2

Threaded end
ISO 1179-2

"B4" CUTTING RING FITTINGS

MOUNTING ON OVERSIZED 24° SEAT (NON-COMPLIANT)



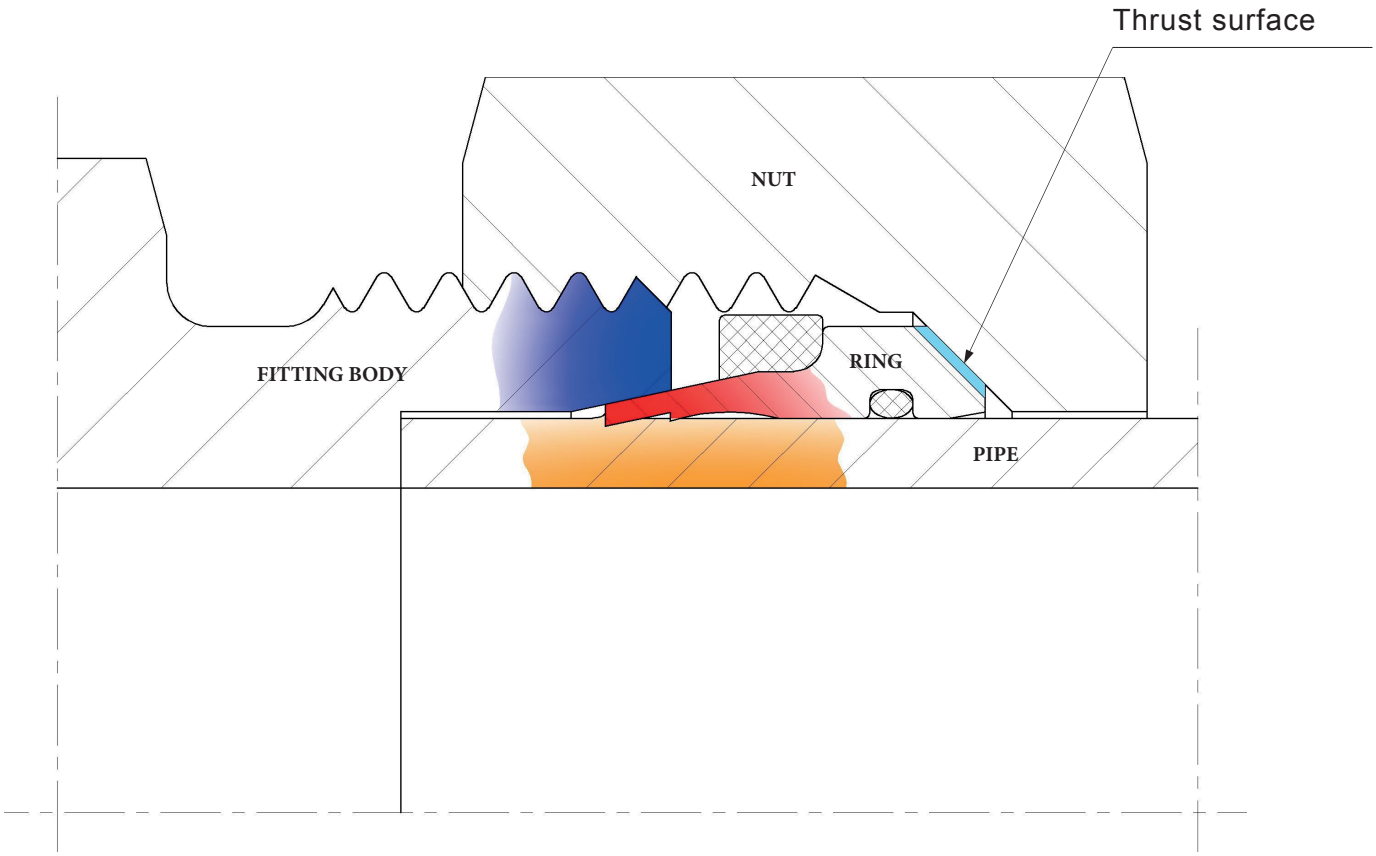
ASSEMBLY BEHAVIOUR:
An oversized (non-compliant) 24° seat causes excessive cutting ring feed, failure of the pipe end and incorrect clinching of the cutting ring to the steel pipe.
The variable-geometry flat gasket is compressed to fit over the ridges of the threads and the head of the cutting ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B4" CUTTING RING FITTINGS

MOUNTING ON UNDERSIZED 24° SEAT (NON-COMPLIANT)



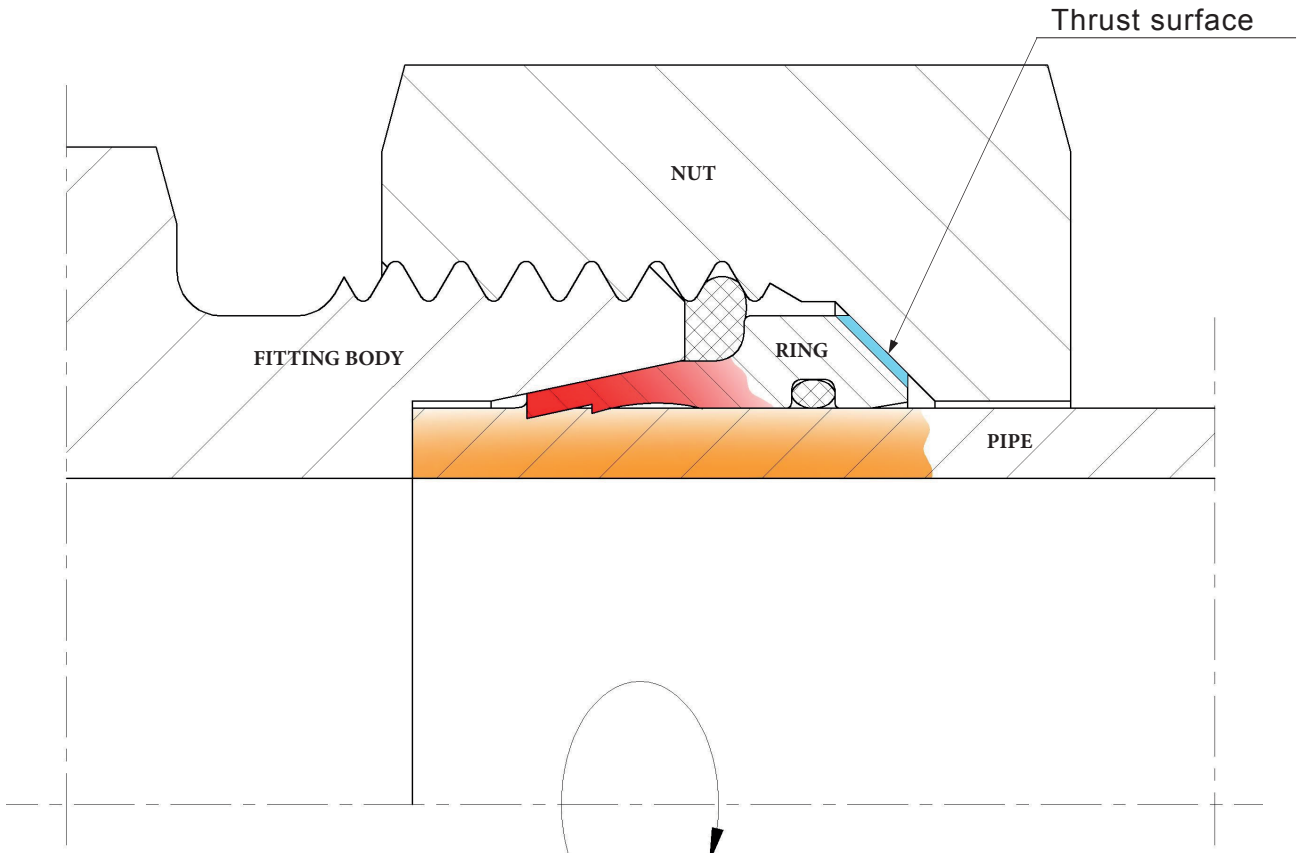
ASSEMBLY BEHAVIOUR:
An undersized 24° seat (non-compliant) causes the ring to be positioned too far back from the pipe face and the cutting ring is incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B4" CUTTING RING FITTINGS

PIPE ROTATING DURING TIGHTENING



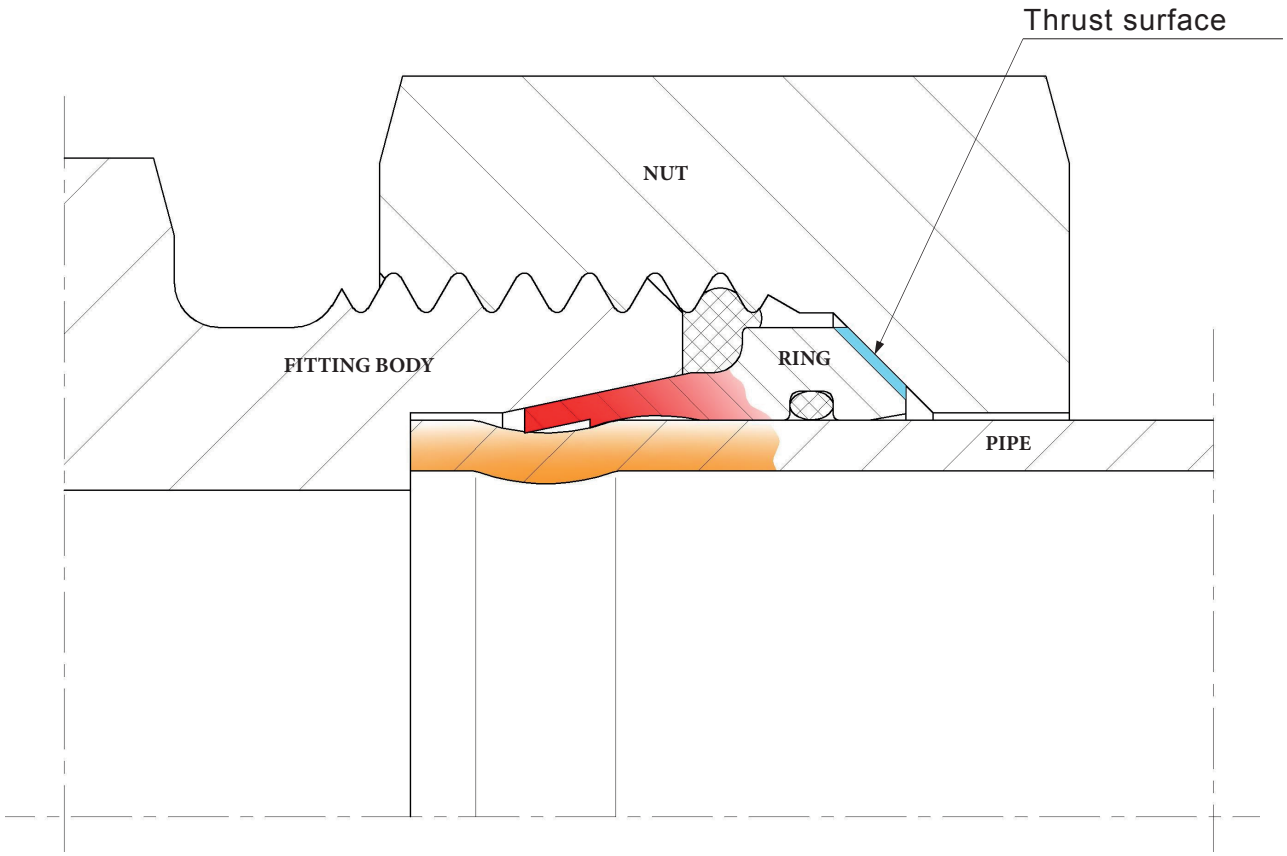
ASSEMBLY BEHAVIOUR:
The rotation of the pipe does not allow the cutting ring to clinch the steel pipe properly.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble, preventing rotation of the steel pipe.

"B4" CUTTING RING FITTINGS

THIN-WALLED PIPE (NON-COMLPLIANT)



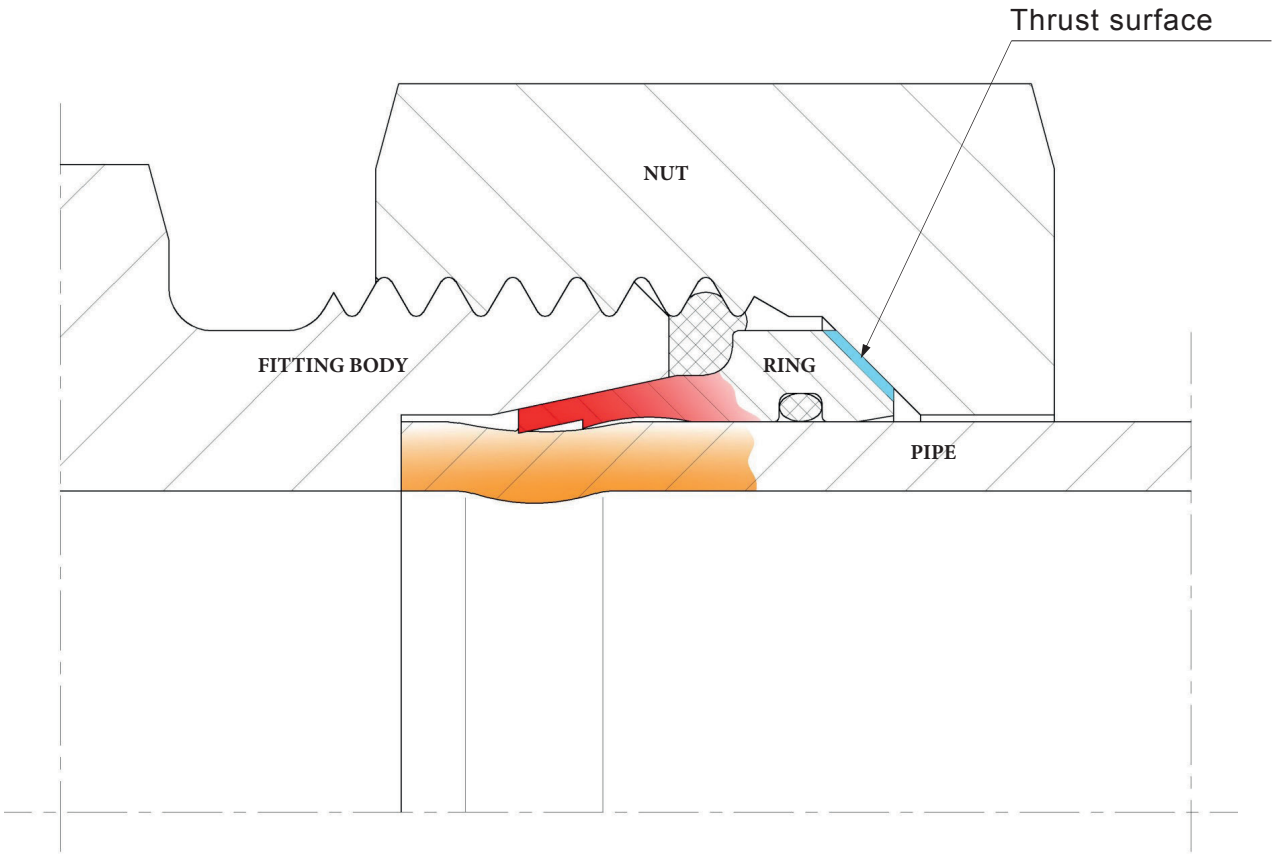
ASSEMBLY BEHAVIOUR:
A thin-walled pipe does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe. The variable-geometry flat gasket is compressed to fit over the ridges of the threads and the head of the cutting ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using an appropriate reinforcing bushing or replace the pipe with a compliant one (see pp. 36-37).

"B4" CUTTING RING FITTINGS

PIPE WITH LESS HARDNESS THAN PERMITTED (NON-COMPLIANT)



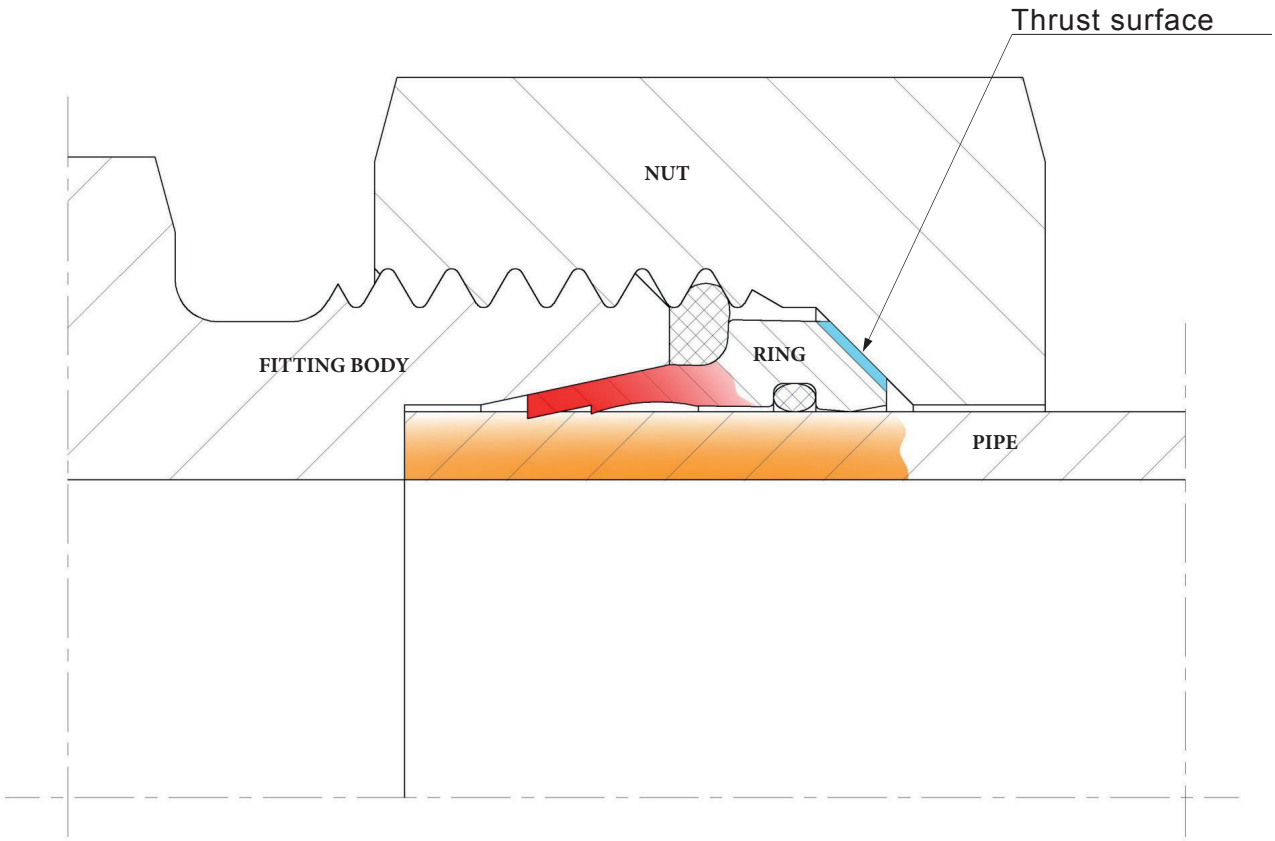
ASSEMBLY BEHAVIOUR:
A pipe with reduced hardness on the outside diameter is also normally poorly structured and does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe.
The variable-geometry flat gasket is compressed to fit over the ridges of the threads and the head of the cutting ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see pp. 36-37).

"B4" CUTTING RING FITTINGS

PIPE IS EXCESSIVELY HARD (NON-COMPLIANT)



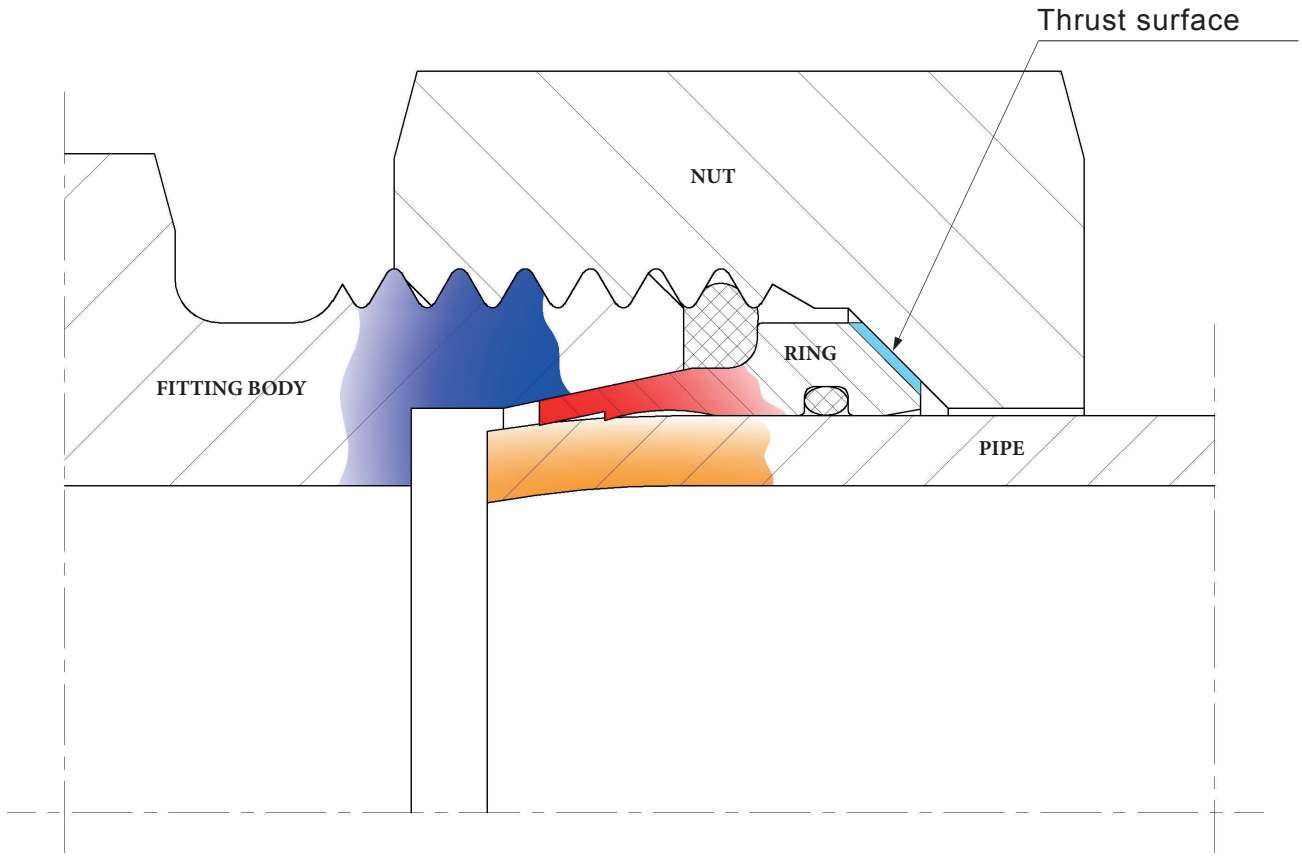
ASSEMBLY BEHAVIOUR:
A pipe with excessive hardness on the external diameter does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see pp. 36-37).

"B4" CUTTING RING FITTINGS

PIPE NOT FULLY INSERTED IN 24° SEAT



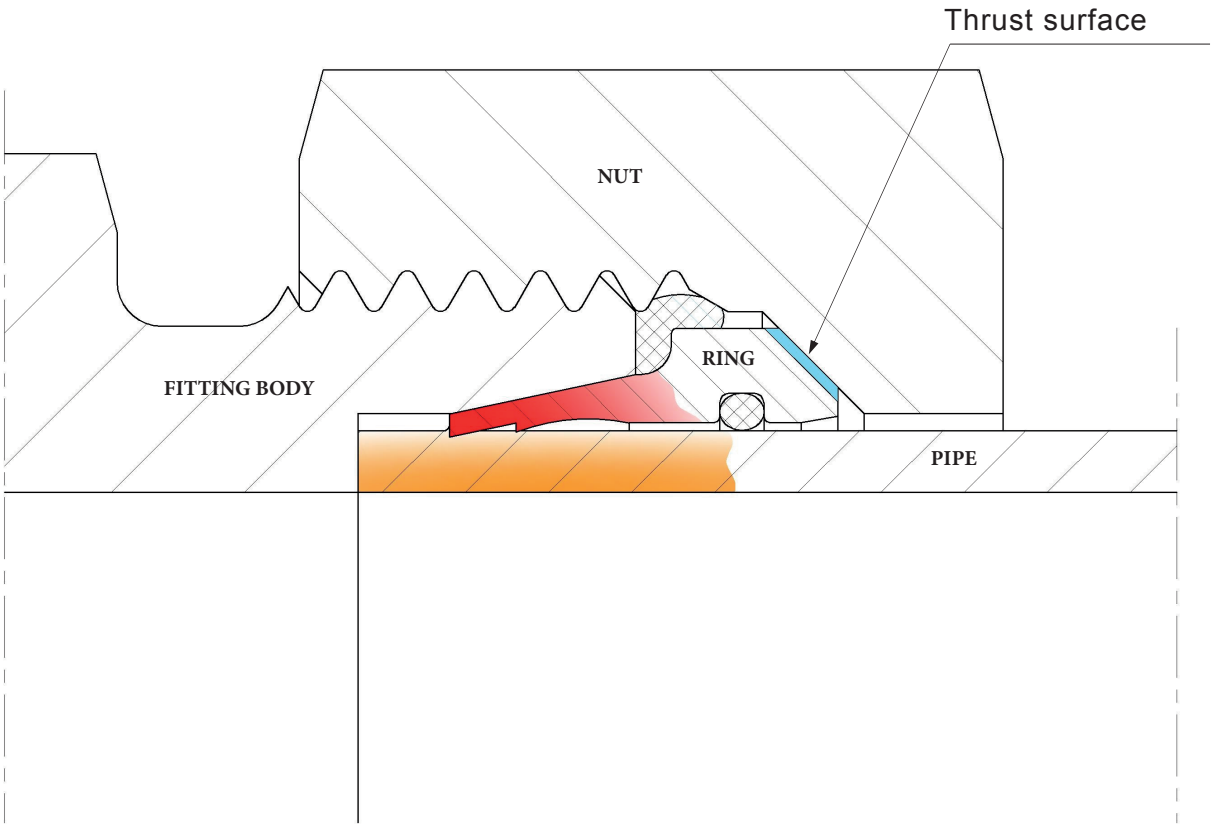
ASSEMBLY BEHAVIOUR:
A pipe not inserted up as far as the stop causes the end of the pipe to yield and the cutting ring is thus incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the pipe is in as far as the stop.

"B4" CUTTING RING FITTINGS

EXTERNAL DIAMETER OF PIPE BELOW NOMINAL SIZE (NON-COMPLIANT)



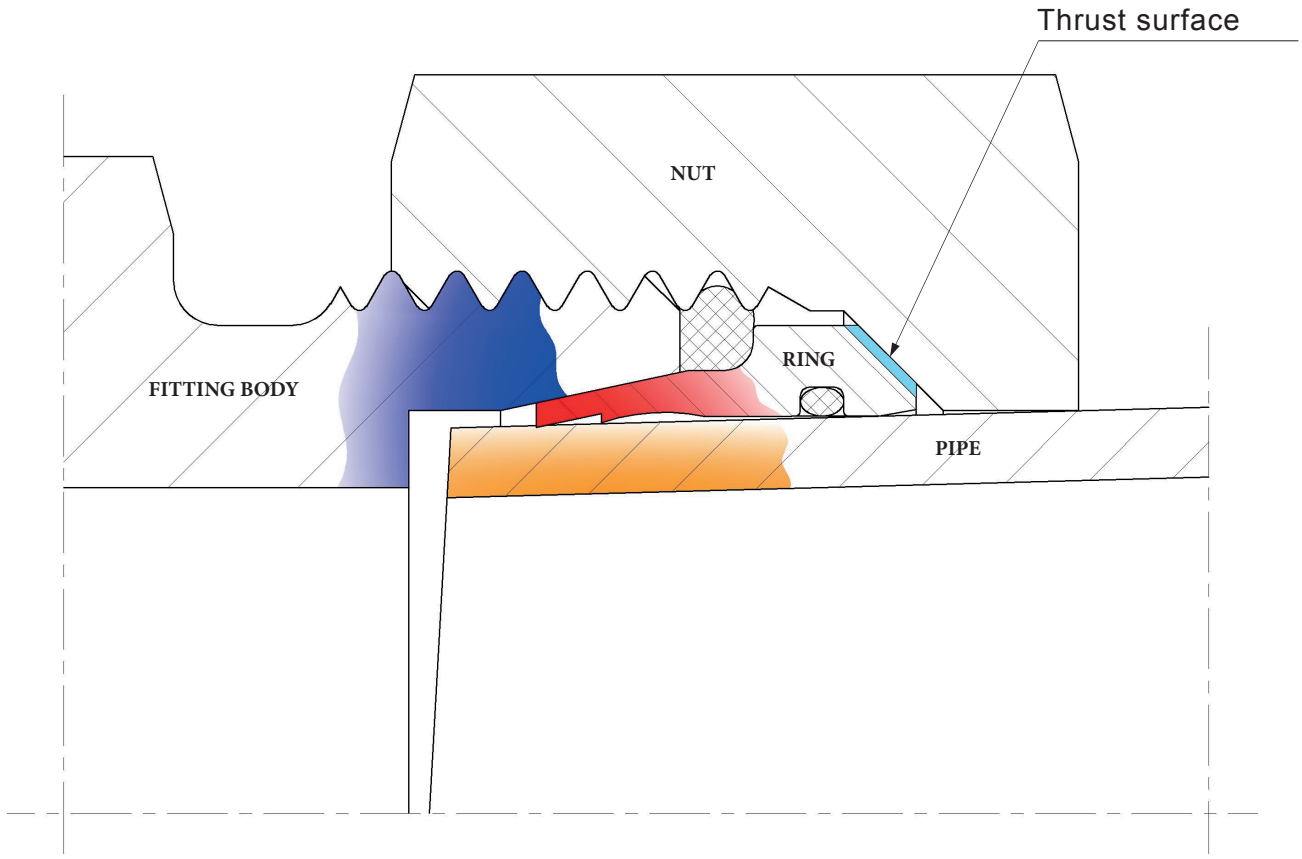
ASSEMBLY BEHAVIOUR:
A pipe with a smaller external diameter does not allow the cutting ring to be properly clinched to the steel pipe.
The variable-geometry flat gasket is compressed to fit over the ridges of the threads and the head of the cutting ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant dimensions (see pp. 36-37).

"B4" CUTTING RING FITTINGS

PIPE CUT OUT OF SQUARE (NON-COMPLIANT)



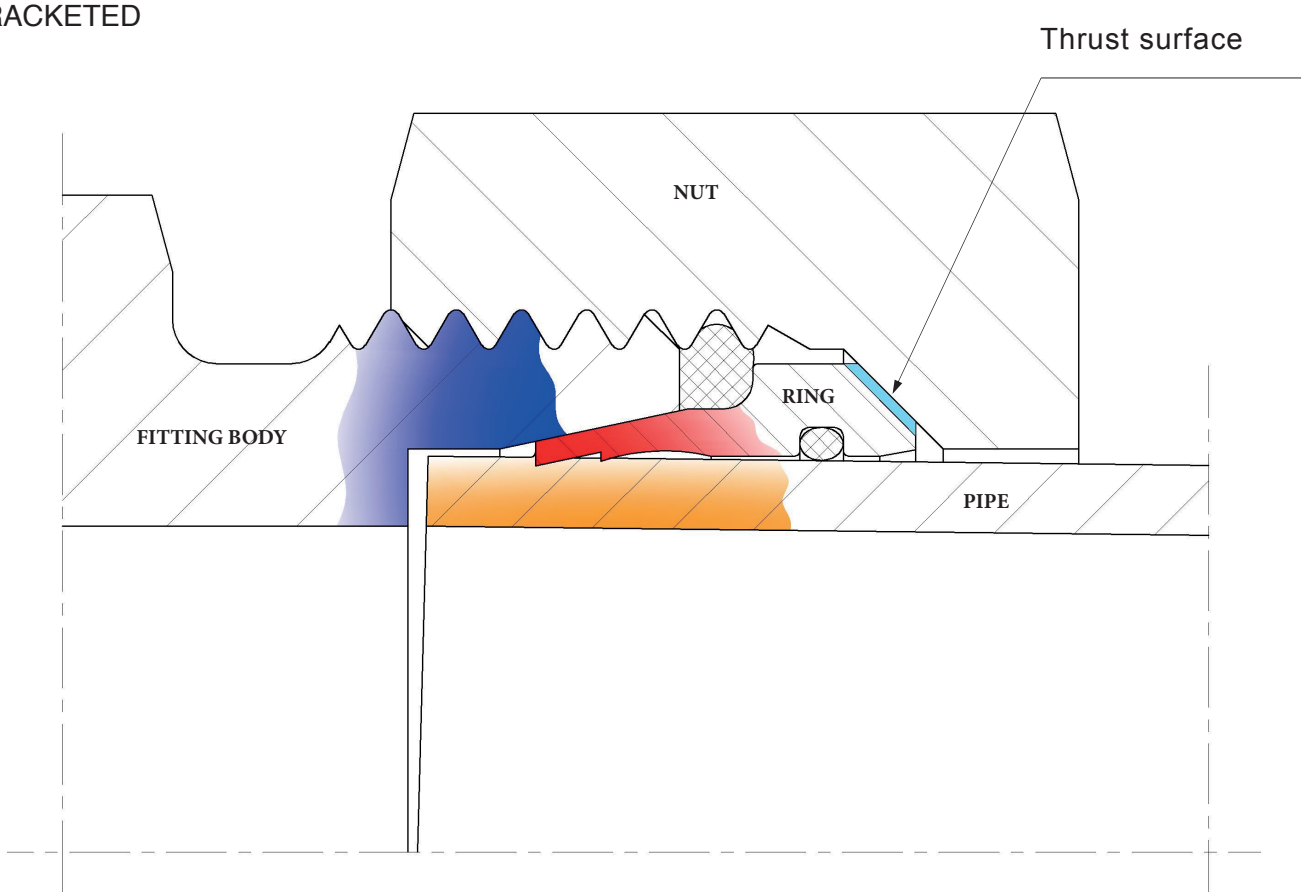
ASSEMBLY BEHAVIOUR:
A pipe cut out of square does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the steel pipe is cut perpendicular to its axis.

"B4" CUTTING RING FITTINGS

PIPE NOT ALIGNED WITH THE AXIS OF THE FITTING AND NOT BRACKETED



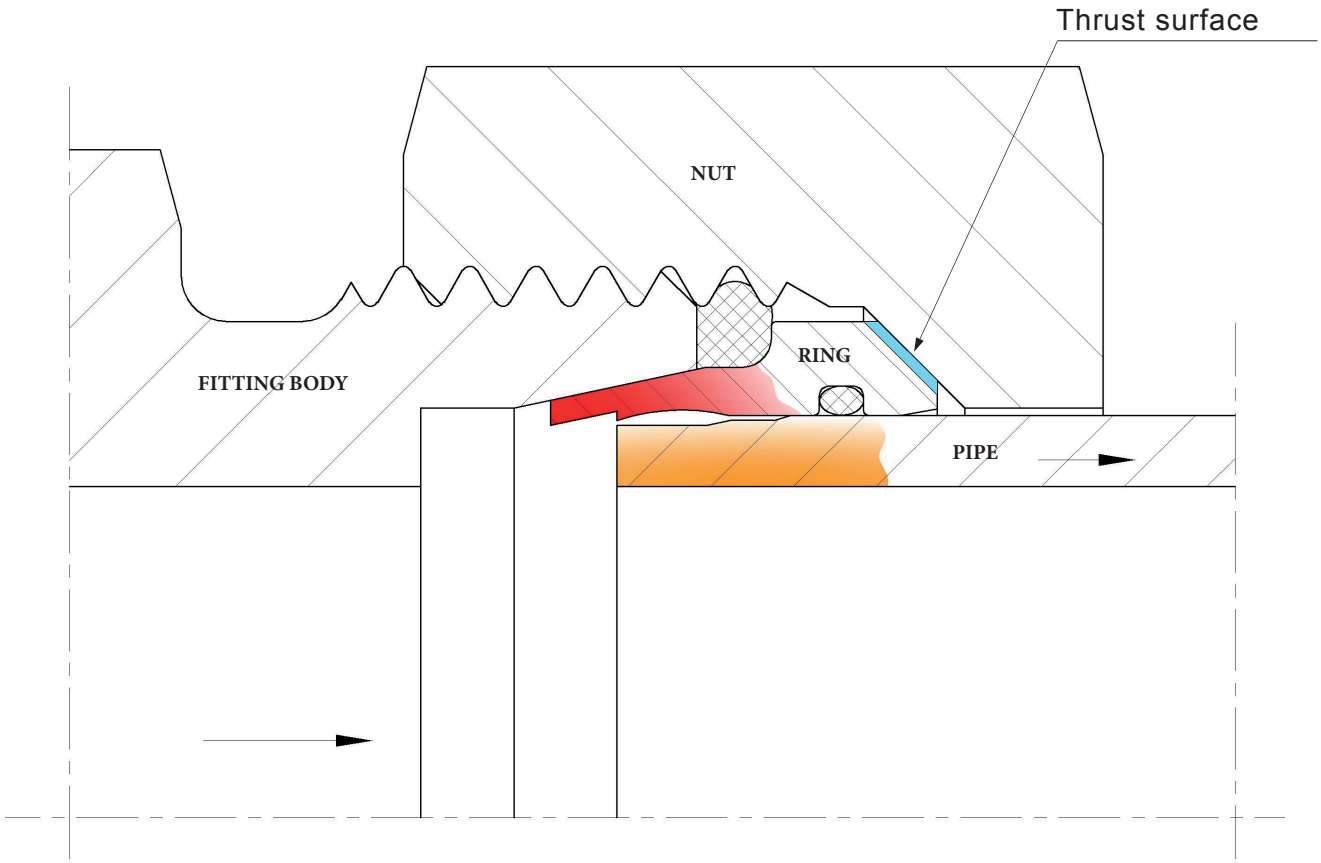
ASSEMBLY BEHAVIOUR:
A pipe that is not aligned with the axis of the fitting, does not guarantee correct sealing of the joint between the cutting ring clinched to the steel pipe and the 24° seat of the fitting.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
The pipe must be aligned with the axis of the fitting and secured with the appropriate brackets.

"B4" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURE PEAKS



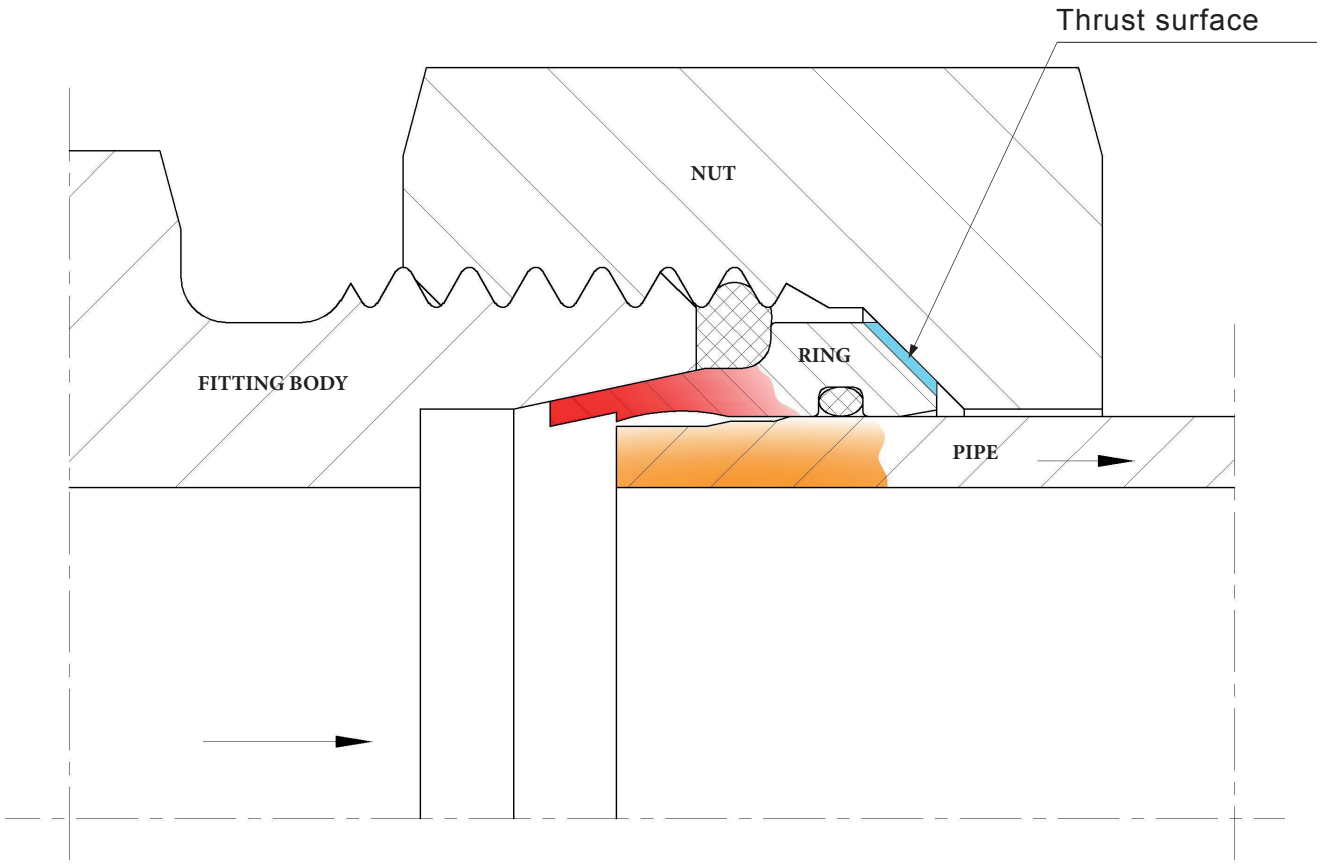
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressure peaks that are higher than those permitted.

"B4" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURES



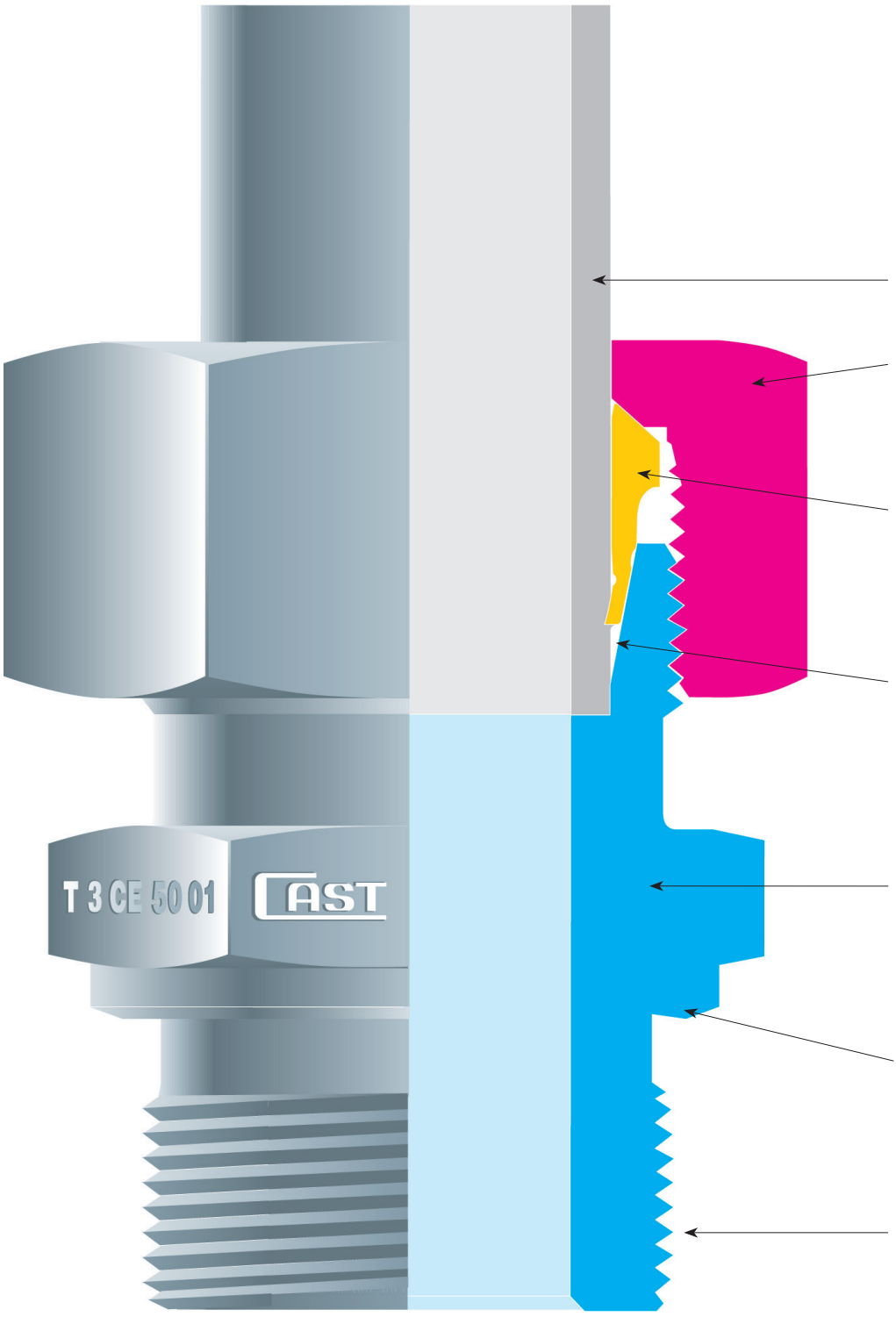
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressures that are higher than permitted.

ISO 8434-1, DIN 2353 JOINT FOR B6 CUTTING RING

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-1, DIN 2353 WITH B6 SINGLE-CUTTING RING



Reference standards:

INOX pipe 1.4571
UNI EN 10216-5

Nut
DIN 3870

"B6" single-cutting ring for stainless steel only

Seat shape
DIN 3861

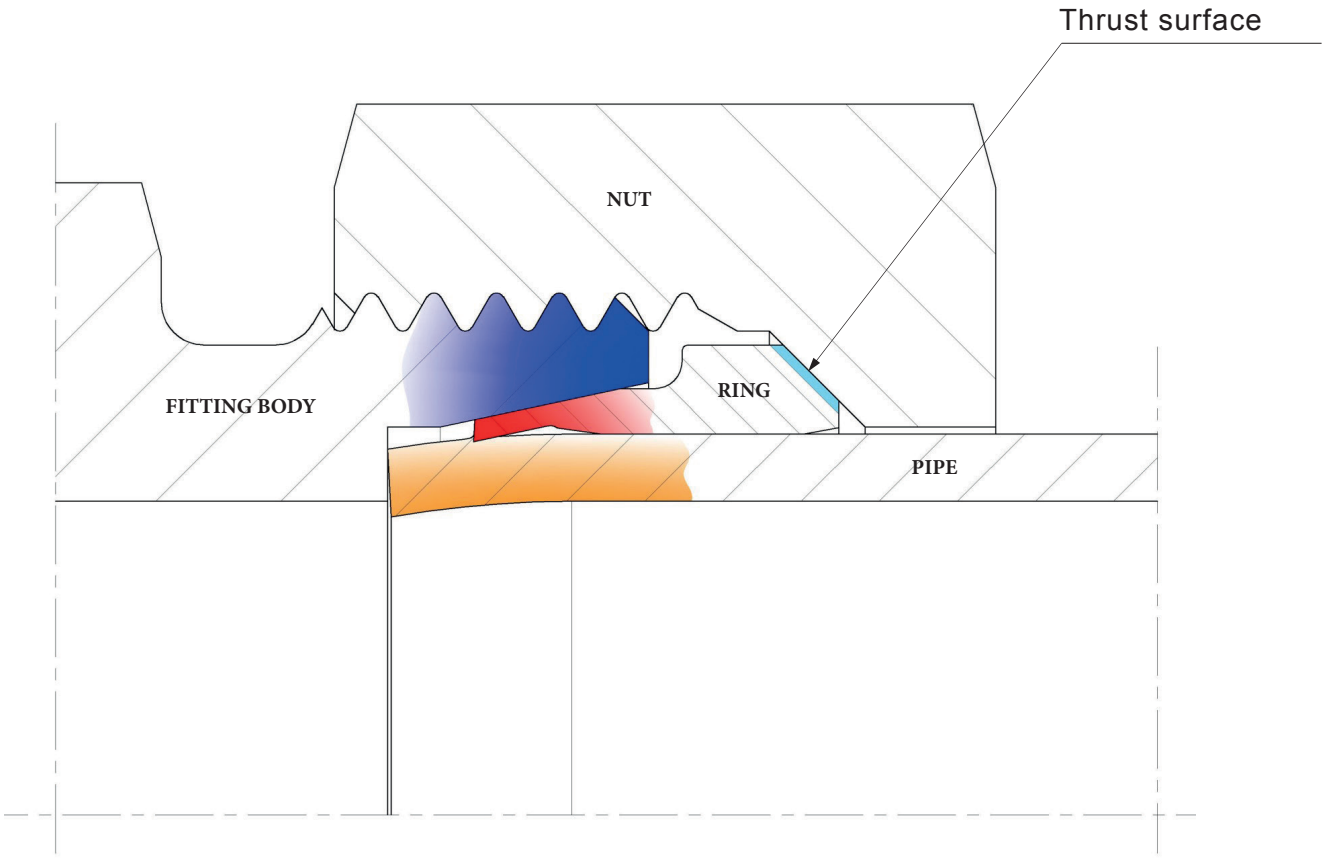
Fitting body
DIN 3861

Metal-to-metal seal seat
ISO 1179-4

Threaded end
ISO 1179-4

"B6" CUTTING RING FITTINGS

MOUNTING ON OVERSIZED 24° SEAT (NON-COMPLIANT)



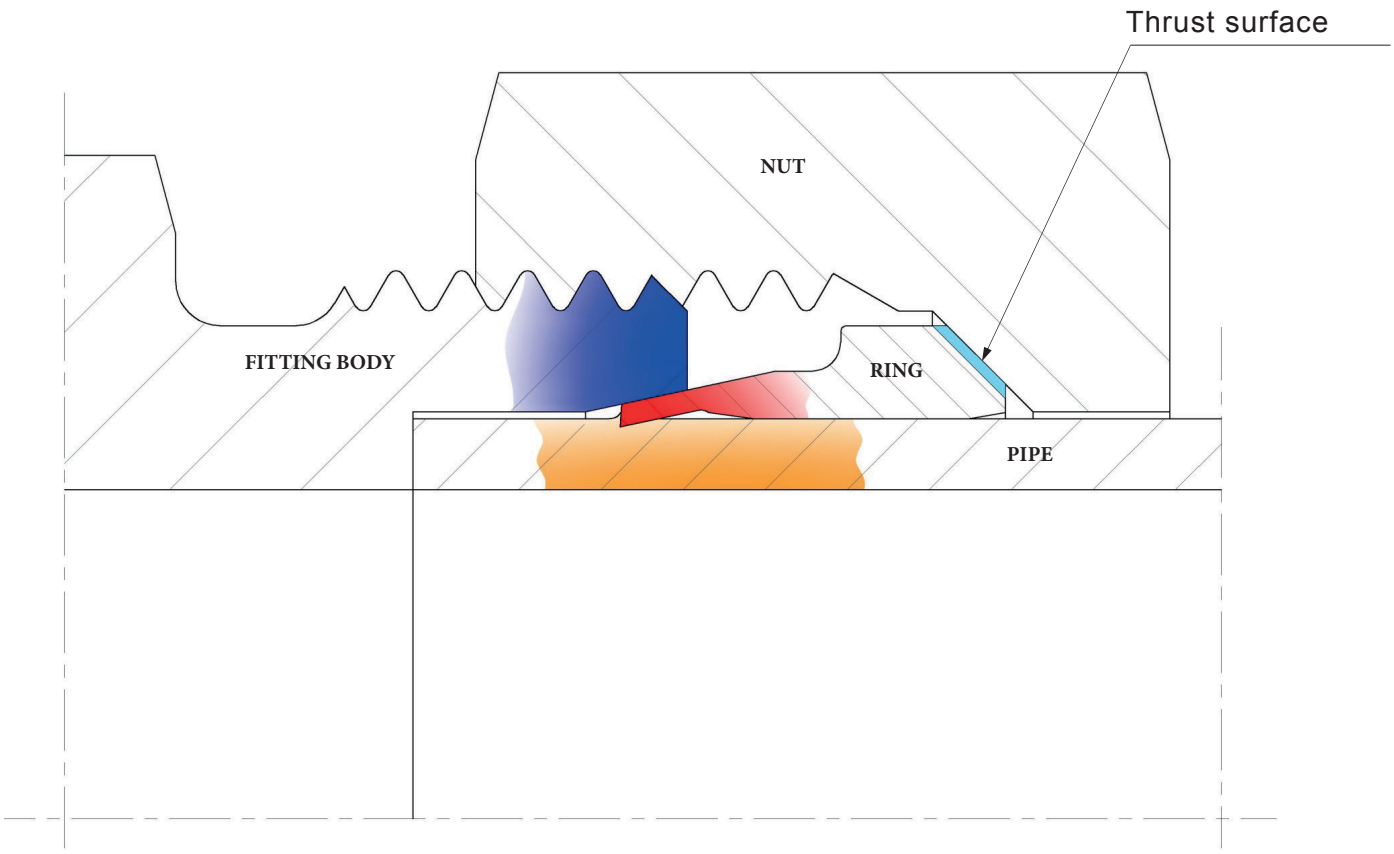
ASSEMBLY BEHAVIOUR:
An oversized (non-compliant) 24° seat causes excessive cutting ring feed, failure of the pipe end and incorrect clinching of the cutting ring to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B6" CUTTING RING FITTINGS

MOUNTING ON UNDERSIZED 24° SEAT (NON-COMPLIANT)



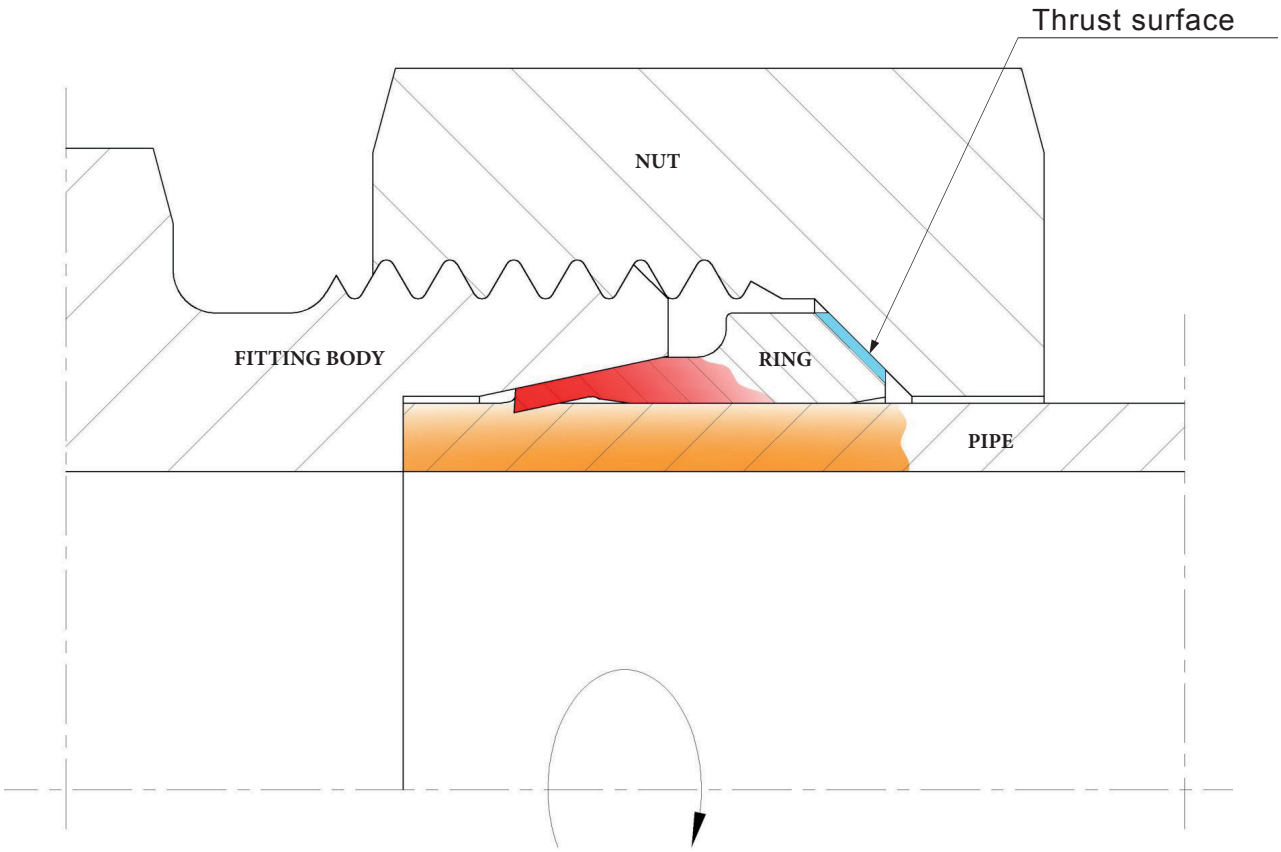
ASSEMBLY BEHAVIOUR:
An undersized 24° seat (non-compliant) causes the ring to be positioned too far back from the pipe face and the cutting ring is incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

"B6" CUTTING RING FITTINGS

PIPE ROTATING DURING TIGHTENING



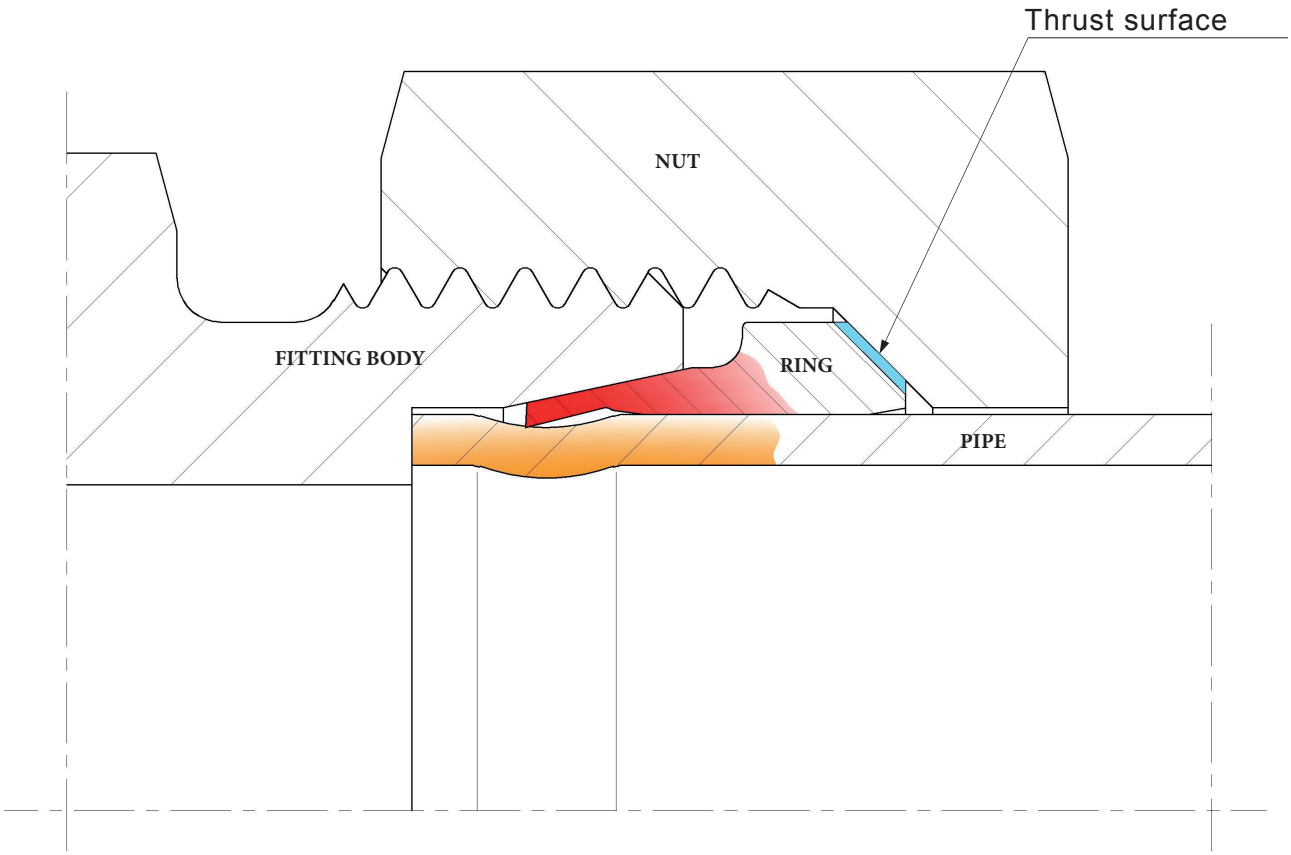
ASSEMBLY BEHAVIOUR:
The rotation of the pipe does not allow the cutting ring to clinch the steel pipe properly.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble, preventing rotation of the steel pipe.

"B6" CUTTING RING FITTINGS

THIN-WALLED PIPE (NON-COMLPLIANT)



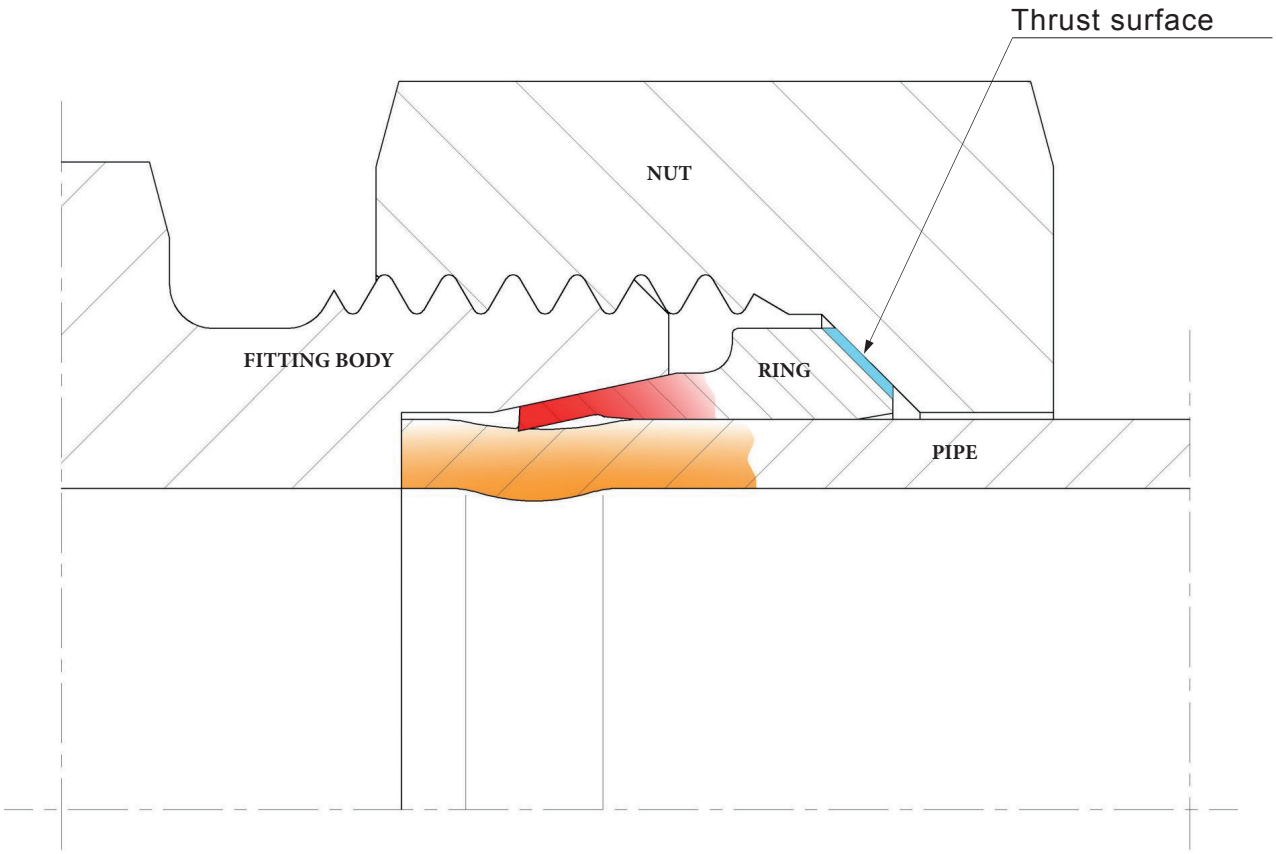
ASSEMBLY BEHAVIOUR:
A thin-walled pipe does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using an appropriate reinforcing bushing or replace the pipe with a compliant one (see p. 37).

"B6" CUTTING RING FITTINGS

PIPE WITH LESS HARDNESS THAN PERMITTED (NON-COMPLIANT)



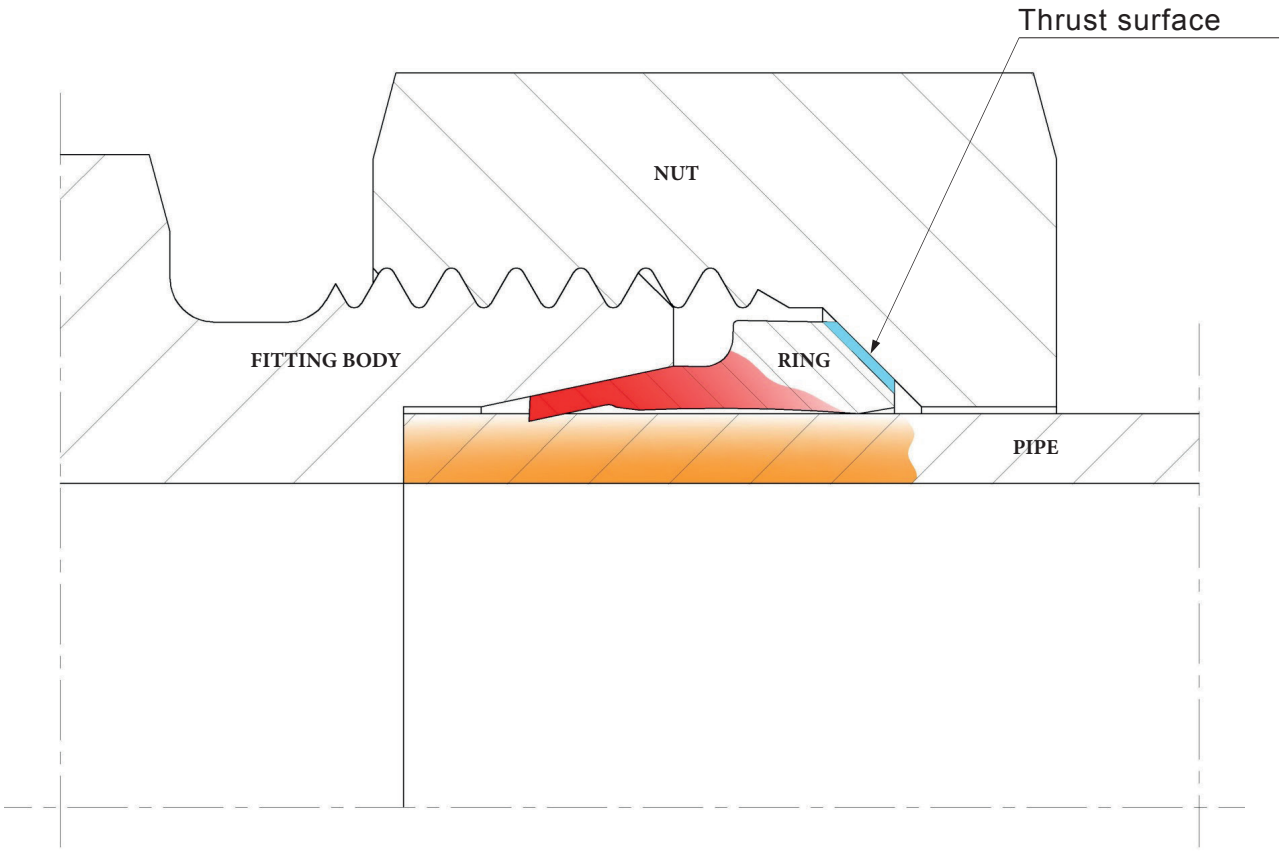
ASSEMBLY BEHAVIOUR:
A pipe with reduced hardness on the outside diameter is also normally poorly structured and does not offer the necessary resistance to the force exerted by the cutting ring during tightening. The pipe gives way and does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see p. 37).

"B6" CUTTING RING FITTINGS

PIPE IS EXCESSIVELY HARD (NON-COMPLIANT)



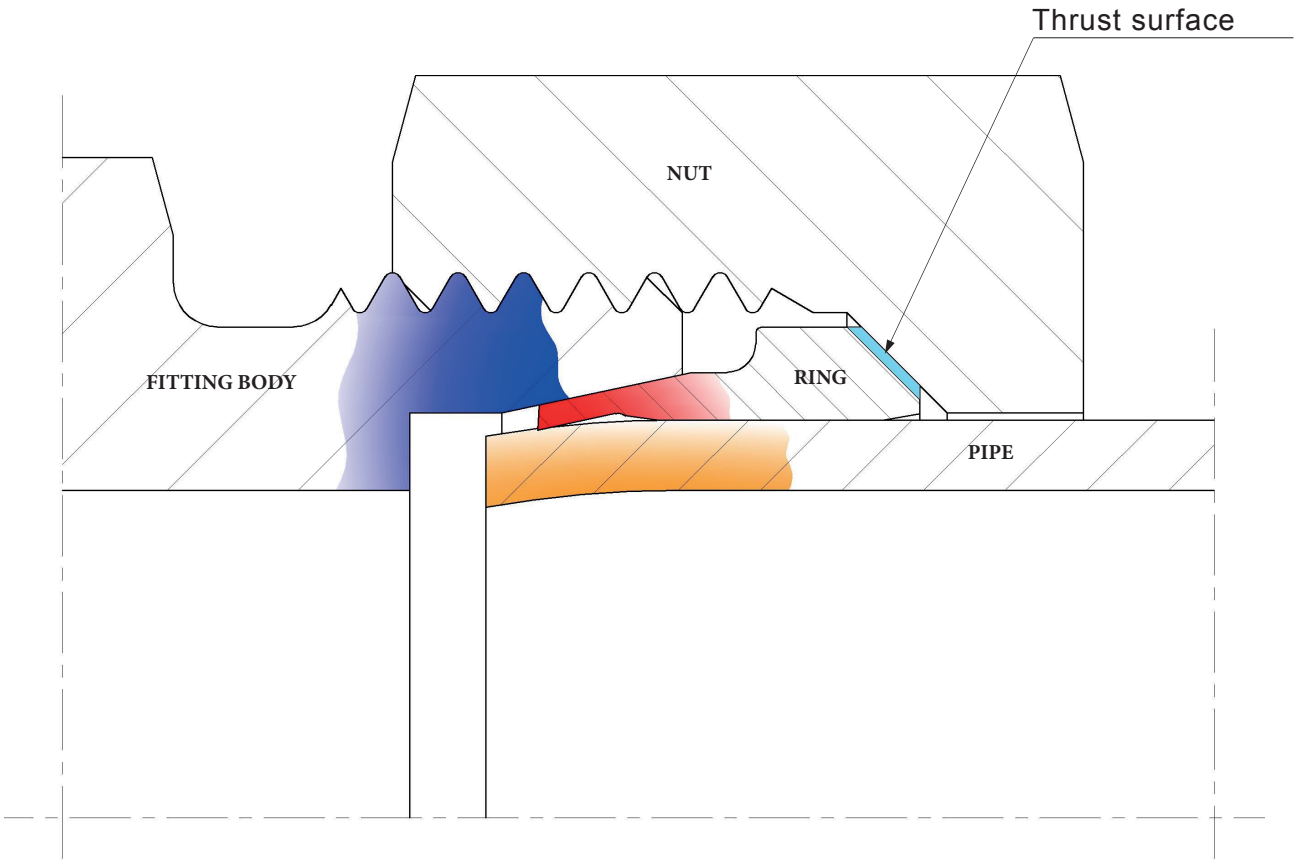
ASSEMBLY BEHAVIOUR:
A pipe with excessive hardness on the external diameter does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant hardness (see p. 37).

"B6" CUTTING RING FITTINGS

PIPE NOT FULLY INSERTED IN 24° SEAT



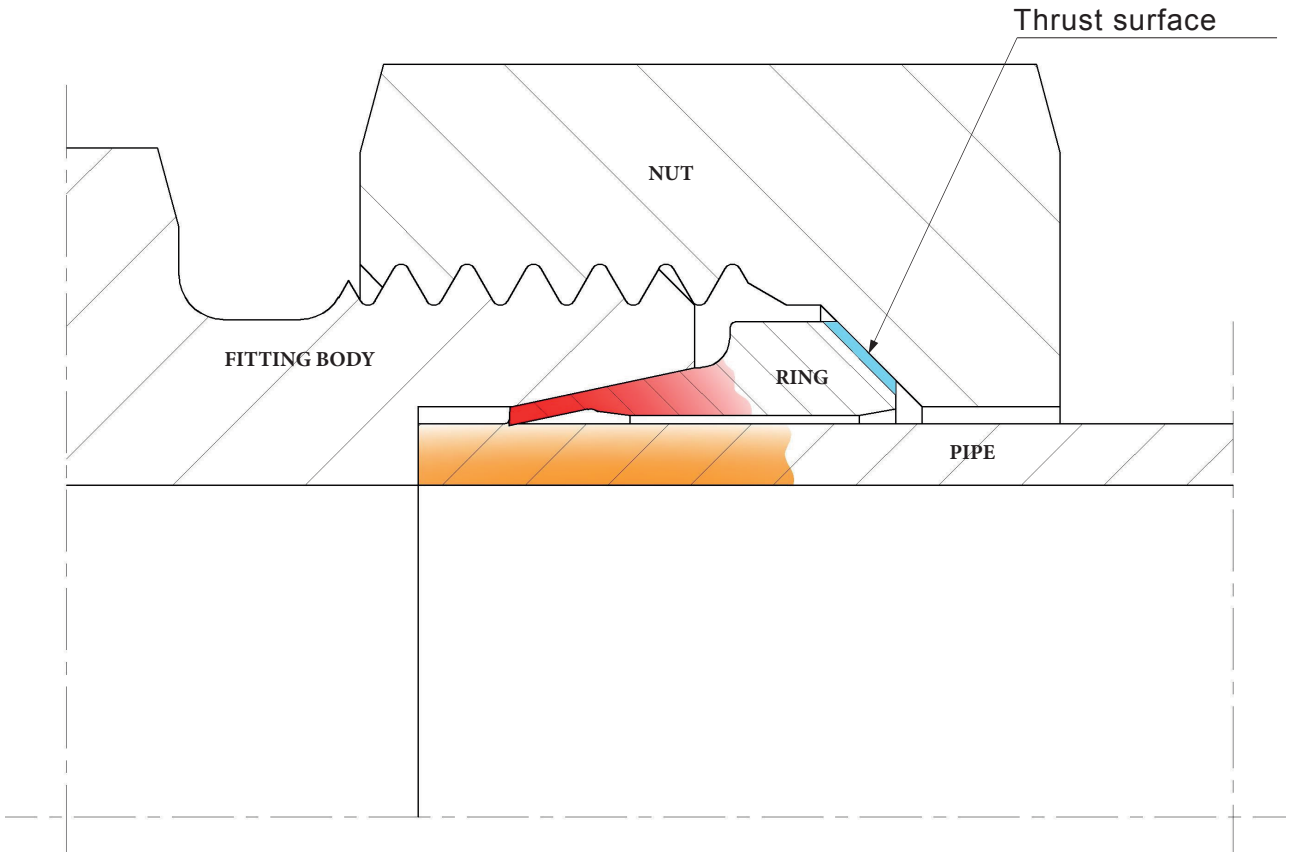
ASSEMBLY BEHAVIOUR:
A pipe not inserted up as far as the stop causes the end of the pipe to yield and the cutting ring is thus incorrectly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the pipe is in as far as the stop.

"B6" CUTTING RING FITTINGS

EXTERNAL DIAMETER OF PIPE BELOW NOMINAL SIZE (NON-COMPLIANT)



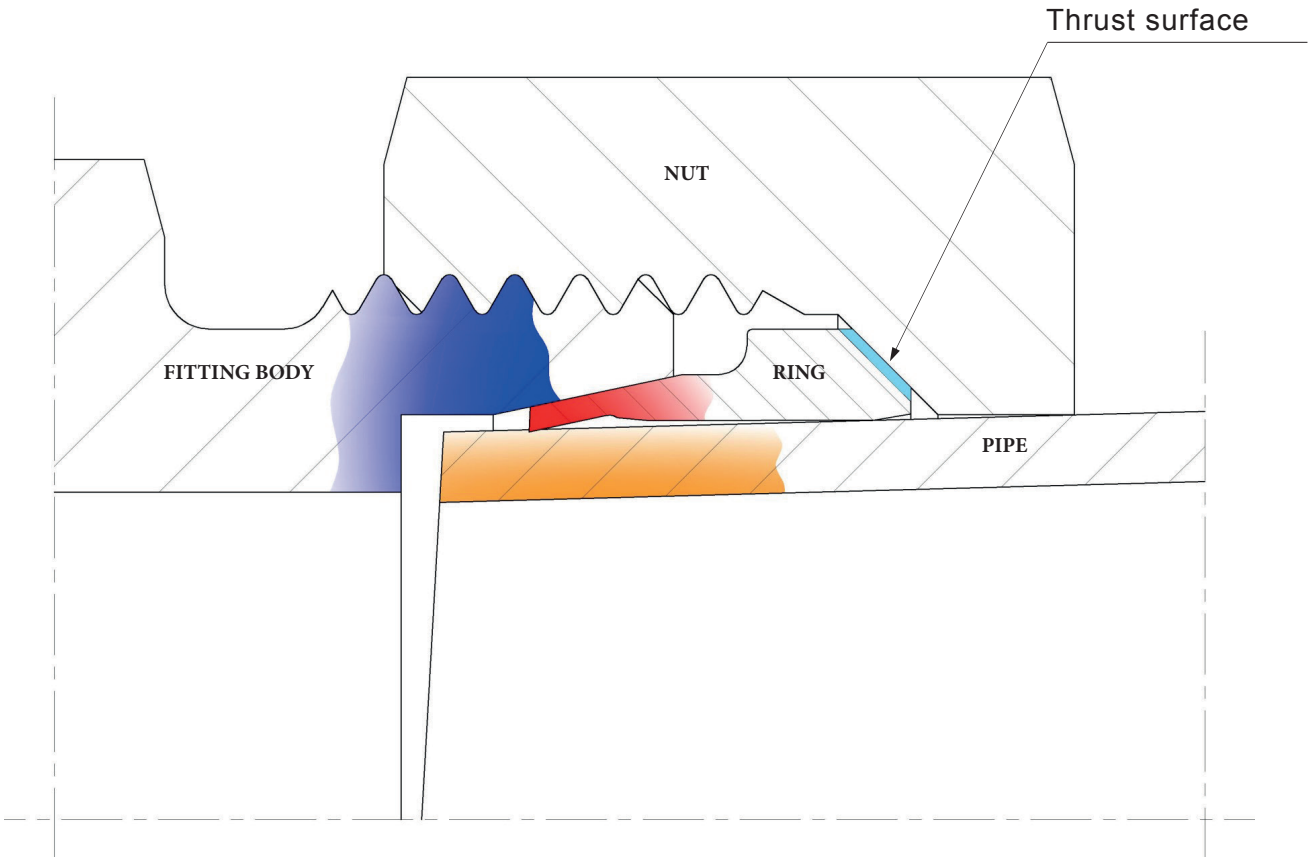
ASSEMBLY BEHAVIOUR:
A pipe with a smaller external diameter does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a pipe with compliant dimensions (see p.37).

"B6" CUTTING RING FITTINGS

PIPE CUT OUT OF SQUARE (NON-COMPLIANT)



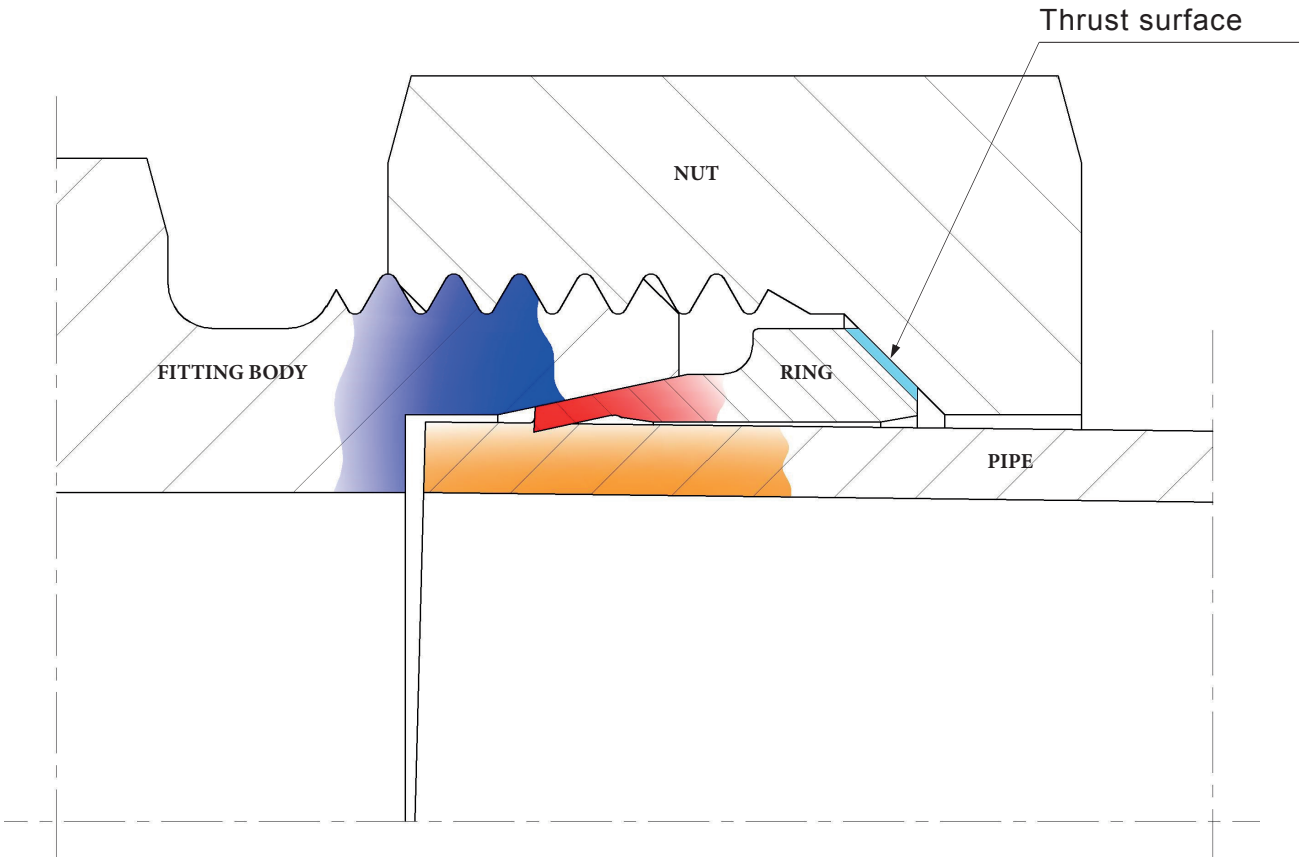
ASSEMBLY BEHAVIOUR:
A pipe cut out of square does not allow the cutting ring to be properly clinched to the steel pipe.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble ensuring that the steel pipe is cut perpendicular to its axis.

"B6" CUTTING RING FITTINGS

PIPE NOT ALIGNED WITH THE AXIS OF THE FITTING AND NOT BRACKETED



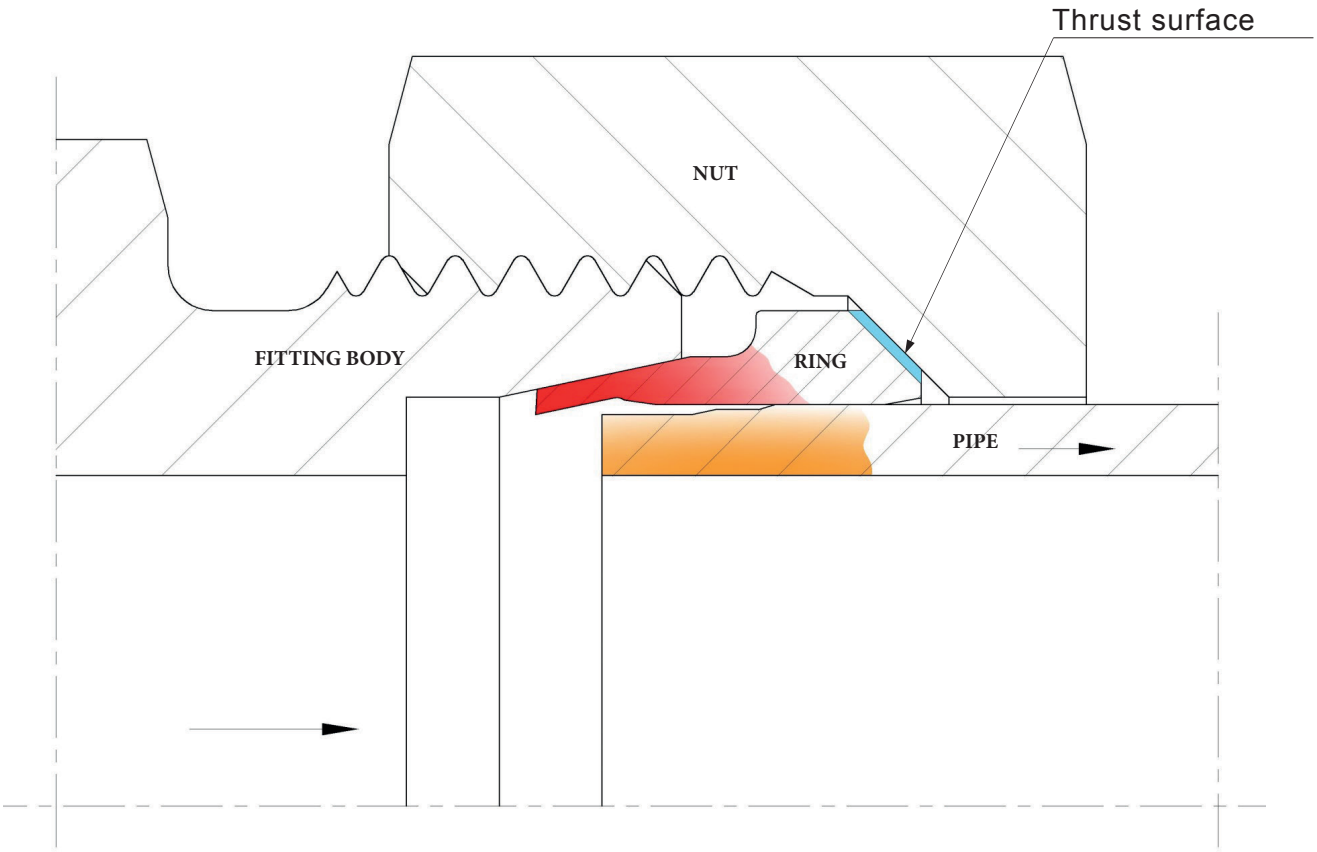
ASSEMBLY BEHAVIOUR:
A pipe that is not aligned with the axis of the fitting, does not guarantee correct sealing of the joint between the cutting ring clinched to the steel pipe and the 24° seat of the fitting.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
The pipe must be aligned with the axis of the fitting and secured with the appropriate brackets.

"B6" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURE PEAKS



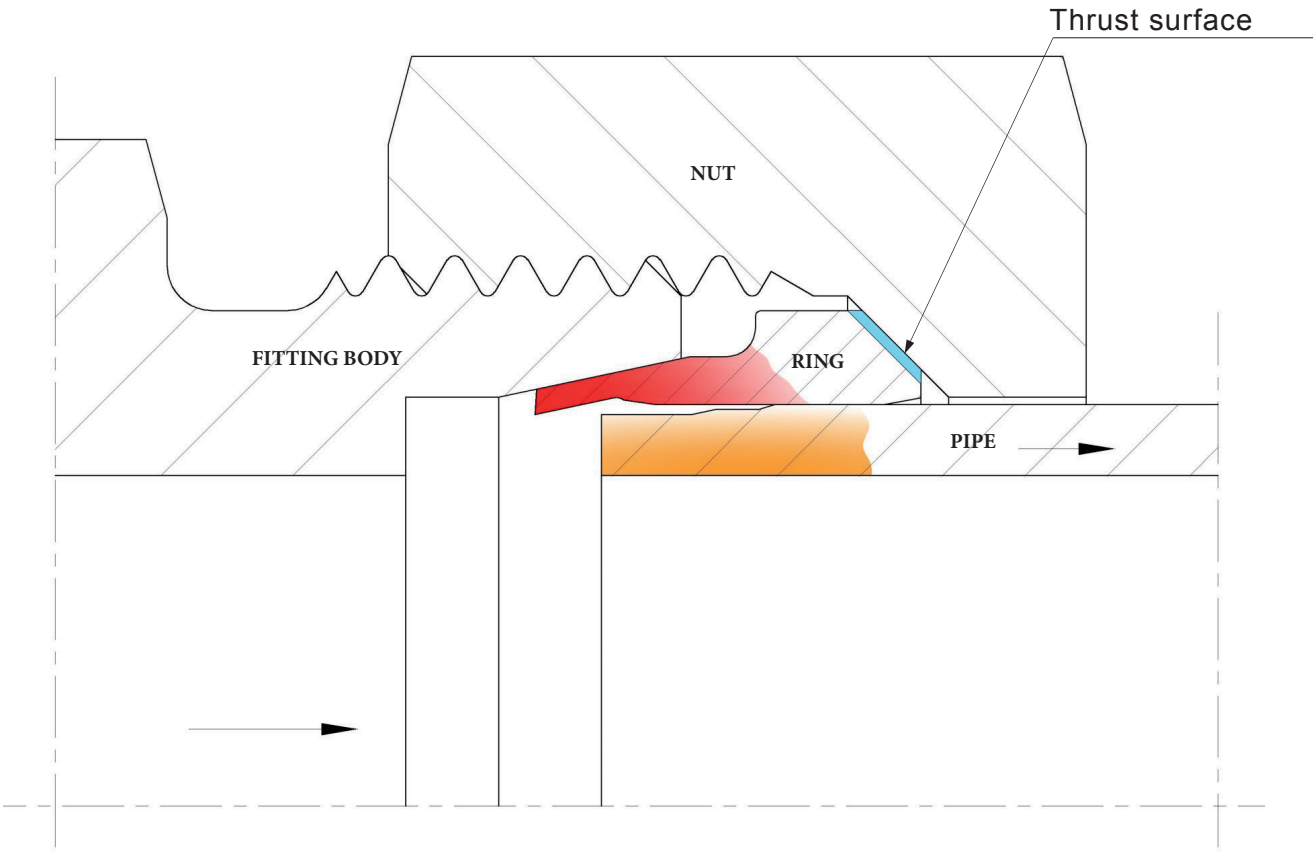
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressure peaks that are higher than those permitted.

"B6" CUTTING RING FITTINGS

SYSTEM WITH HIGHER THAN PERMITTED PRESSURES



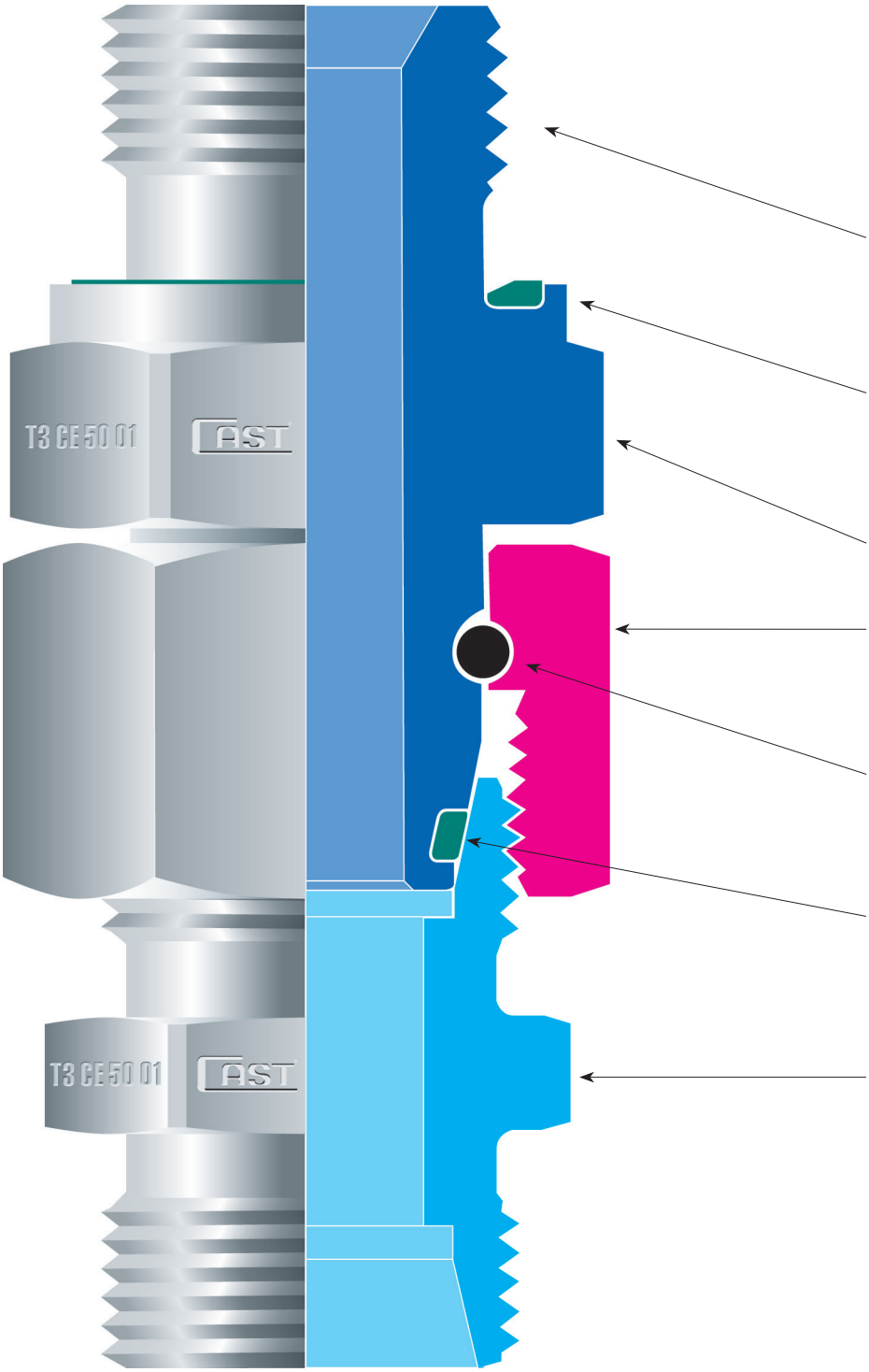
ASSEMBLY BEHAVIOUR:
During use (under pressure) it is possible for the correctly clinched steel pipe to unthread after the cutting ring has drawn the part of the pipe in front of the ring.

CONSEQUENCES:
Dislodgement of the steel pipe with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressures that are higher than permitted

ISO 8434-1 JOINT
WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINTING SYSTEM ISO 8434-1, WITH BARBED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Barbed body

Barbed
swivel nut

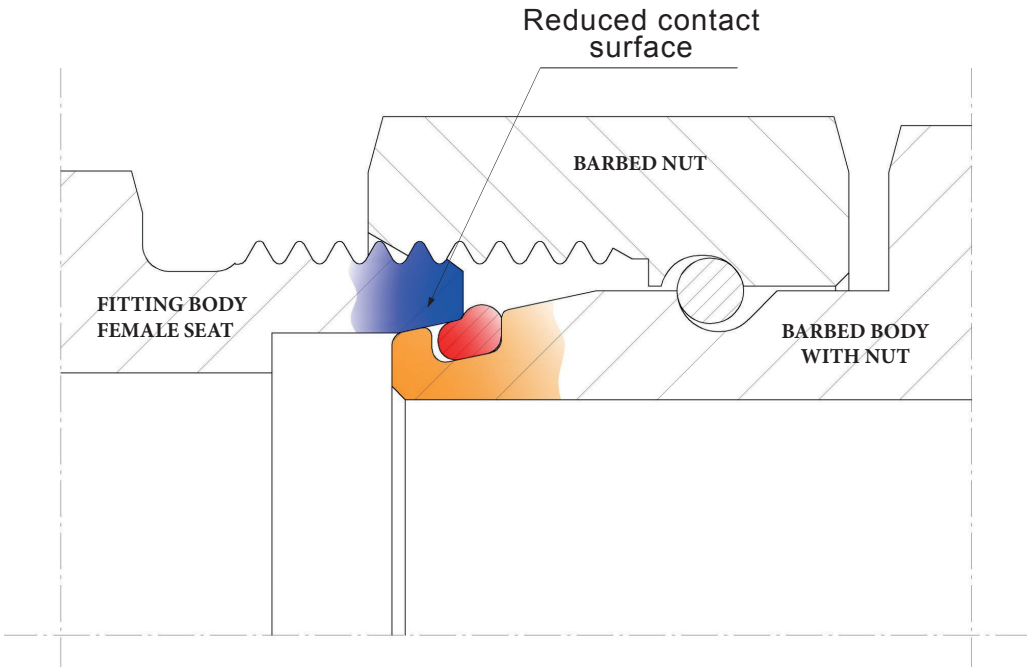
Pinning

O-ring seal

Fitting body
ISO 8434-1

DIN FITTING WITH BARBED SWIVEL NUT

MOUNTING ON UNDERSIZED 24° SEAT (NON-COMPLIANT)



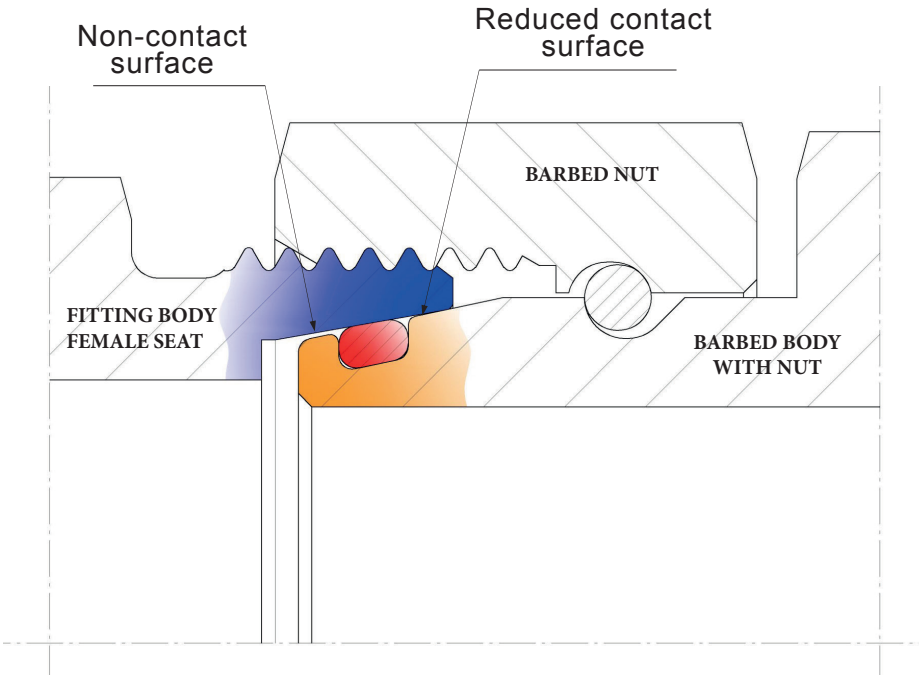
ASSEMBLY BEHAVIOUR:
The cone of the barbed body only covers the front of the sealing surface of the female seat with incorrect containment of the o-ring.

CONSEQUENCES:
Extrusion of the o-ring, with the possibility of serious personal injury and property damage.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

DIN FITTING WITH BARBED SWIVEL NUT

MOUNTING ON SEAT WITH AN ANGLE OF LESS THAN 24° (NON-COMPLIANT)



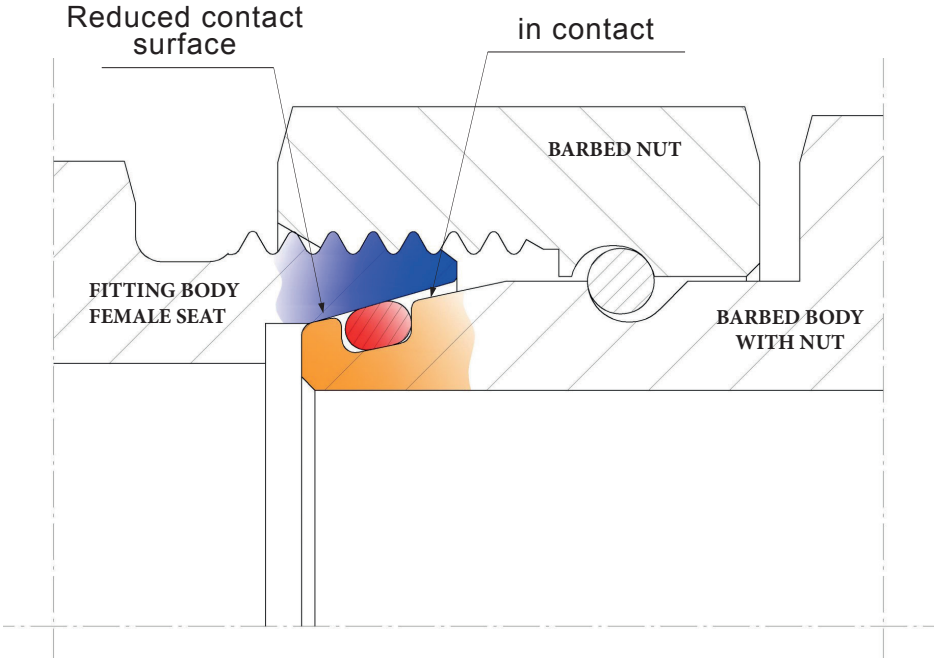
ASSEMBLY BEHAVIOUR:
The cone of the barbed body only covers the front of the sealing surface of the female seat with incorrect containment of the o-ring.

CONSEQUENCES:
Loss of fluid with the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

DIN FITTING WITH BARBED SWIVEL NUT

MOUNTING ON SEAT WITH AN ANGLE GREATER THAN 24° (NON-COMPLIANT)



ASSEMBLY BEHAVIOUR:
The cone of the barbed body only covers the front of the sealing surface of the female seat with incorrect containment of the o-ring.

CONSEQUENCES:
Possible extrusion of the o-ring, with the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Replace the non-compliant 24° seat part with a compliant part and reinstall.

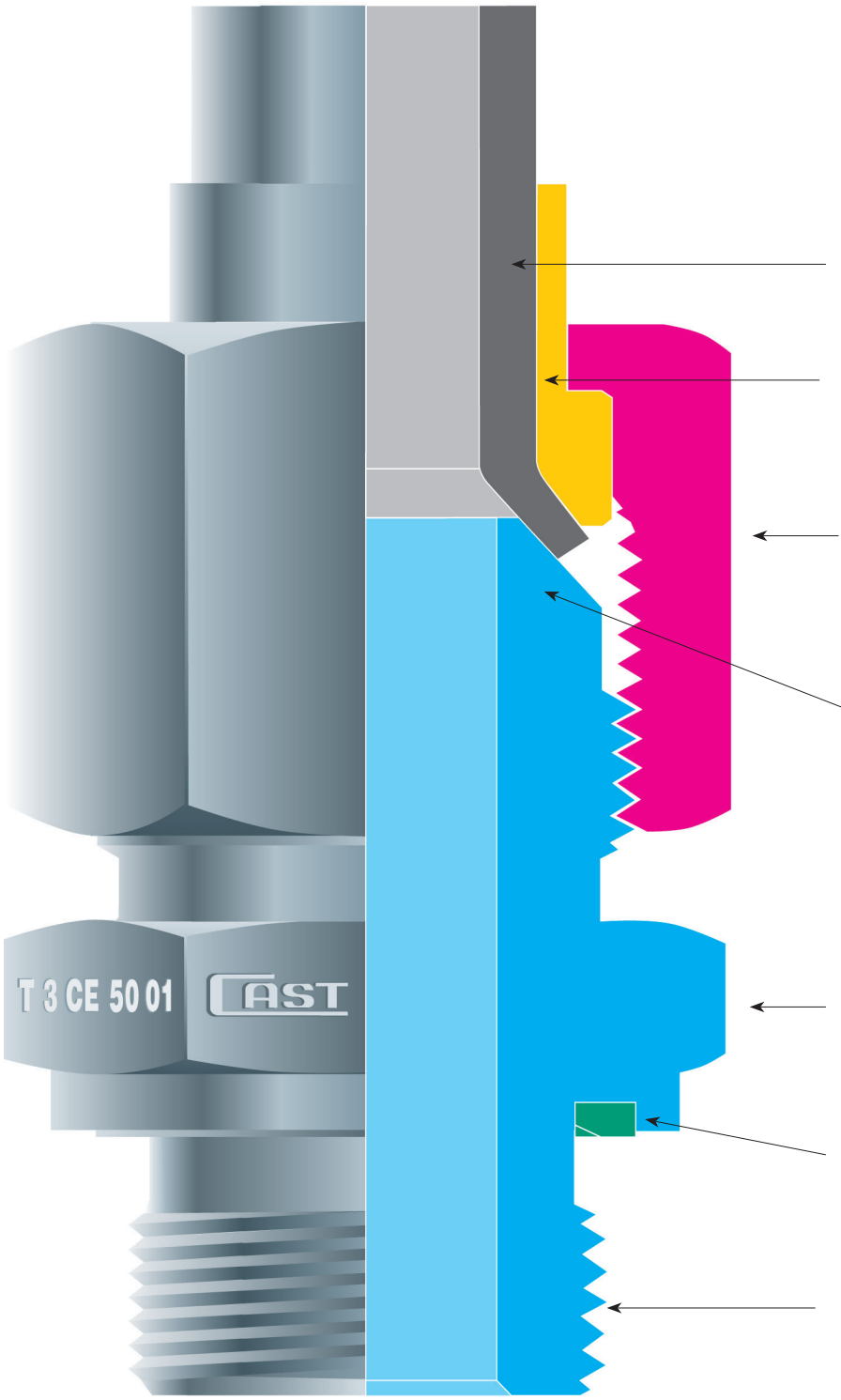
CAST PRODUCTION DEPARTMENTS

Machining centres

Multi-spindle machines

ISO 8434-2, SAE J514 JOINT FOR 37° FLARED PIPE

SCHEMATIC DIAGRAM FOR ISO 8434-2, SAE J514 JOINT SYSTEM WITH PRESSURE RING



Reference standards:

Pipe E235
EN 10305-4

Pressure ring
ISO 8434-2
/SAE J514

Nut
ISO 8434-2
/SAE J514

37° Cone

Fitting body
ISO 8434-2

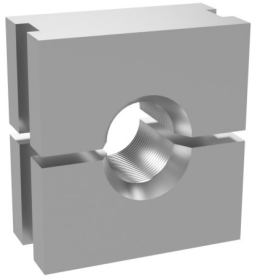
Seal seat
flat gasket
ISO 1179-2

Threaded end
ISO 1179-2

INSTRUCTIONS FOR PREPARING THE PIPE

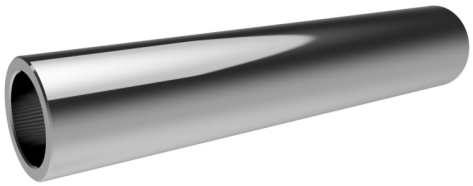
1. CHECKING INSTRUMENTS TO BE USED

• Before starting the 37° pipe-flaring and assembly operations, you must ensure that the necessary equipment and components (tools, fittings, pipes, etc.) are 100% efficient, compliant and free of defects. Replace those that are non-compliant.

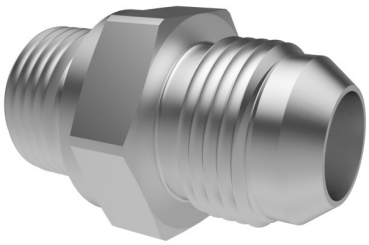


Pipe clamping vice

Flaring tool (punch)

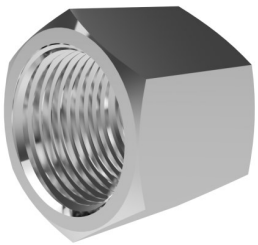


Pipe



Fitting

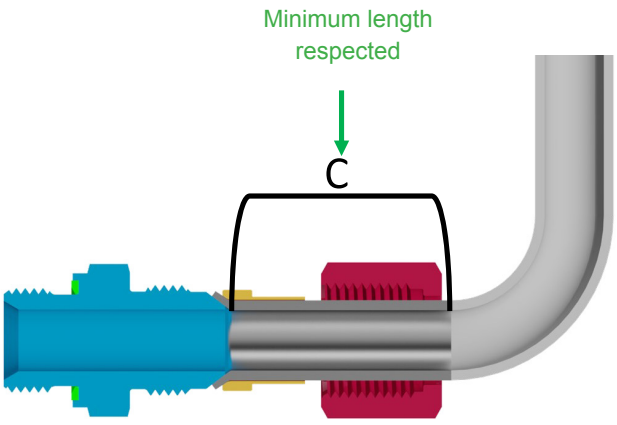
Pressure ring



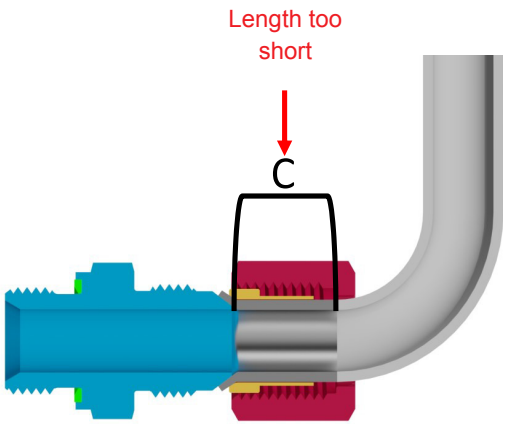
Nut

2. PREPARING THE PIPE

• To obtain the desired pipe length, you must add the dimension “B” in the table on page 126 in the paragraph “pipe flaring”, to the pipe length you wish to obtain. Dimension “B” will be entirely absorbed during assembly by the overlap between the 37° cone of the fitting and the distorted part of the flared pipe. If the bend in the pipe is close to the flared end, then dimension “C” must be added to the previously obtained length, which can also be found in the table on page 126 in the paragraph “Pipe flaring”. This value represents the straight section necessary for clamping the pipe during flaring and is also the minimum section that must remain unaltered by any change in shape that affects it.



COMPLIANT



NON-COMPLIANT

- Check that there are no drawing lines or other structural defects in the pipe which could compromise the seal of the cone on the fitting body or the integrity of the pipe itself. Discard the non-compliant pipe.
- Cut the pipe with the appropriate hacksaw (fig. 3 and 4) and do not use a roller pipe-cutter (fig. 5). Check that the cut has been made correctly at 90°. Lightly remove internal and external burrs with the deburring tool and remove internal and external processing residues.

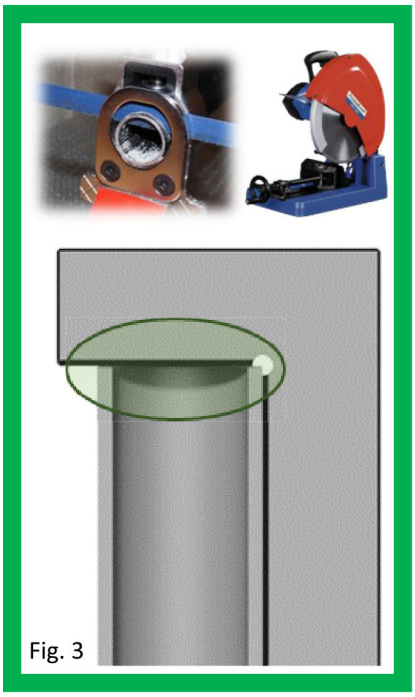


Fig. 3

COMPLIANT

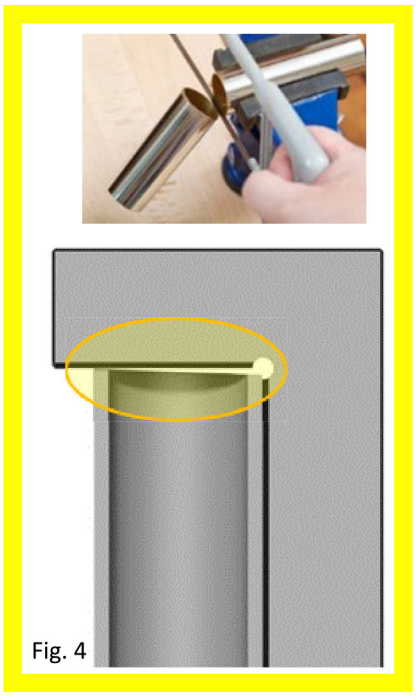


Fig. 4

COMPLIANT

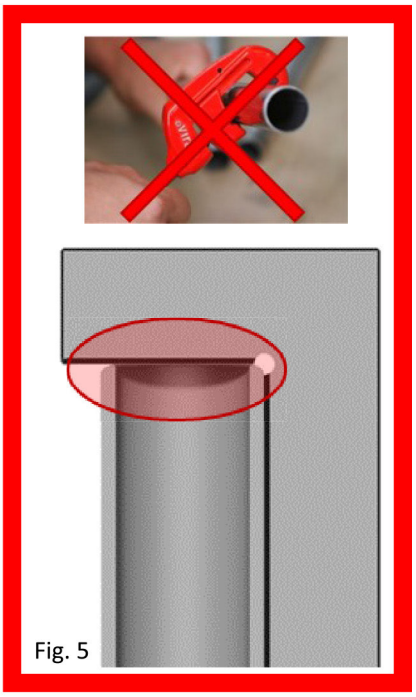


Fig. 5

NON-COMPLIANT

3. PIPE CLEANING AND LUBRICATION

- Carefully clean the pipe to be flared and lubricate with the appropriate products.

4. PREPARING COMPONENTS

- Put the nut and pressure ring on the pipe as shown in figure 6. Pay particular attention to the orientation of the components: the threaded opening of the nut must face the end of the pipe to be flared, just as the larger diameter of the pressure ring must always face the end of the pipe to be flared.

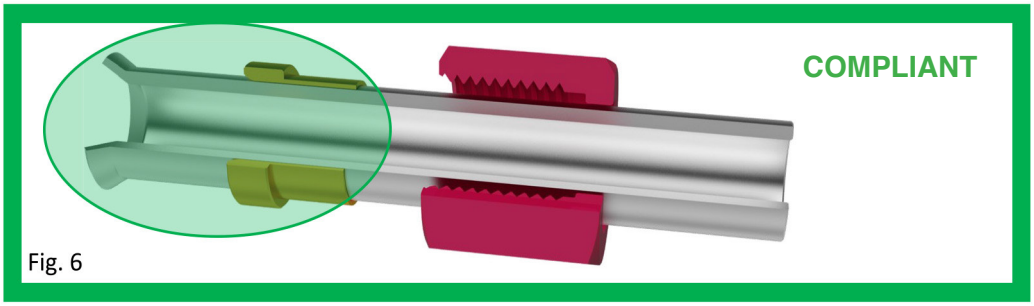


Fig. 6

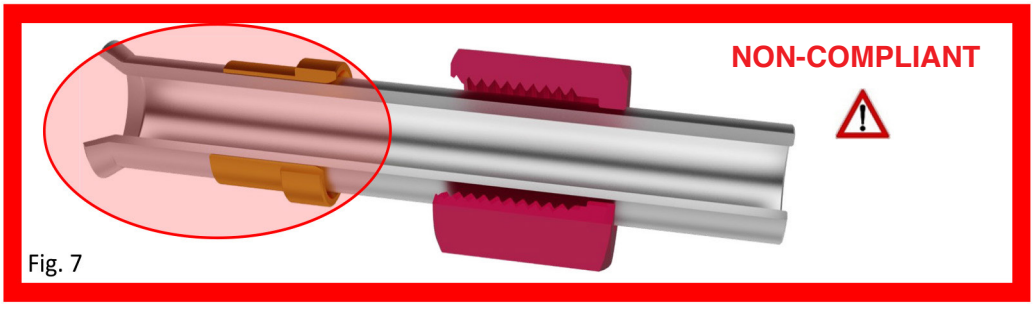
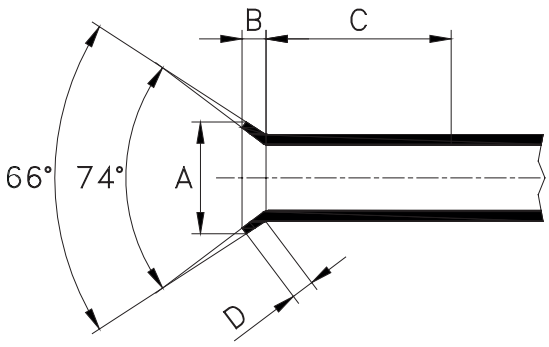


Fig. 7

5. PIPE FLARING

• Flare the pipe with the special flaring unit in accordance with the following table. The drawing indicates the dimensions that must be taken into account.



Pipe Ø Metric	Pipe Ø Inches	Ø Flaring A min	Ø Flaring A max	B	C (1)
6x1	1/4 x 0.89	8.6	9.1	2.5	32
6x1.5	1/4 x 1.65	8.9	9.1	2.7	
8x1	5/16 x 0.89	10.2	10.9	2.3	35
8x1.5	5/16 x 1.65	10.2	10.9	2.5	
10x1	3/8 x 0.89	11.7	12.4	2	40
10x1.5	3/8 x 1.65	11.7	12.4	2.2	
12x1	1/2 x 0.89	16	16.8	3.7	45
12x1.5	1/2 x 1.65	16	16.8	3.9	
12x2	1/2 x 2.1	16	16.8	4.1	
14x1.5	-	19.3	20.1	4.8	45
14x2	-	19.3	20.1	5.1	
15xx1.5	-	19.3	20.1	4.1	45
15x2	-	19.3	20.1	4.3	
16x1.5	5/8 x 1.65	19.3	20.1	3.4	45
16x2	5/8 x 2.1	19.3	20.1	3.6	
16x2.5	5/8 x 2.41	19.3	20.1	3.8	
18x2	-	23.4	24.1	5.1	50
18x2.5	-	23.4	24.1	5.3	
20x2	3/4 x 2.1	23.4	24.1	3.6	50
20x2.5	3/4 x 2.41	23.4	24.1	3.8	
20x3	3/4 x 3.05	23.4	24.1	4.1	
25x2	1 x 2.1	29.7	30.5	4.6	60
25x3	1 x 3.05	29.7	30.5	5.1	
30x2	-	37.6	38.4	6.7	60
30x3	-	37.6	38.4	7.2	
32x2	1.1/4 x 2.1	37.6	38.4	5.3	60
32x3	1.1/4 x 3.05	37.6	38.4	5.7	
38x3	1.1/2 x 3.05	43.2	43.9	5.4	70
38x4	1.1/2 x 4.05	43.2	43.9	5.8	

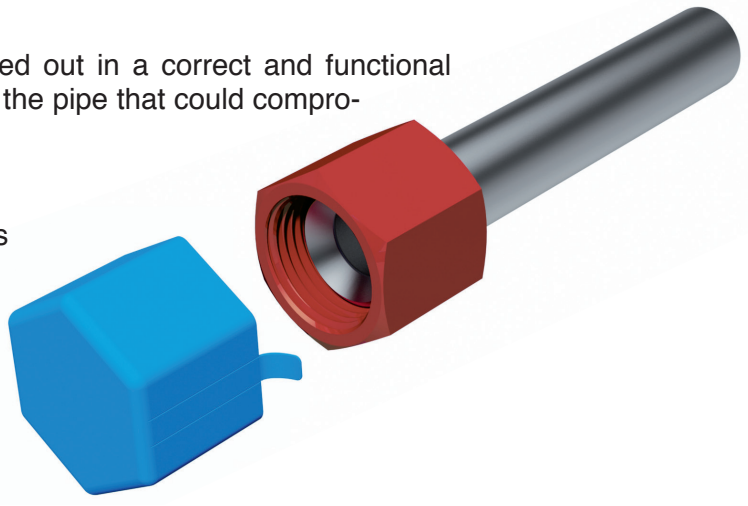
Nota: (1) The "C" value may vary depending on the type of flaring tool used

6. CHECK THE PIPE FLARING

• Check that the flaring of the pipe has been carried out in a correct and functional manner and that there are no material flaws inside the pipe that could compromise the seal.

7. PROTECTING THE ASSEMBLED PIPE

• Remove internal and external processing residues from the pipe. If the pipe is not used immediately for final assembly on the machine, protect the end with plastic plugs.



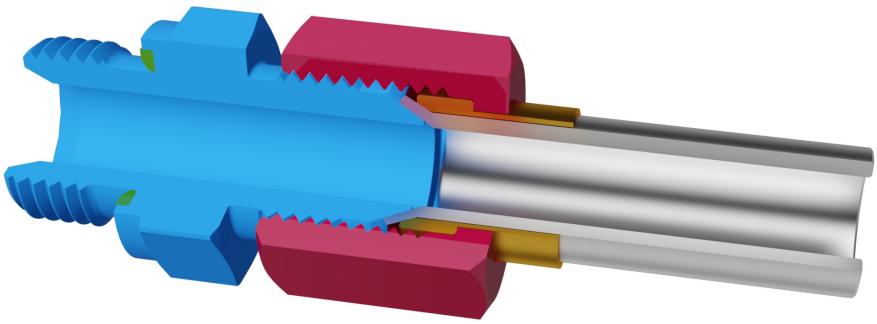
INSTRUCTIONS FOR FINAL ASSEMBLY ON THE MACHINE

1. CHECKING COMPONENTS TO BE USED

- Before starting the final tightening of the previously flared pipe on the machine, you must ensure that the necessary components (nuts, rings, fittings, pipe and gaskets, if present) are 100% efficient, compliant and free of defects. Replace those that are non-compliant.
- Remove any plastic plugs from the ends of the pipes.
- Check all pipes to be fitted for correct flaring. The dimensions of the flaring table must be adhered to, the flared surface must be free of imperfections, cracks or flaking and the flaring, checked from the front, must be uniform over the entire crown, without any burrs.
- Check that the pipes to be assembled are free from occlusions, constrictions or damage resulting from the various preparation processes. Replace non-compliant pipes.
- Check that the pipes are free from internal impurities resulting from the various processes.

2. FINAL TIGHTENING ON THE MACHINE

- Clean the fittings carefully and for stainless steel fittings lubricate the threads with the recommended products.
- Place the flared pipe on the cone of the fitting, screw the union nut onto the fitting body by hand and check the alignment of the parts. Tighten the nut until the metal-to-metal conical parts make contact in accordance with the tightening torques given in the table below, opposing key against key with a torque wrench.



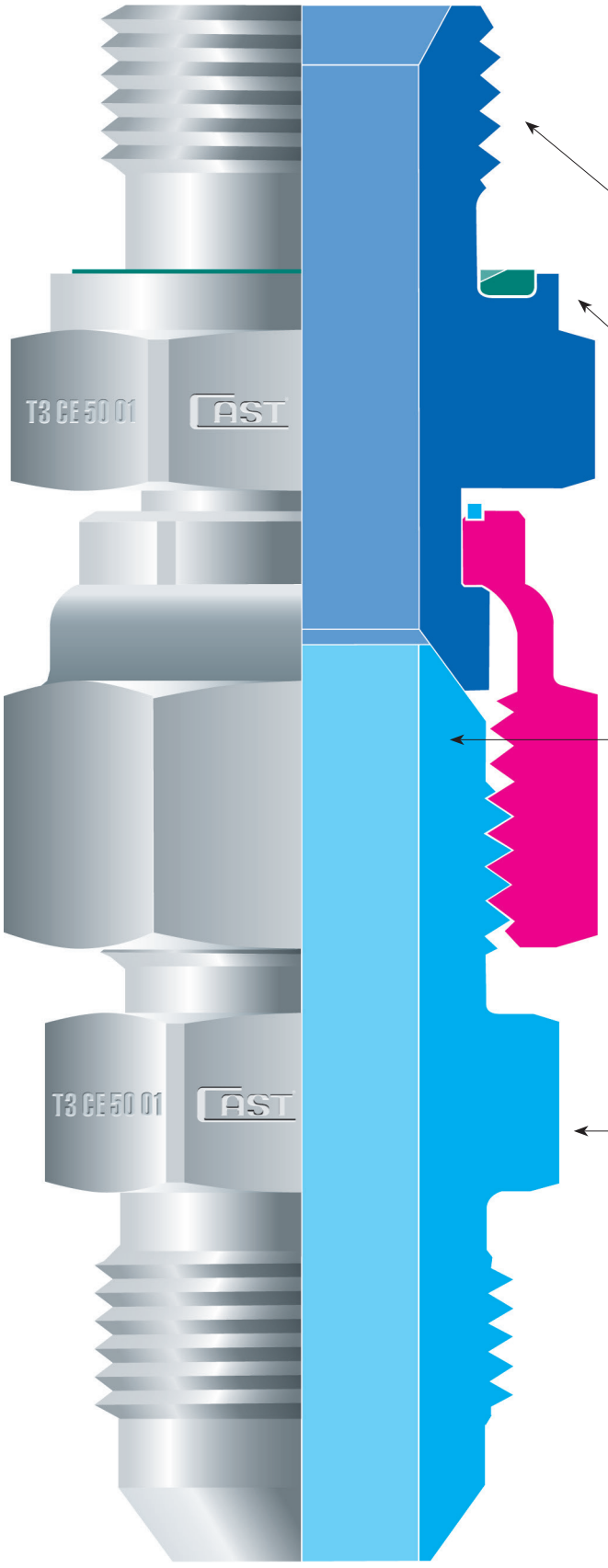
Series	Pipe Ø Metric	Pipe Ø Inches	Thread UNF/UN-2A	Pipe-side torque [Nm] $^{+10\%}_{0}$
UNIVERSAL	6	1/4	7/16-20 UNF-2A	10
	8	5/16	1/2-20 UNF-2A	20
	10	3/8	9/16-18 UNF-2A	25
	12	1/2	3/4-16 UNF-2A	45
	14-15-16	5/8	7/8-14 UNF-2A	75
	18-20	3/4	1.1/16-12 UN-2A	115
	25	1	1.5/16-12 UN-2A	160
	30-32	1.1/4	1.5/8-12 UN-2A	240
	38	1.1/2	1.7/8-12 UN-2A	400

Nota: Tightening torques valid for carbon and stainless steel

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the pipe-side tightening torques on the SAE J514 cone represent the torque required for correct tightening.

ISO 8434-2, SAE J514 JOINT WITH CLINCHED SWIVEL NUT

SCHEMATIC DIAGRAM OR JOINT SYSTEM ISO 8434-2, SAE J514, WITH CLINCHED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat flat
gasket ISO 1179-2

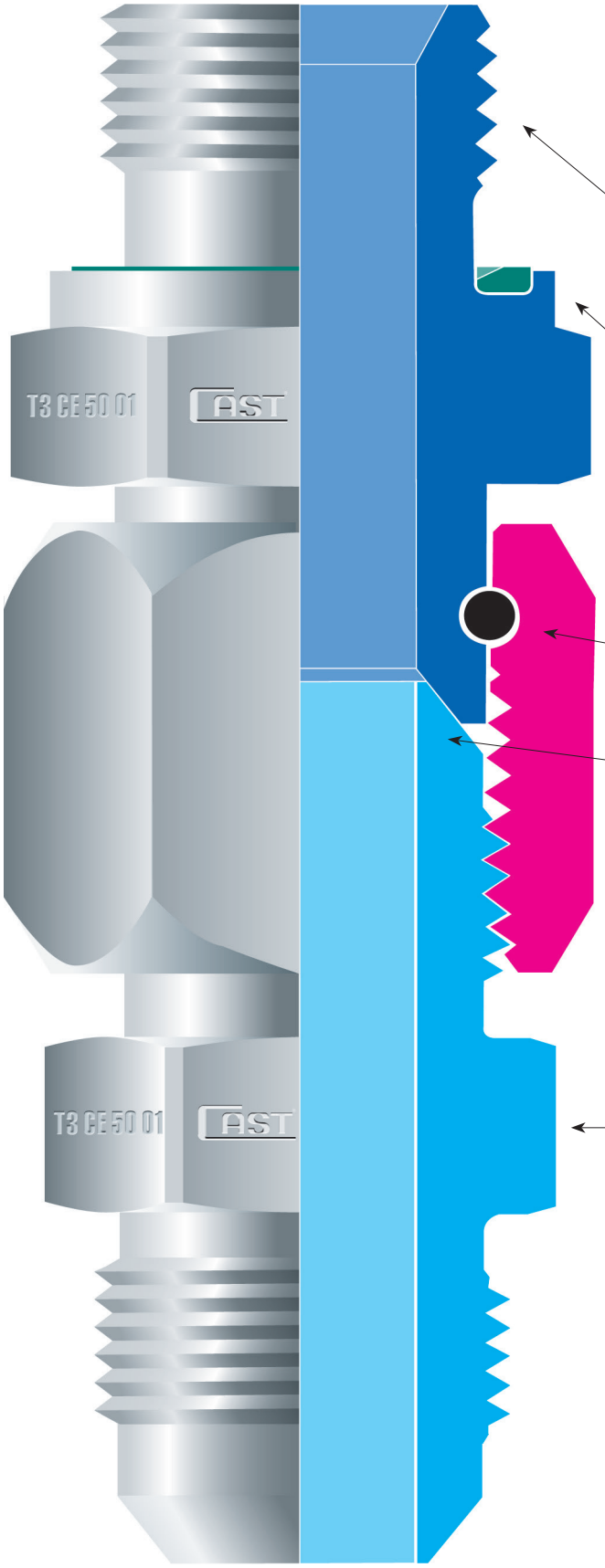
37°Cone

Barbed
swivel nut

Intermediate
fitting body
ISO 8434-2
SAE J514

ISO 8434-2, SAE J514 JOINT WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-2, SAE J514, WITH BARBED SWIVEL NUT



Reference standards:

Threaded end

Seal seat flat gasket ISO 1179-2

Pinning

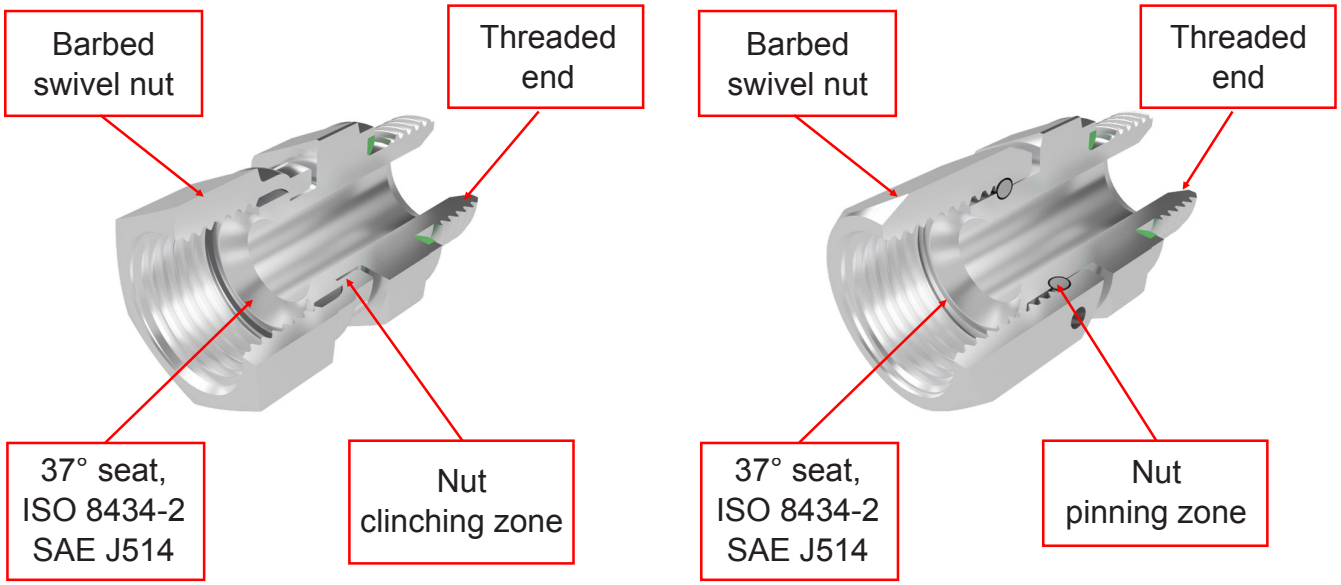
37° Cone

Barbed swivel nut

Intermediate fitting body ISO 8434-2 SAE J514

FITTINGS WITH CLINCHED AND BARBED SWIVEL NUT SERIES 20...
ISO 8434-2 / SAE J514

This series of clinched or barbed swivel nut fittings with a 37° cone seal meets the needs of users who increasingly demand high pressures, absolute airtightness, lower tightening torques, compact dimensions and low industrial costs.



ASSEMBLY INSTRUCTIONS

• Before starting assembly of the fittings with Cast swivel nut, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

• Clean the fittings carefully. For stainless steel fittings lubricate the threads with the recommended products.

• Screw the clinched or barbed nut onto the fitting body by hand and check the alignment of the parts. Tighten the nut until there is contact between the metal-to-metal parts, in accordance with the tightening torques given in the table below, opposing key against key with a torque wrench.

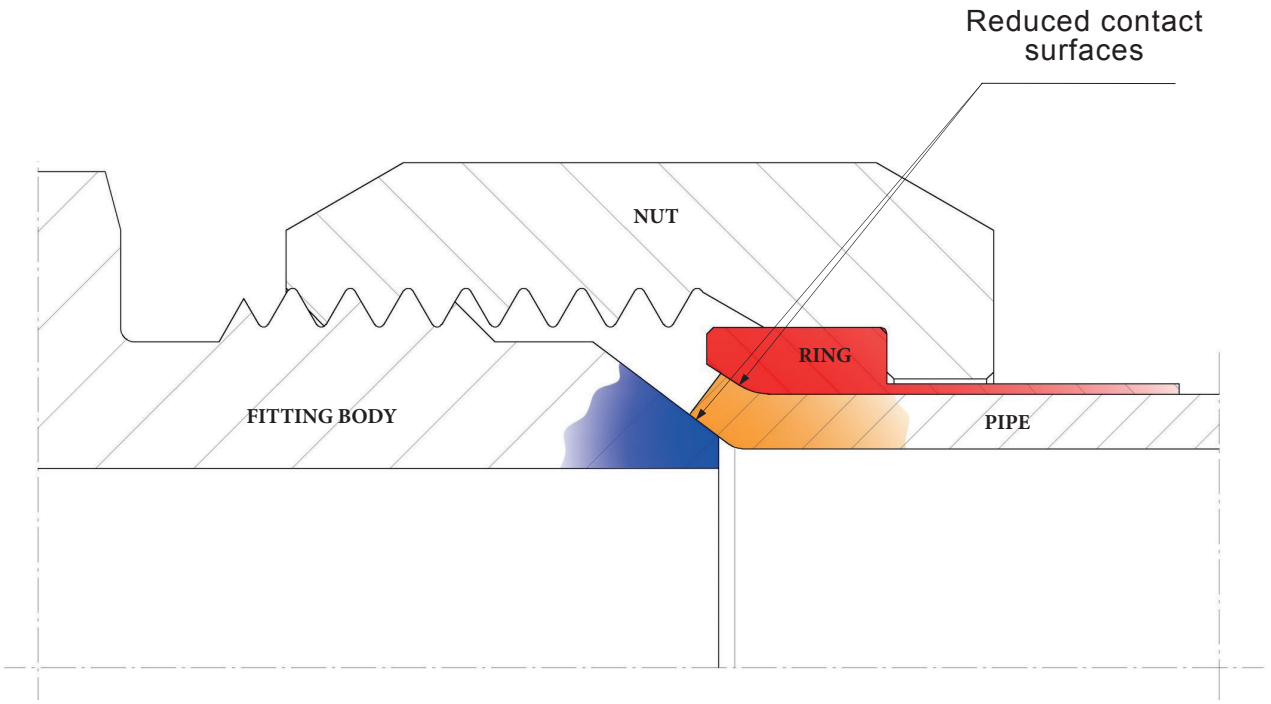
Series	Ø Pipe Metric	Ø Pipe Inches	Thread UNF/UN-2A	Clinched nut torque [Nm] $^{+10\%}_{0}$	Barbed nut torque [Nm] $^{+10\%}_{0}$
UNIVERSAL	6	1/4	7/16-20 UNF-2A	20	-
	8	5/16	1/2-20 UNF-2A	25	-
	10	3/8	9/16-18 UNF-2A	35	-
	12	1/2	3/4-16 UNF-2A	65	-
	14-15-16	5/8	7/8-14 UNF-2A	90	-
	18-20	3/4	1.1/16-12 UN-2A	120	-
	25	1	1.5/16-12 UN-2A	180	-
	30-32	1.1/4	1.5/8-12 UN-2A	-	380
	38	1.1/2	1.7/8-12 UN-2A	-	460

Nota: Tightening torques valid for carbon and stainless steel

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the tightening torques on the swivel nut represent the torque required for correct tightening.

FITTINGS FOR 37° FLARED PIPES

UNDERSIZED FLARING DIAMETER (NON-COMPLIANT)



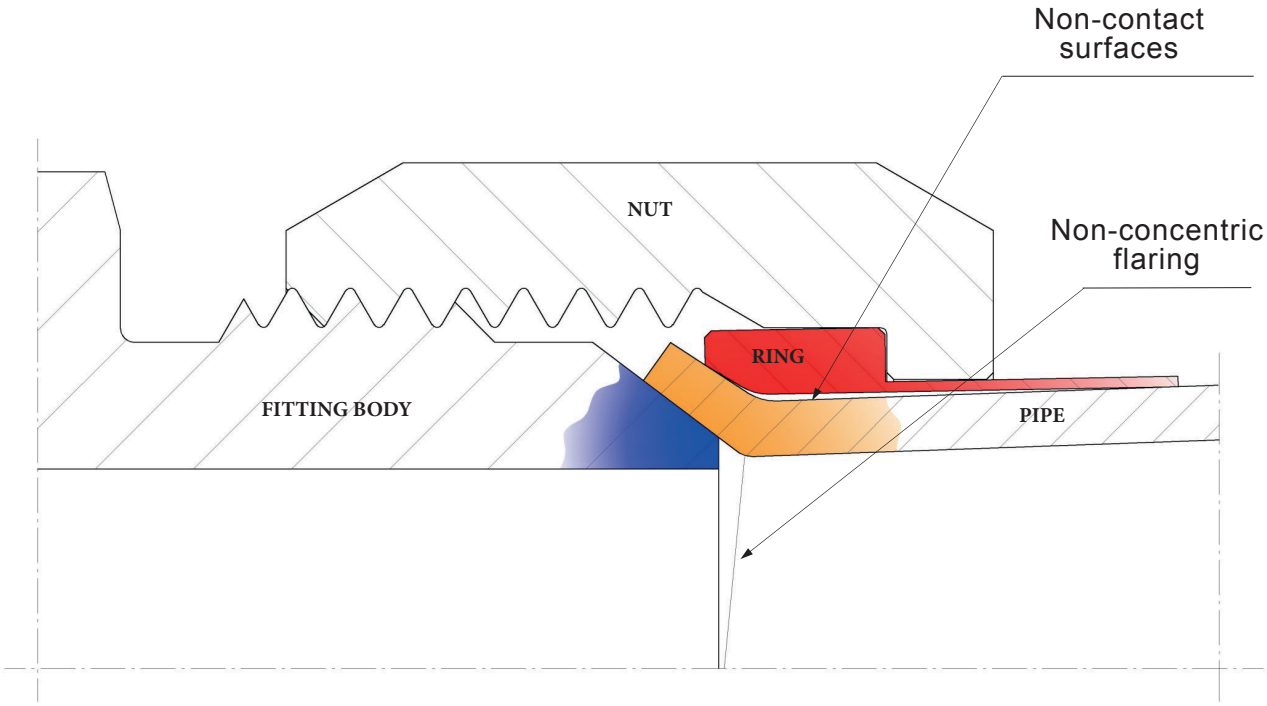
ASSEMBLY BEHAVIOUR:
The 37° flared steel pipe only covers part of the sealing surface of the fitting body.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flared to the appropriate diameters.

FITTINGS FOR 37° FLARED PIPES

FLARING NOT CONCENTRIC TO THE PIPE (NON-COMPLIANT)



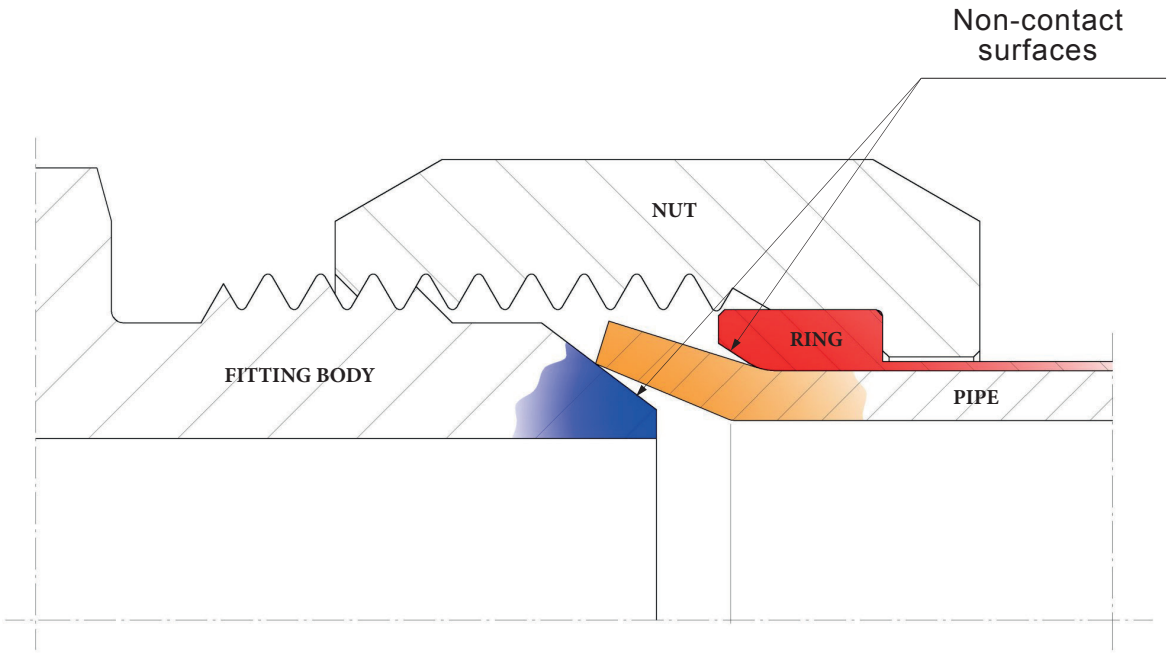
ASSEMBLY BEHAVIOUR:
When tightening the steel pipe, the flaring does not allow a proper fit with the sealing surface of the fitting body.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble ensuring that the flaring is concentric to the steel pipe.

FITTINGS FOR 37° FLARED PIPES

FLARING ANGLE LESS THAN 37° (NON-COMPLIANT)



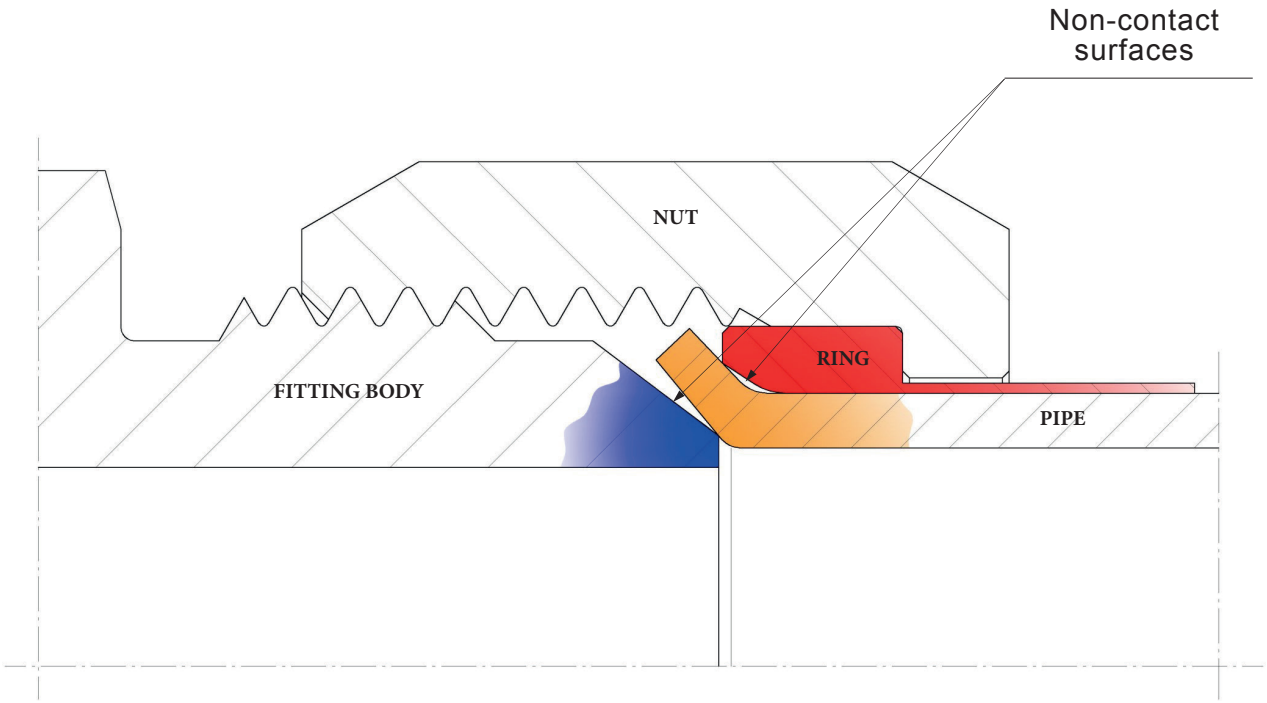
ASSEMBLY BEHAVIOUR:
The contact between the sealing surface is limited to a single point, which is absolutely not sufficient to ensure proper functioning of the system.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flared to the appropriate diameters.

FITTINGS FOR 37° FLARED PIPES

FLARING ANGLE GREATER THAN 37° (NON-COMPLIANT)



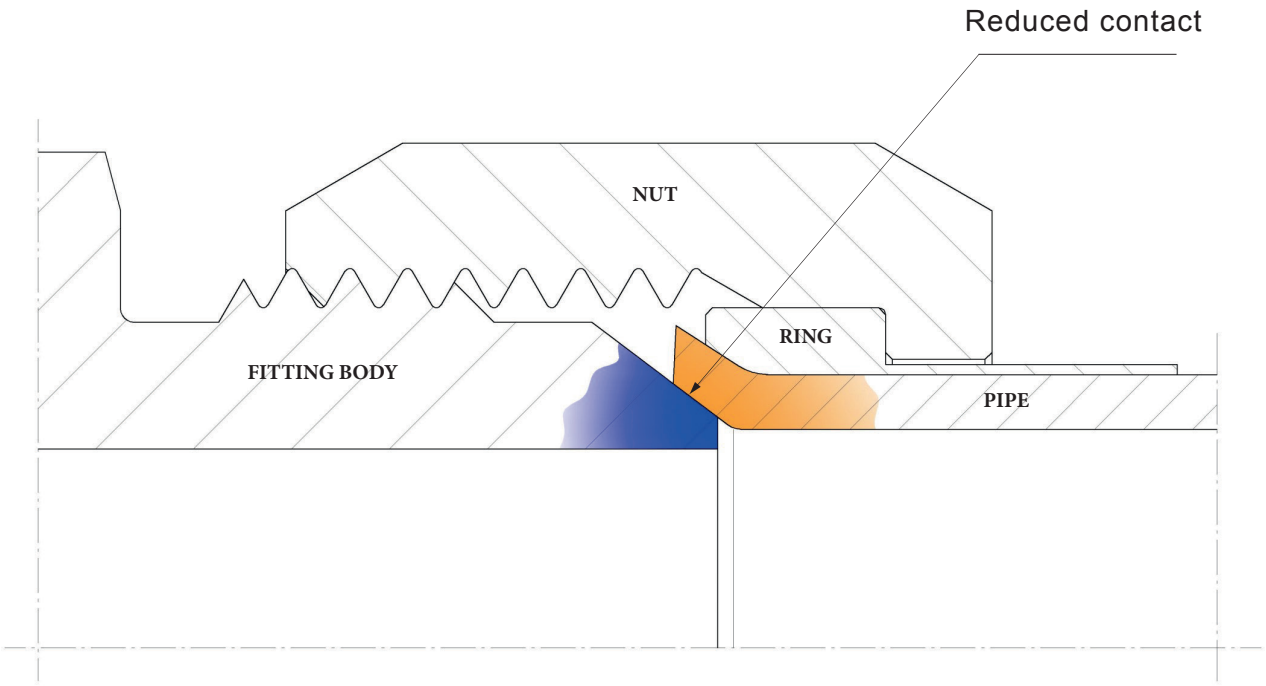
ASSEMBLY BEHAVIOUR:
The flared steel pipe only covers the front part of the sealing surface of the fitting body.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flared to the appropriate diameters.

FITTINGS FOR 37° FLARED PIPES

PIPE CUT OUT OF SQUARE



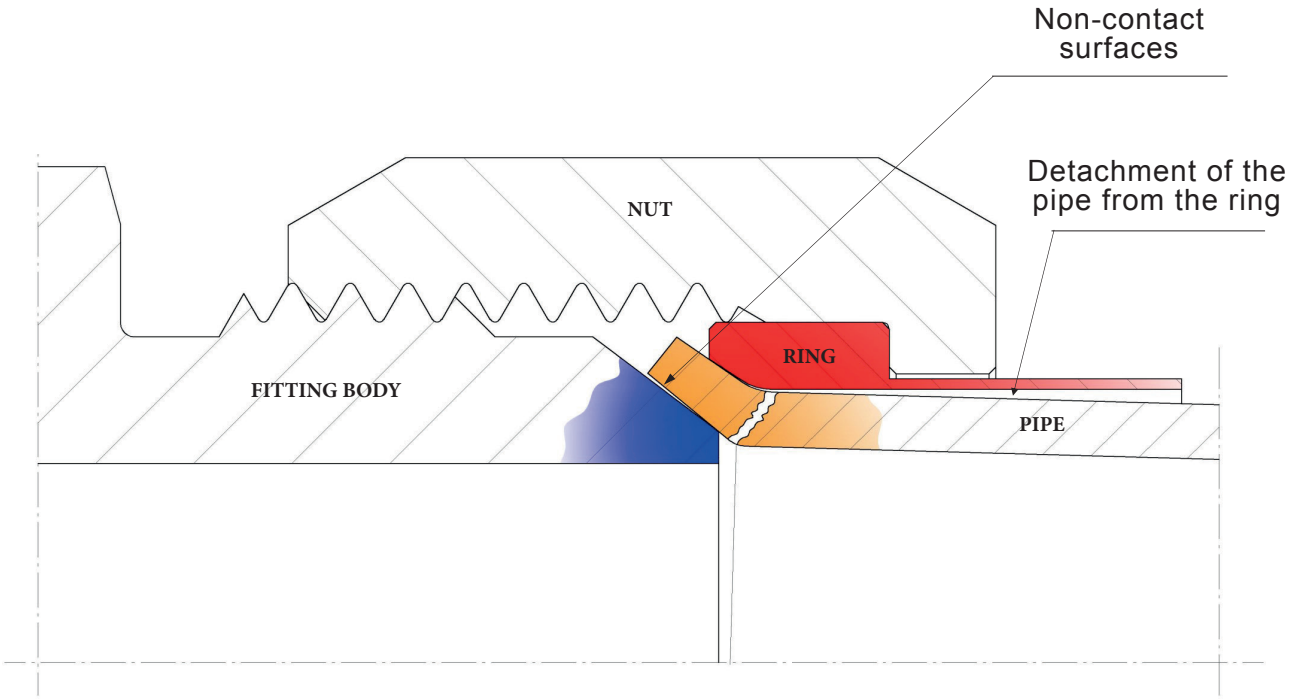
ASSEMBLY BEHAVIOUR:
The 37° flared steel pipe only covers part of the sealing surface of the fitting body.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble ensuring that the steel pipe has been cut correctly.

FITTINGS FOR 37° FLARED PIPES

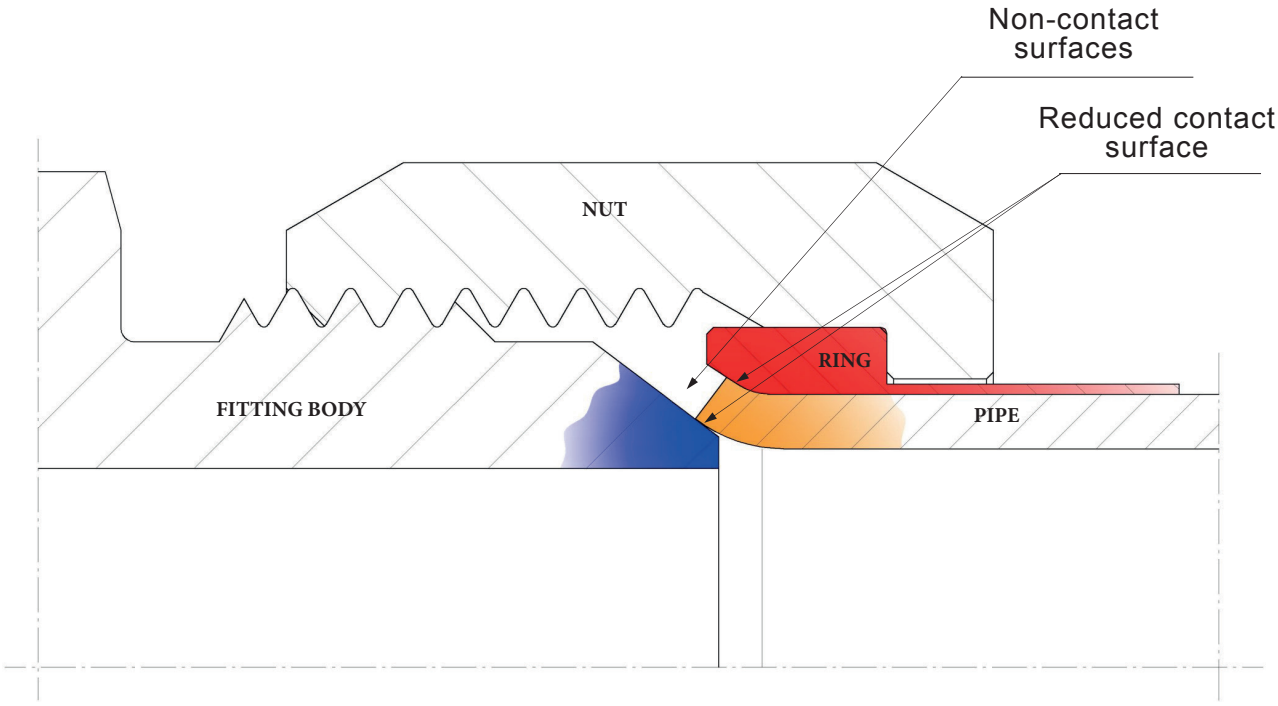
PIPE NOT BRACKETED PROPERLY



ASSEMBLY BEHAVIOUR:
During use (under pressure) the seal between the flared steel pipe and the fitting body may be compromised by “pipe breakage” due to bending stress.
CONSEQUENCES:
Loss of fluid from the fitting and possible dislodgement of the steel pipe with the possibility of serious damage to people and property.
MEASURES TO BE APPLIED:
The pipe must be secured with the appropriate brackets.

FITTINGS FOR 37° FLARED PIPES

SYSTEM WITH HIGHER THAN PERMITTED PRESSURE PEAKS



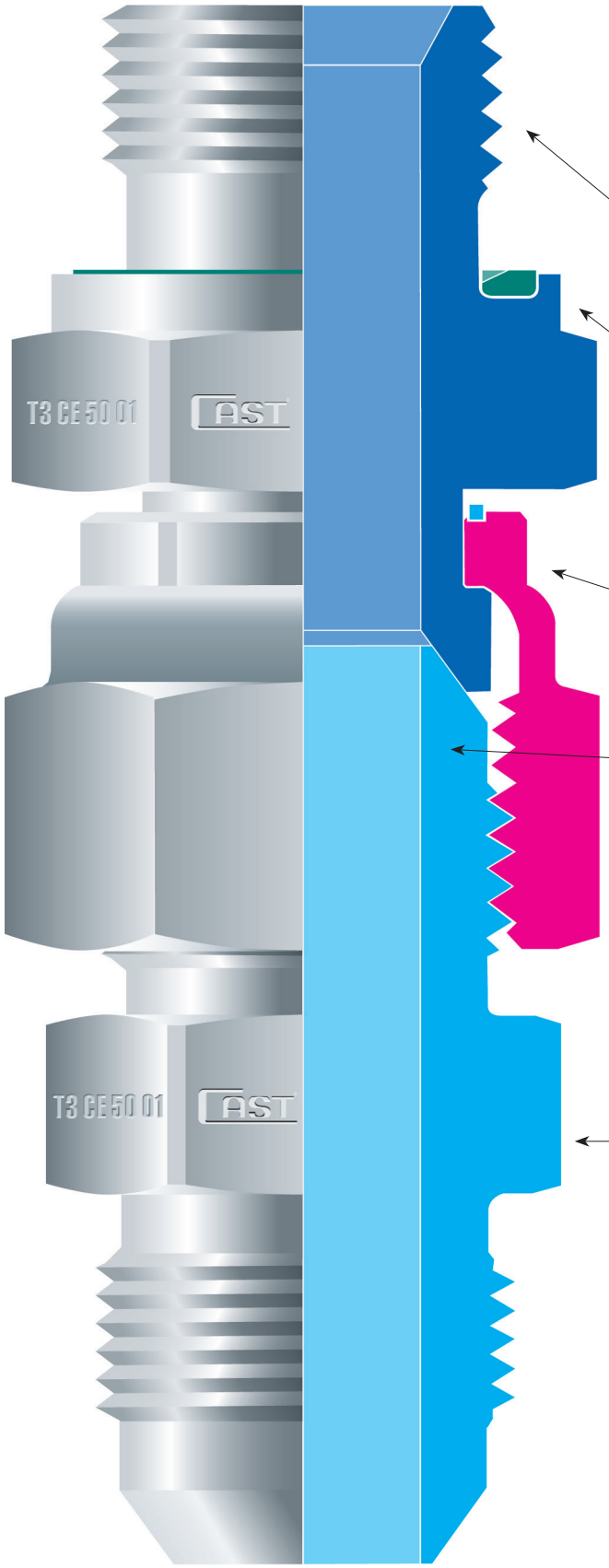
ASSEMBLY BEHAVIOUR:
When using (pressurised) steel pipe flared at 37°, pressure peaks may straighten the pipe flaring, thus disconnecting it from the fitting body.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressure peaks that are higher than permitted.

ISO 8434-2, SAE J514 JOINT WITH CLINCHED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-2, SAE J514, WITH CLINCHED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Clinching

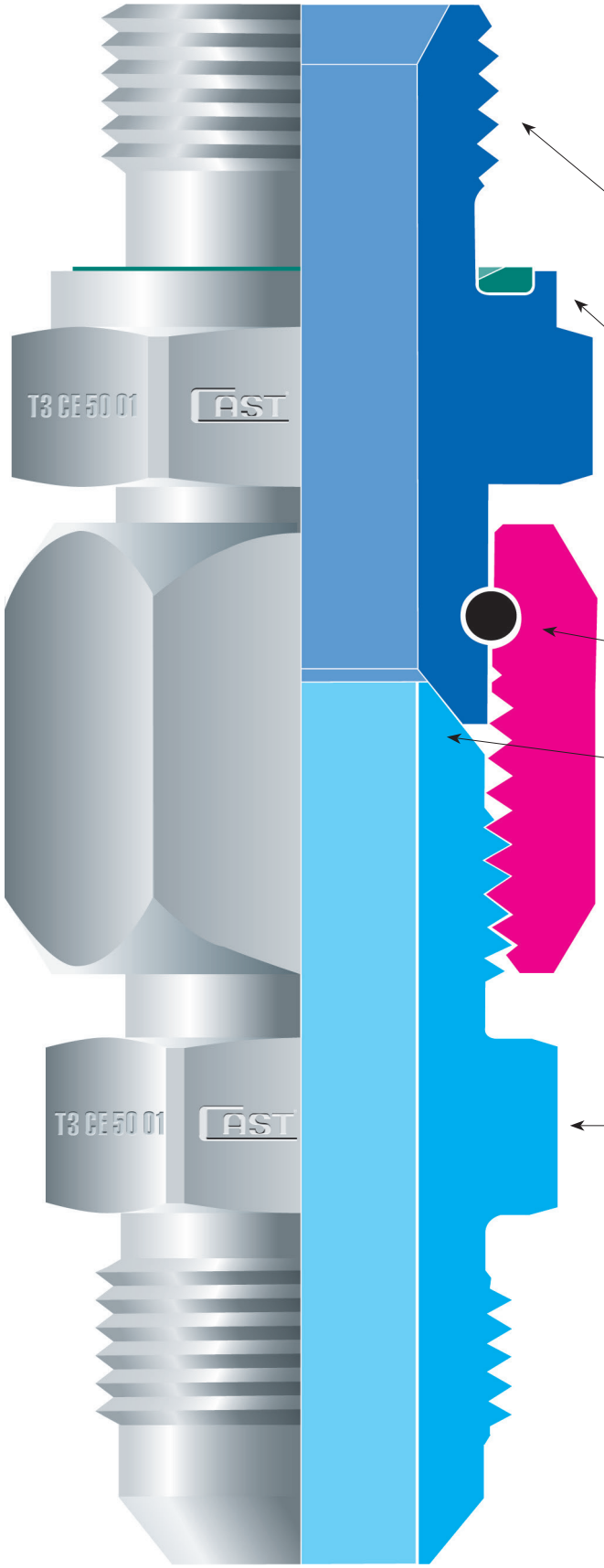
37°Cone

Barbed
swivel nut

Intermediate
fitting body
ISO 8434-2
SAE J514

ISO 8434-2, SAE J514 JOINT WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-2, SAE J514, WITH BARBED SWIVEL NUT



Prescrizioni di riferimento:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Pinning

37°Cone

Barbed
swivel nut

Fitting body
ISO 8434-2
SAE J514

37° FITTING WITH CLINCHED NUT (FIG.1) AND BARBED NUT (FIG.2)

DIAMETRO CONO DI GIUNZIONE A 37° MAGGIORATO (NON CONFORME)

Fig. 1
Clinched

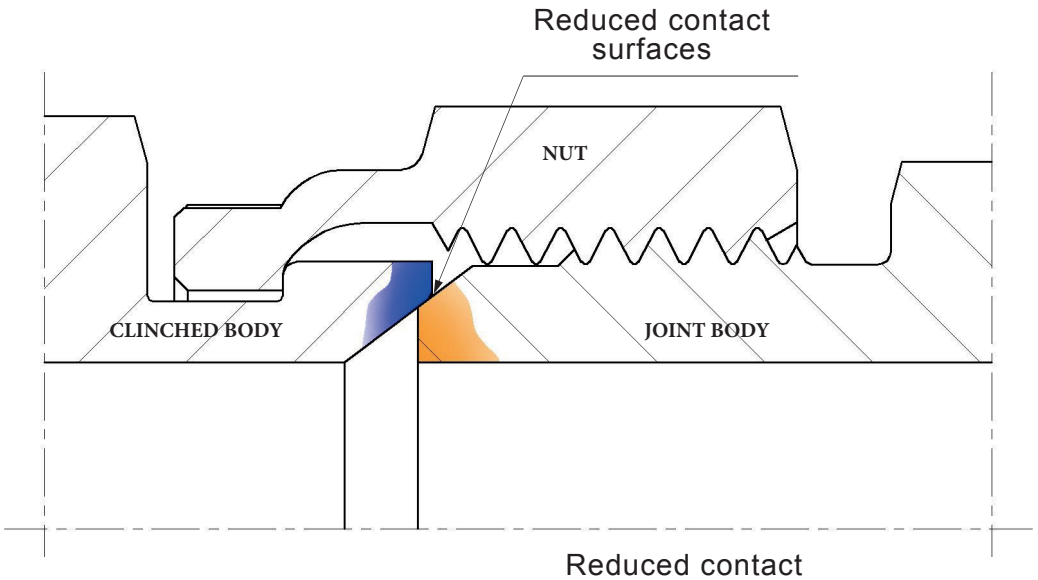
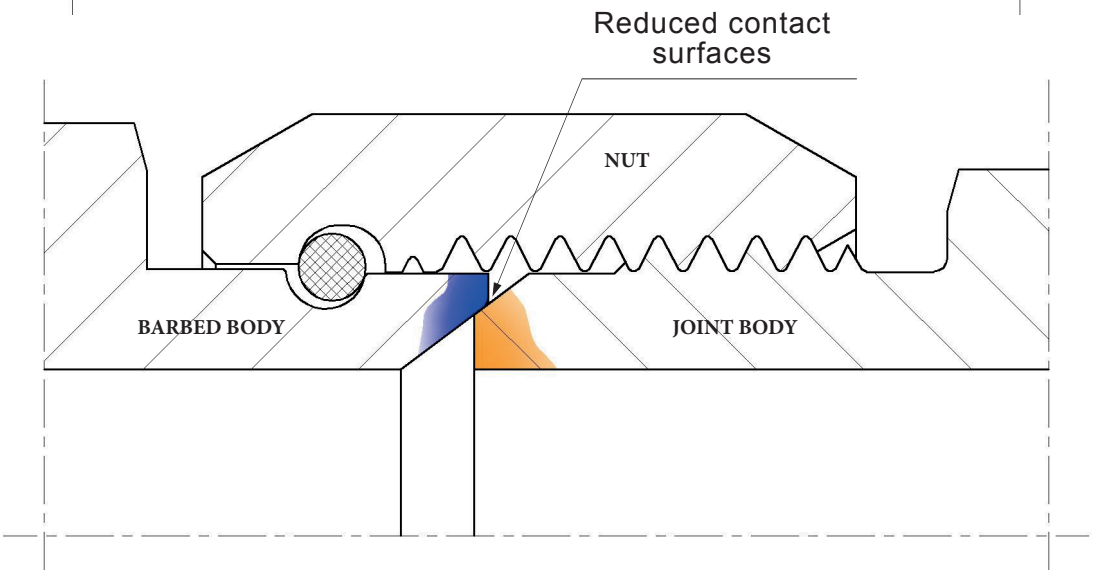


Fig. 2
Barbed



ASSEMBLY BEHAVIOUR:
The 37° flared steel pipe only covers part of the sealing surface of the fitting body, valid for Fig. 1 and Fig. 2.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 37° cone.

37° FITTING WITH CLINCHED NUT (FIG.1) AND BARBED NUT (FIG.2)

ANGOLO CONO DI GIUNZIONE MINORE DI 37° (NON CONFORME)

Fig. 1
Clinched

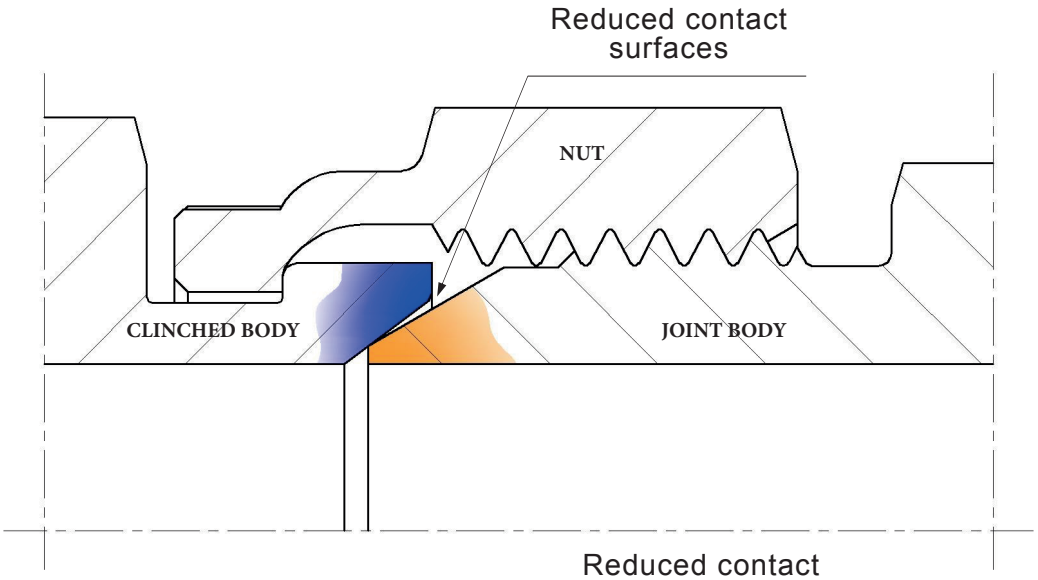
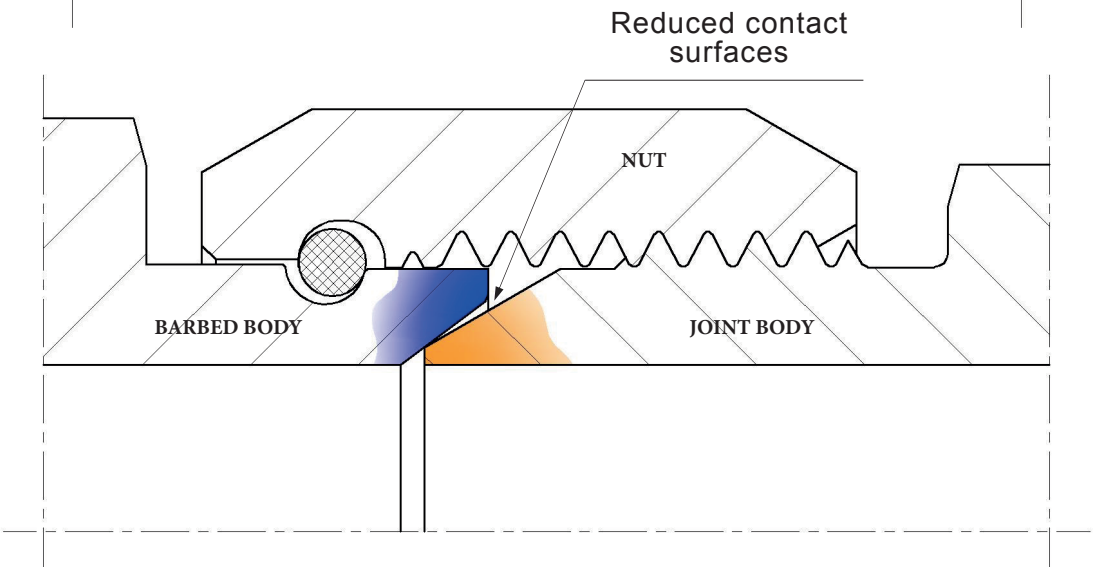


Fig. 2
Barbed



COMPORTAMENTO DELL'ASSEMBLAGGIO:
Il contatto tra la superfici di tenuta è limitato ad un solo punto, assolutamente non sufficiente a garantire system functioning correctly, valid for Fig. 1 and Fig. 2.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 37° cone.

37° FITTING WITH CLINCHED NUT (FIG.1) AND BARBED NUT (FIG.2)

FITTING CONE ANGLE GREATER THAN 37° (NON-COMPLIANT)

Fig. 1
Clinched

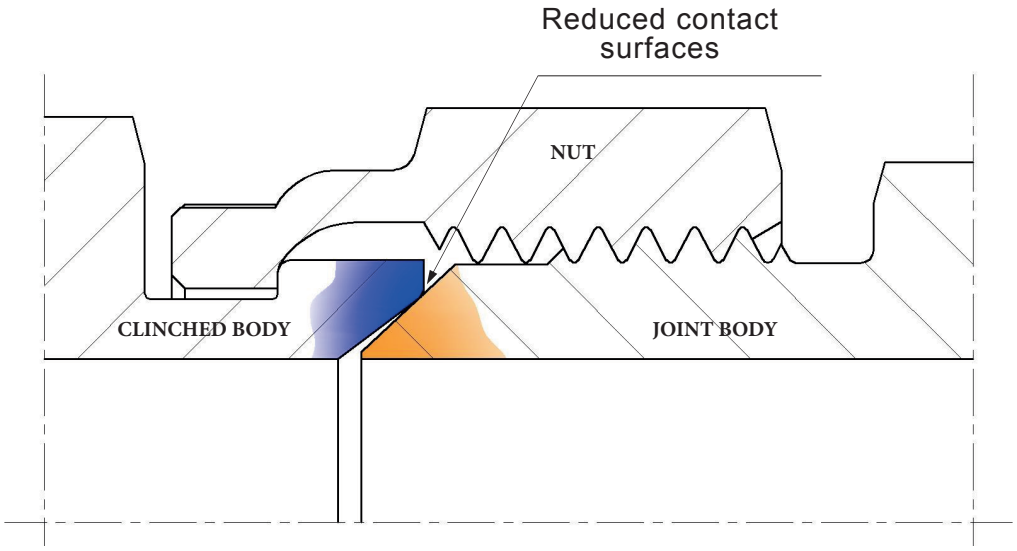
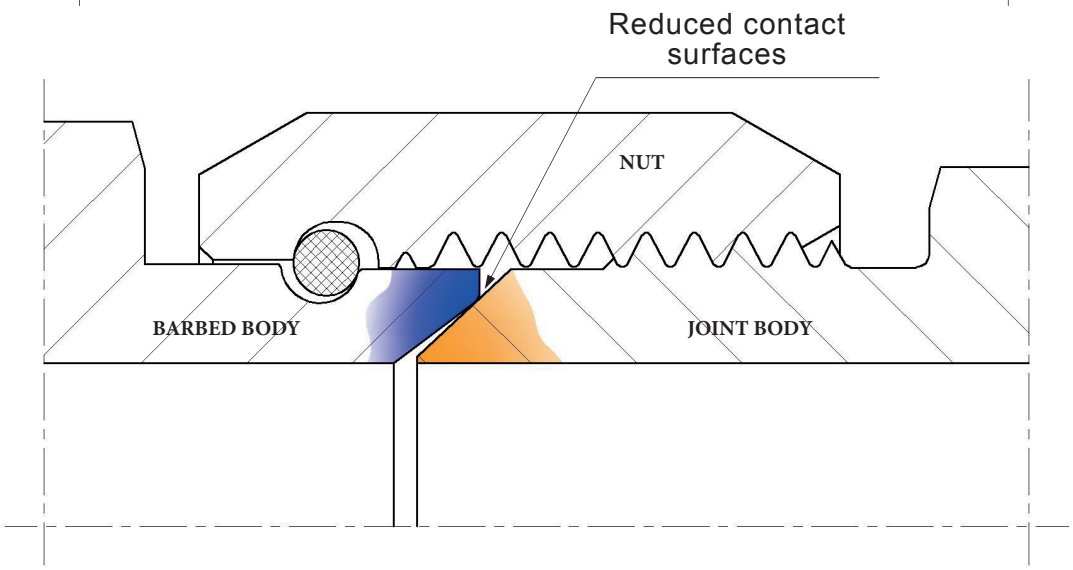


Fig. 2
Barbed



ASSEMBLY BEHAVIOUR:
The contact between the sealing surface is limited to a single point, which is absolutely not sufficient to ensure proper functioning of the system, valid for FIg. 1 and Fig. 2.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious personal injury and property damage.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 37° cone.

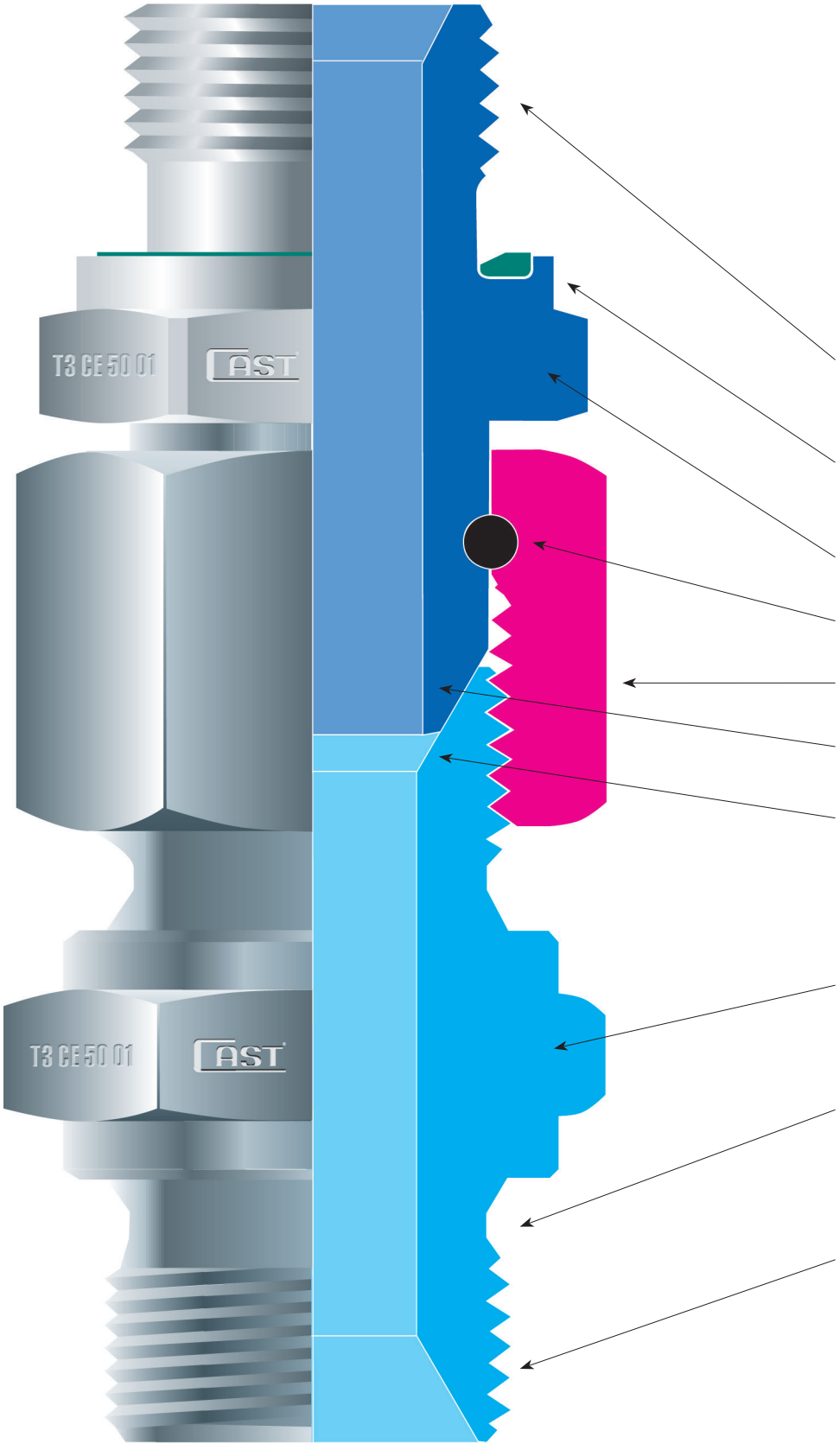
CAST ASSEMBLY DEPARTMENT

Automated assembly

Stock of finished products

ISO 8434-6, BS5200 JOINT WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-6, BS 5200 WITH BARBED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Barbed body

Nut pinning

Barbed swivel nut

60° cone

60° seat

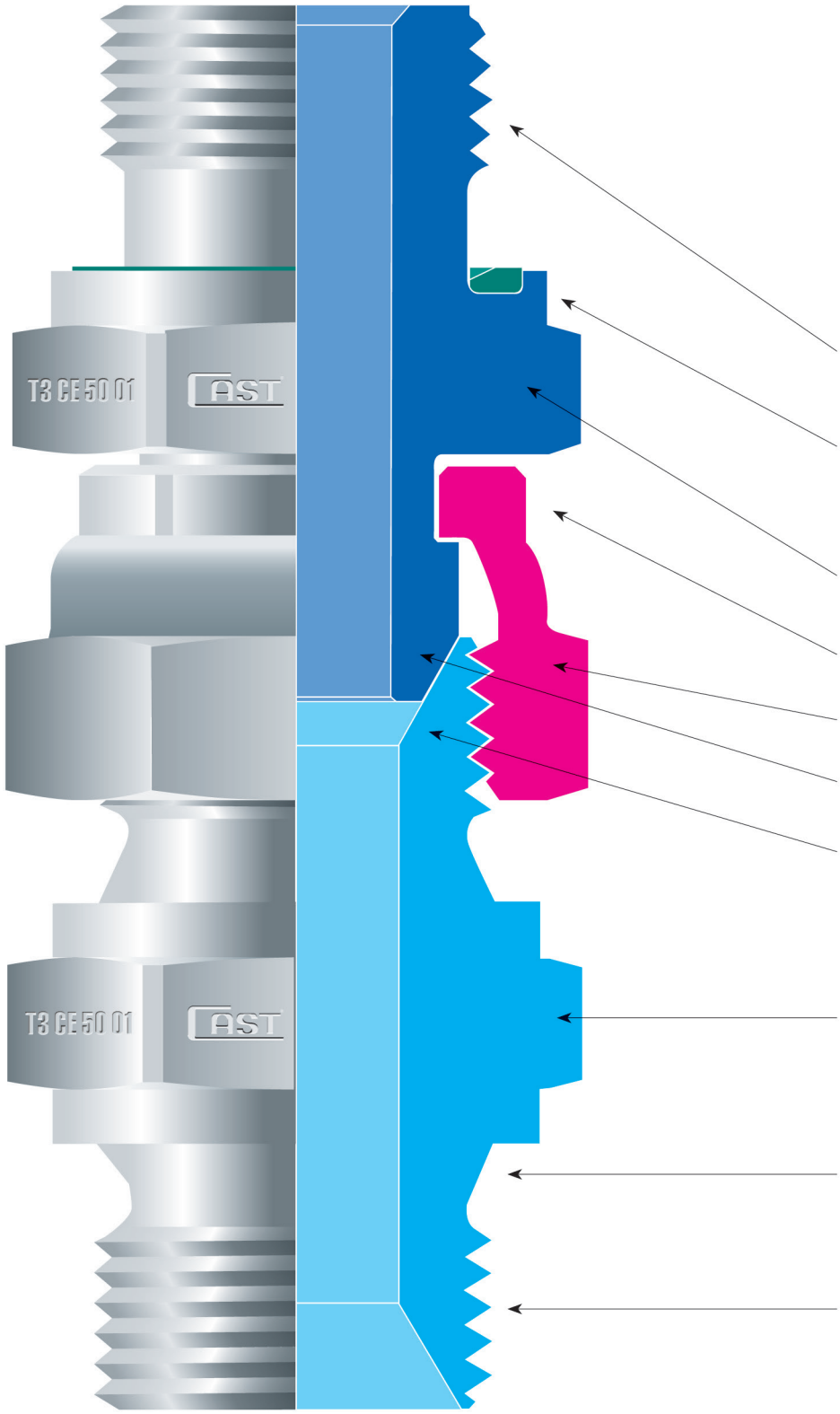
Fitting body

Seal seat Washer
guide DIN 3852-2

Threaded end
ISO 8434-6
BS 5200

ISO 8434-6, BS5200 JOINT WITH BARBED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-6, BS 5200 WITH CLINCHED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Clinched body

Nut clinching

Barbed swivel nut

60° cone

60° seat

Fitting body

Seal seat Washer
guide DIN 3852-2

Threaded end
ISO 8434-6
BS 5200

ASSEMBLY INSTRUCTIONS

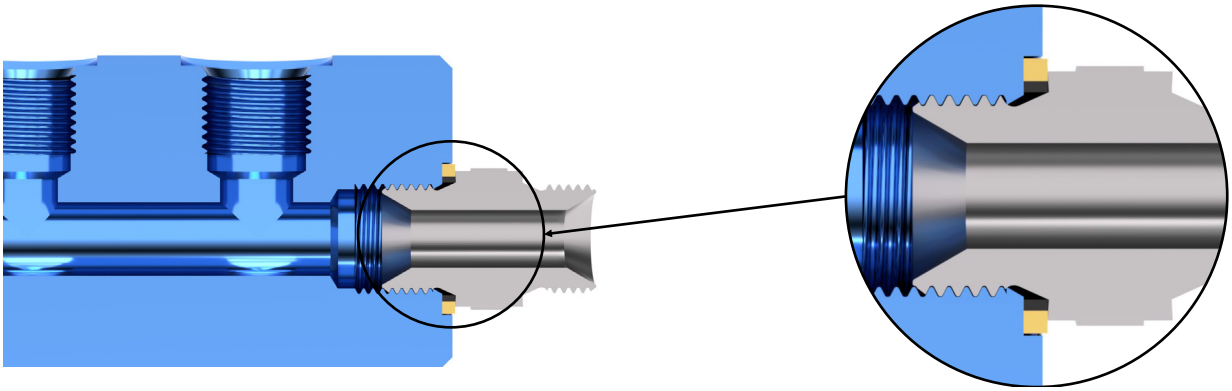
1. CHECKING INSTRUMENTS TO BE USED

• Before starting assembly operations, it is essential to make sure that the necessary equipment and components are 100% efficient, compliant and free of defects. Replace those that are non-compliant..

2. ON-MACHINE TIGHTENING OF A SHAPE ATHREADED END

• Clean the fittings carefully. For stainless steel fittings lubricate the threads with the recommended products.

• Put the end thread of the fitting on the fixed female part, screw it in by hand and check the alignment of the parts. Tighten until the metal-to-metal parts make contact in accordance with the tightening torques given in the table below, using the torque wrench.

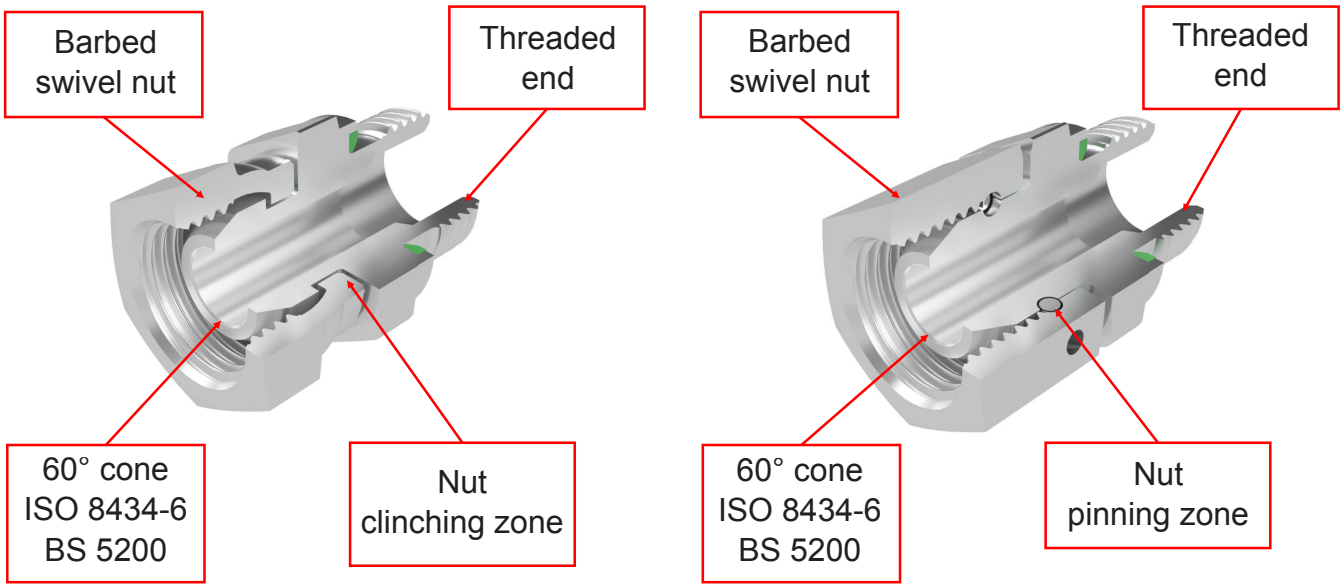


Series	Gas thread cylinders	Torque [Nm] $^{+10\%}_{0}$	Torque Metric cylindrical	Torque [Nm] $^{+10\%}_{0}$
UNIVERSAL	G 1/8	20	M10x1	20
	G 1/4	35	M12x1.5	30
	G 3/8	70	M14x1.5	45
	G 1/2	85	M16x1.5	60
	G 5/8	105	M18x1.5	80
	G 3/4	120	M20x1.5	105
	G 1	180	M22x1.5	130
	G 1.1/4	260	M26x1.5	160
	G 1.1/2	290	M30x1.5	190
	G 2	380	M38x1.5	230
	-	-	M45x1.5	280

Nota: Tightening torques valid for carbon and stainless steel

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the tightening torques represent the torque required for correct tightening.

FITTINGS WITH CLINCHED AND BARBED SWIVEL NUT SERIES 30...
ISO 8434-6 / BS 5200



This series of clinched or barbed swivel nut fittings with 60° cone seal meets the needs of users who increasingly demand high pressures, absolute airtightness, lower tightening torques, compact dimensions and lower industrial costs..

ASSEMBLY INSTRUCTIONS

- Before starting the assembly of fittings with CAST swivel nuts, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.
- Clean the fittings carefully. For stainless steel fittings lubricate the threads with the recommended products.
- Screw the clinched or barbed nut onto the fitting body by hand and check the alignment of the parts. Tighten the nut until there is contact between the metal-to-metal parts, in accordance with the tightening torques given in the table below, opposing key against key with a torque wrench.

Serie	Filetto Gas cilindrico	Coppia dado graffato [Nm] $^{+10\%}_{0}$	Coppia dado spinato [Nm] $^{+10\%}_{0}$	Filetto Metrico cil.	Coppia dado graffato [Nm] $^{+10\%}_{0}$
UNIVERSALE	G 1/8	20	-	M12x1.5	20
	G 1/4	25	-	M14x1.5	25
	G 3/8	45	-	M16x1.5	45
	G 1/2	70	-	M18x1.5	60
	G 5/8	100	-	M20x1.5	80
	G 3/4	130	-	M22x1.5	90
	G 1	150	-	M26x1.5	130
	G 1.1/4	-	400	M30x1.5	150
	G 1.1/2	-	500	-	-
	G 2	-	600	-	-

Nota: Tightening torques valid for carbon and stainless steel

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the tightening torques represent the torque required for correct tightening.

60° FITTING WITH CLINCHED NUT (Fig. 1) AND BARBED NUT (Fig. 2)

UNDERSIZED FLARING DIAMETER (NON-COMPLIANT)

Fig. 1
Clinched

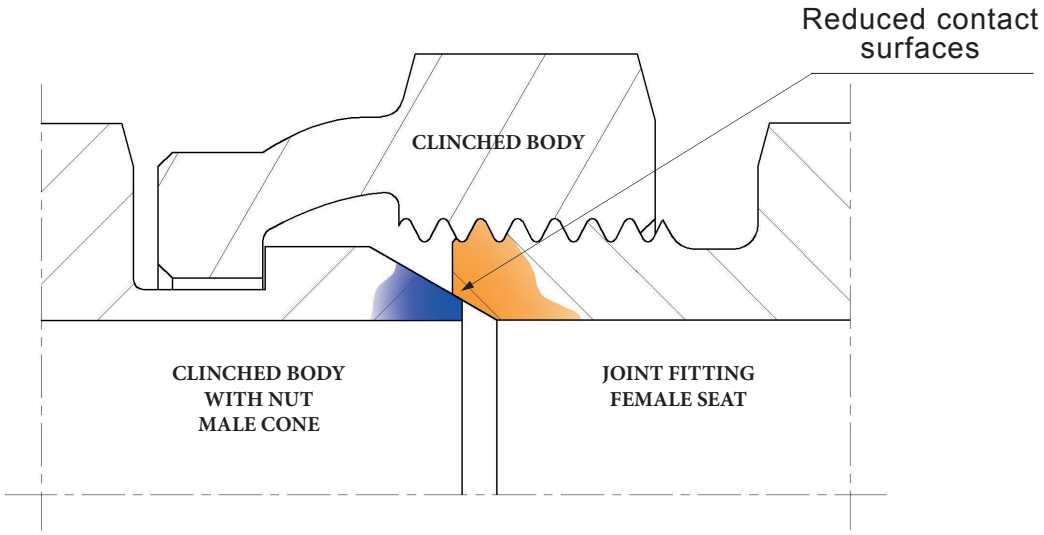
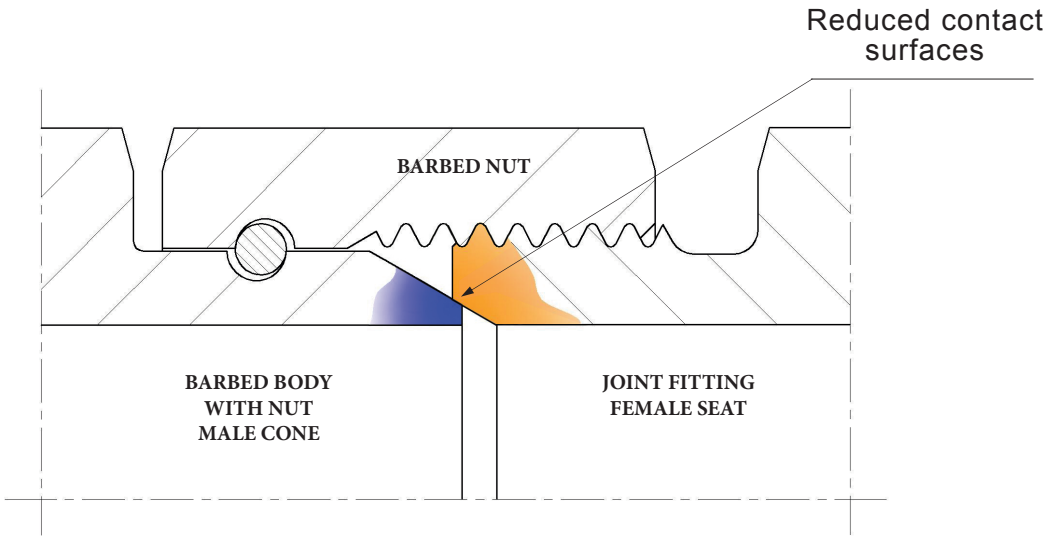


Fig. 2
Barbed



ASSEMBLY BEHAVIOUR:
The contact area between the male cone and female seat (60° metal-to-metal seal) covers only a small portion of the sealing surface provided on the swivel nut fitting; valid for Fig. 1 and Fig. 2.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious damage to persons and property.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 60° female seat.

60° FITTING WITH CLINCHED NUT (Fig. 1) AND BARBED NUT (Fig. 2)

FLARING LESS THAN 60° (NON-COMPLIANT)

Fig. 1
Clinched

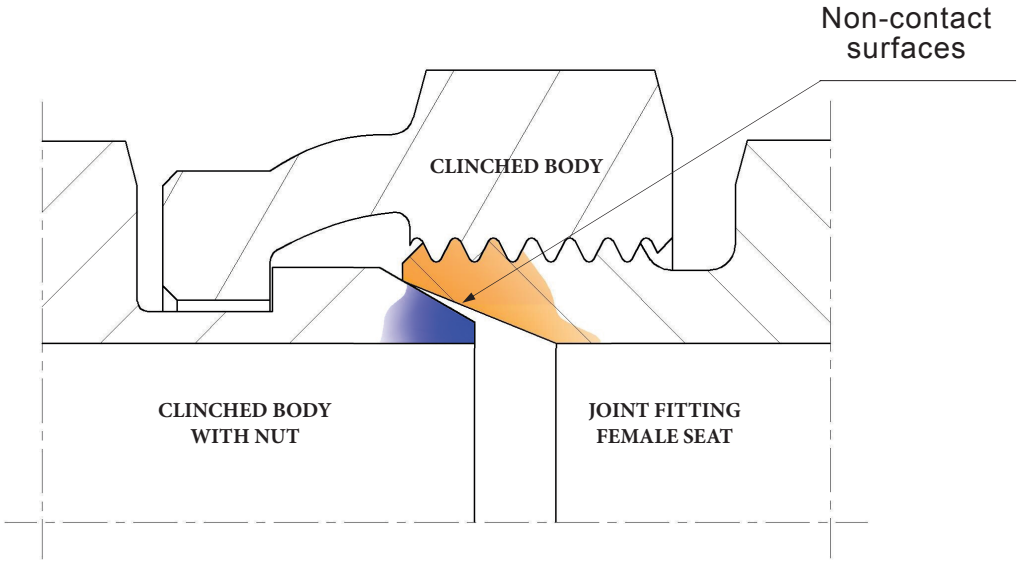
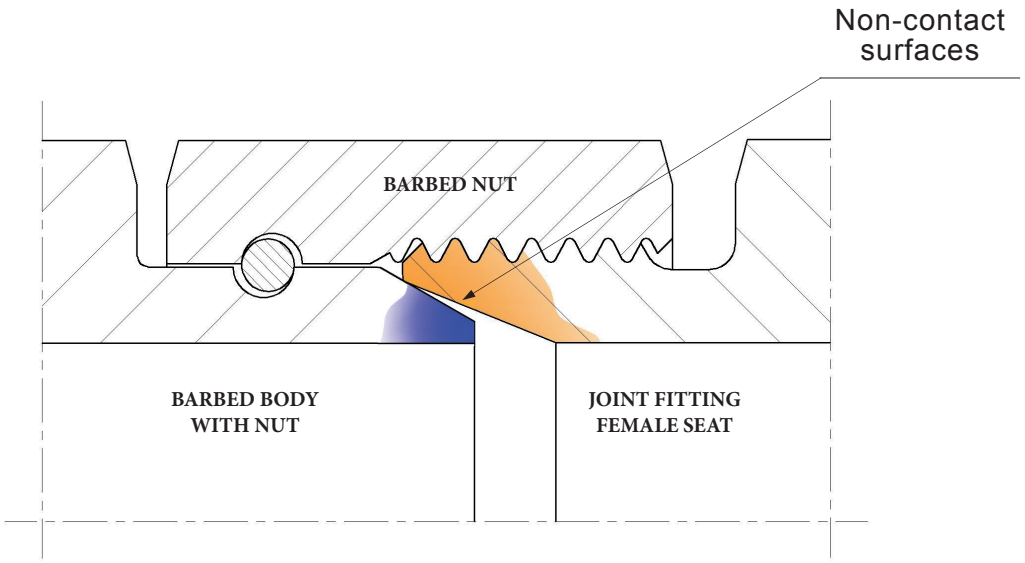


Fig. 2
Barbed



ASSEMBLY BEHAVIOUR:
The 60° connection fitting only covers the rear part of the sealing surface of the swivel nut fitting, valid for Fig. 1 and Fig. 2

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious damage to persons and property.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 60° seat.

60° FITTING WITH CLINCHED NUT (Fig. 1) AND BARBED NUT (Fig. 2)

FLARING GREATER THAN 60° (NON-COMPLIANT)

Fig. 1
Clinched

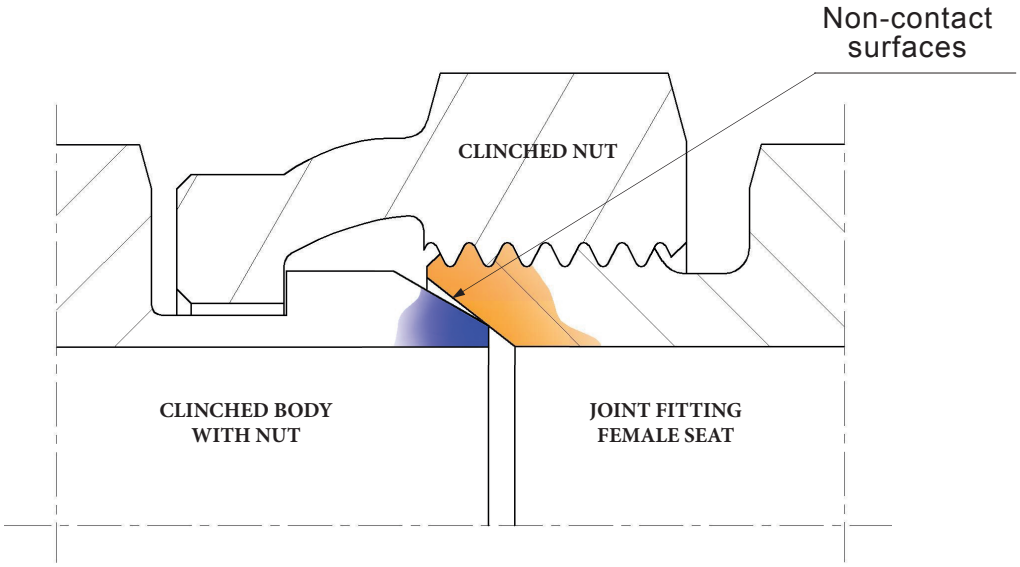
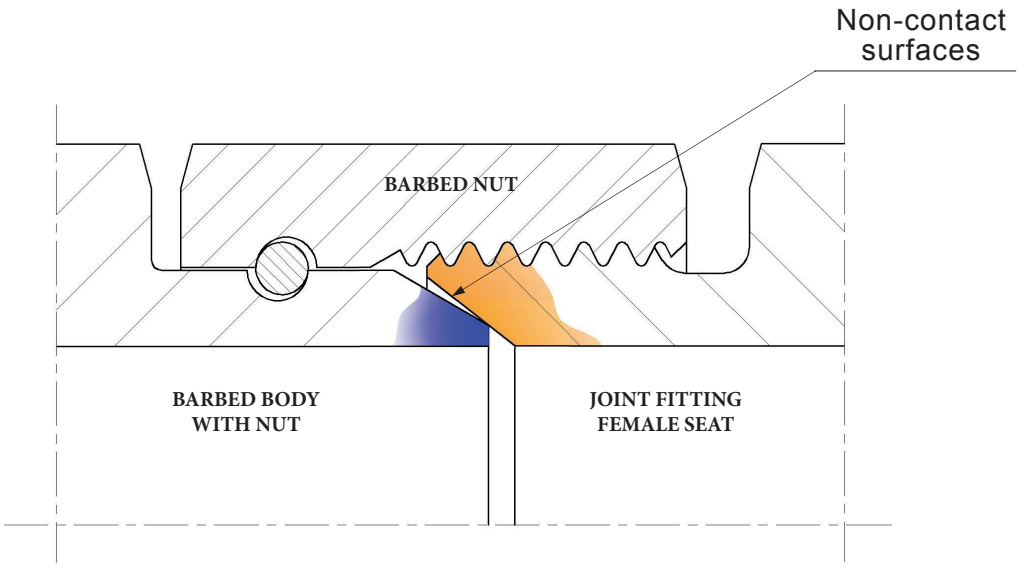


Fig. 2
Barbed



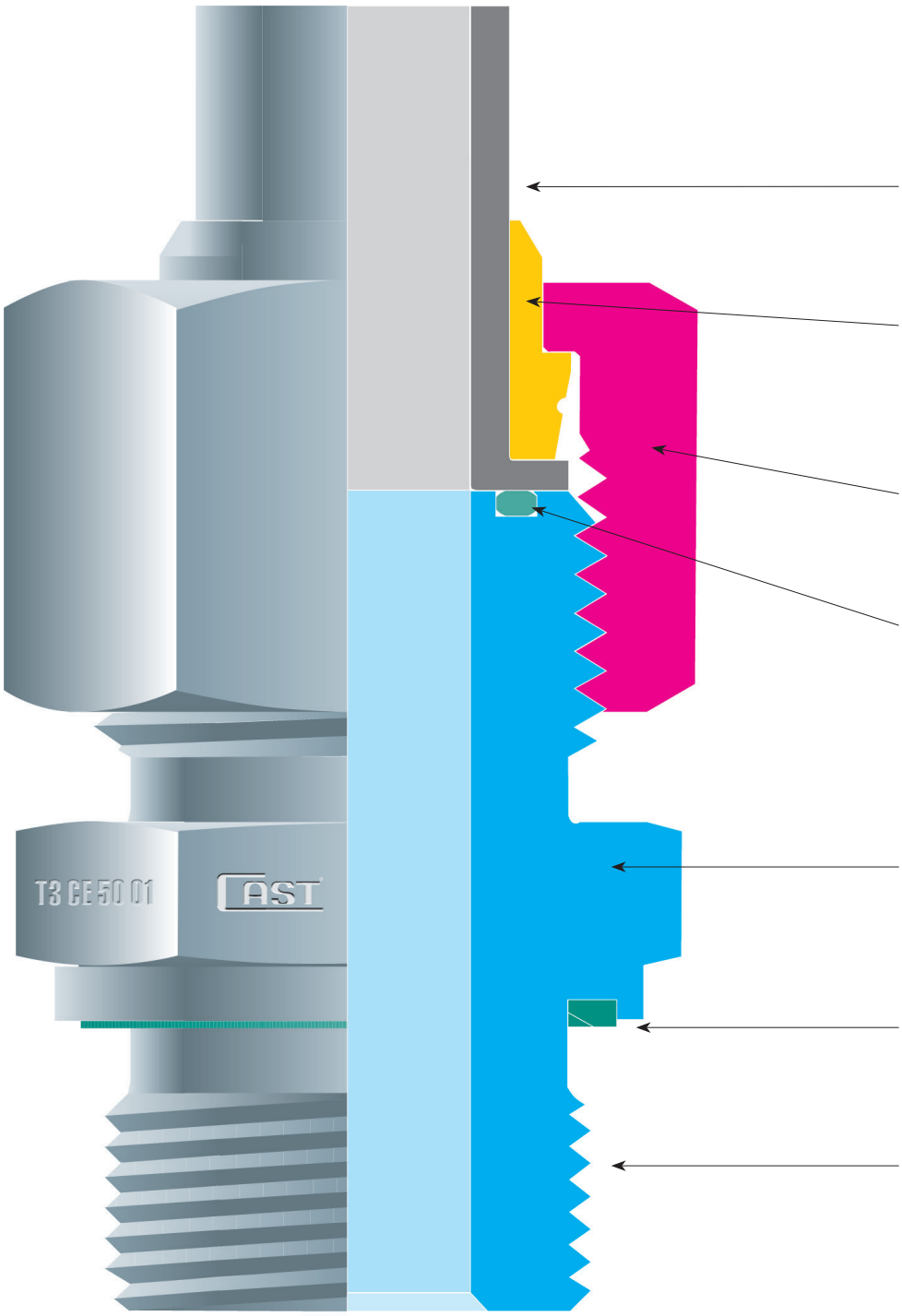
ASSEMBLY BEHAVIOUR:
The 60° connection fitting only covers the front part of the sealing surface of the swivel nut fitting, valid for Fig. 1 and Fig. 2

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious damage to persons and property.

MEASURES TO BE APPLIED:
Reassemble using a fitting with a compliant 60° seat.

ISO 8434-3, SAE J1453 JOINT FOR FLANGED-SOLDERED PIPE

OVERALL DIAGRAM
ISO 8434-3, SAE J1453 JOINT SYSTEM
WITH FLANGED PIPE



Reference standards:

Pipe E235
EN 10305-4

Bushing for flanged pipe
ISO 8434-3
SAE J1453

Nut
ISO 8434-3
SAE J1453

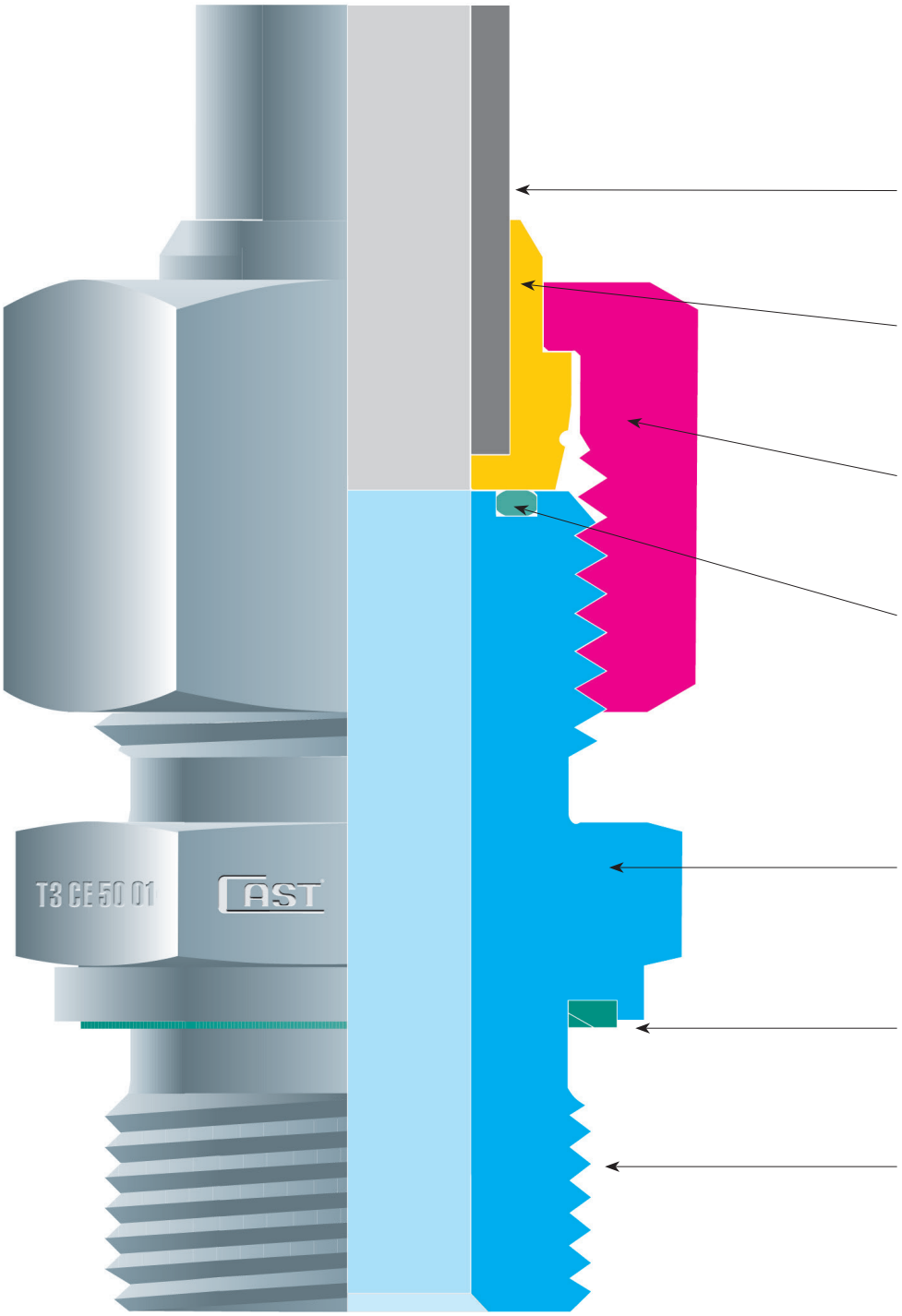
O-ring seat
ISO 8434-3
SAE J1453

Fitting body
ISO 8434-3

Seal seat flat gasket
ISO 1179-2

Threaded end
ISO 1179-2

OVERALL DIAGRAM
ISO 8434-3, SAE J1453 JOINT SYSTEM
WITH SOLDERED PIPE



Reference standards:

Pipe E235
EN 10305-4

Bushing for soldered pipe
ISO 8434-3
SAE J1453

Nut
ISO 8434-3
SAE J1453

O-ring seat
ISO 8434-3
SAE J1453

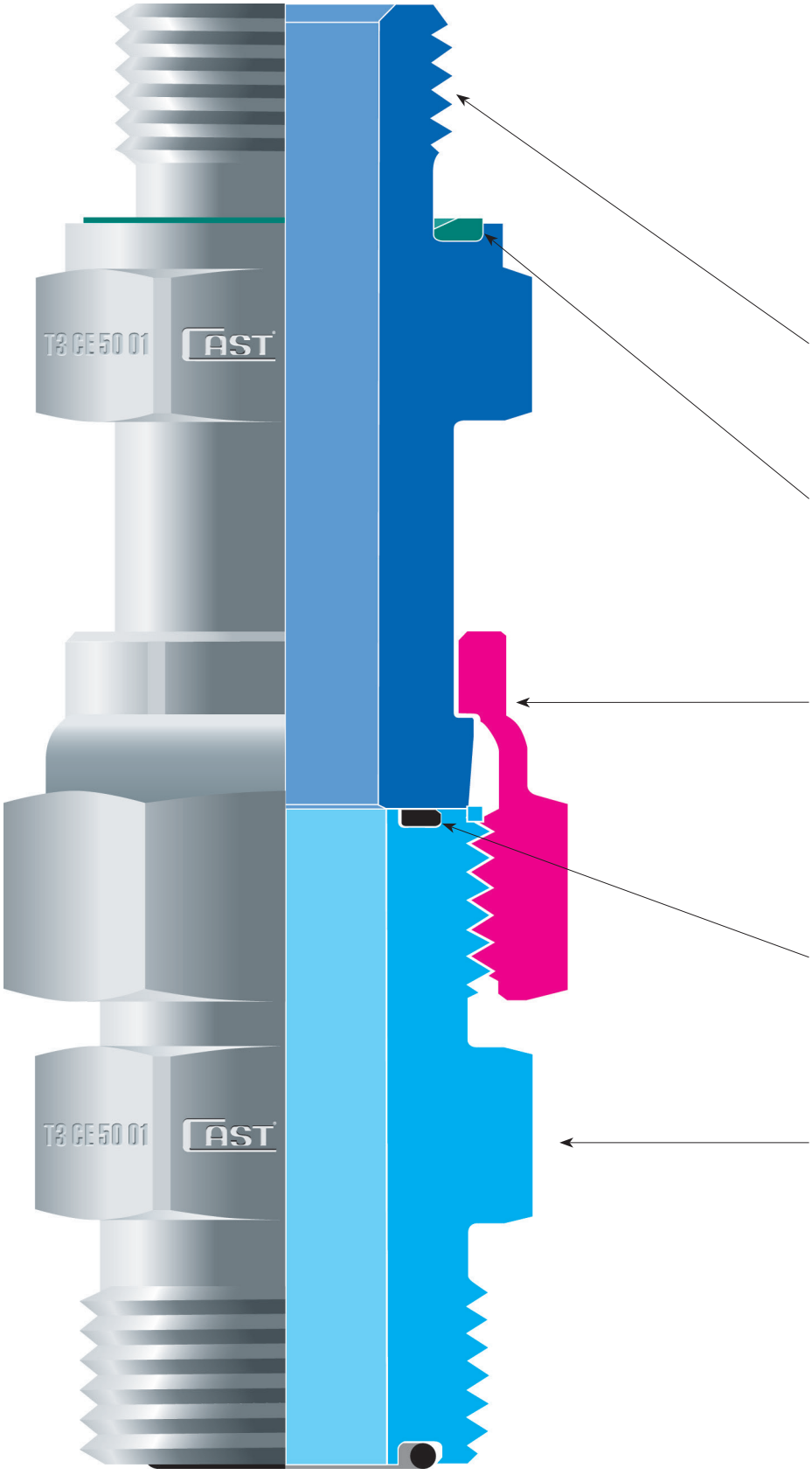
Fitting body
ISO 8434-3

Seal seat flat gasket
ISO 1179-2

Threaded end
ISO 1179-2

ISO 8434-3, SAE J1453 JOINT WITH CLINCHED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-3, SAE J1453, WITH CLINCHED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gasket
ISO 1179-2

Barbed
swivel nut

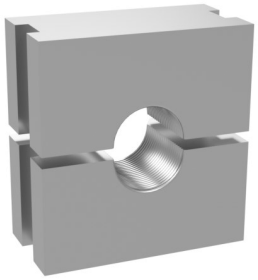
O-ring seat
ISO 8434-3
SAE J1453

Intermediate
fitting body
ISO 8434-3

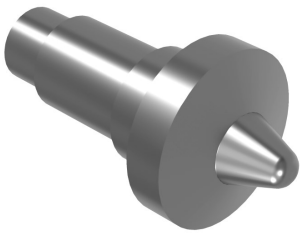
INSTRUCTIONS FOR PREPARING THE FLANGED PIPE

1. CHECKING INSTRUMENTS TO BE USED

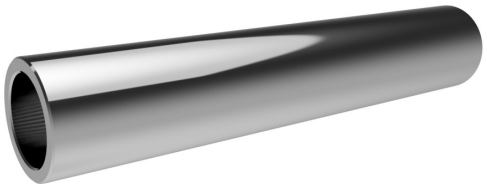
• Before starting the 90° pipe flanging (commonly called flaring) and assembly operations, you must ensure that the necessary equipment and components (tools, fittings, pipes, etc.) are 100% efficient, compliant and free of defects. Replace those that are non-compliant.



Pipe clamping vice



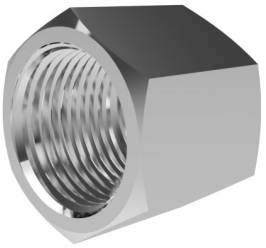
Flaring tool (punch)



Pipe

Fitting

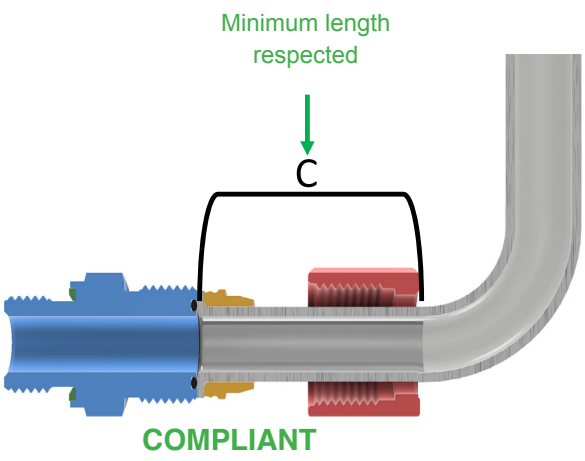
Bushing for flanged pipe

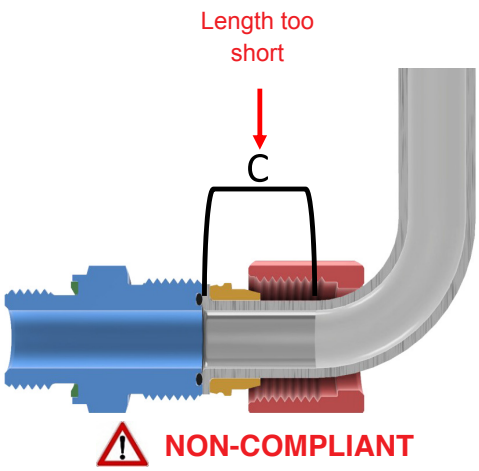


Nut

2. PREPARING THE PIPE

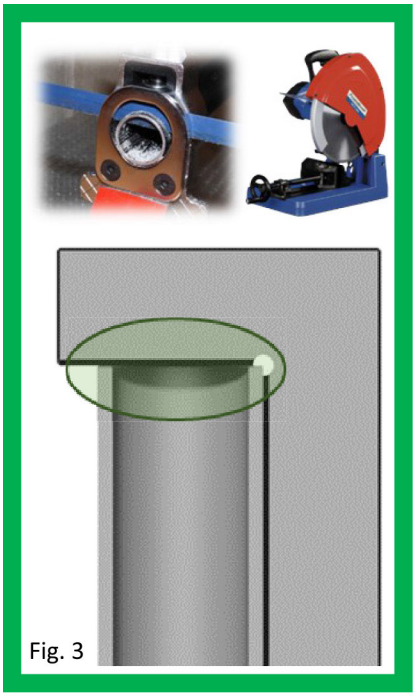
• To obtain the desired pipe length, you must add to the pipe length you wish to obtain the “L1” value which can be found in the table on page 164 in the paragraph “Technical data for the preparation of flanged pipes”. The “L1” value will be fully absorbed during the distortion (flanging) phase of the steel pipe. If the pipe bends close to the flanged end, you must also add the “C” value to the previously obtained length, which can be found in the table on page 164 in the paragraph “Technical data for the preparation of flanged pipes”. This value represents the straight tract required to block the pipe during flanging and is also the minimum tract that must be maintained unaltered by any change in shape that will affect the pipe.



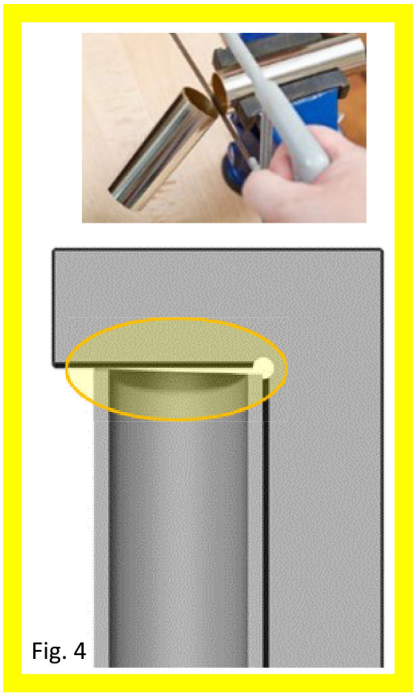


• Check that there are no drawing lines or other structural defects in the pipe which could compromise the seal between the pipe and the fitting body, or the integrity of the pipe itself. Discard the non-compliant pipe.

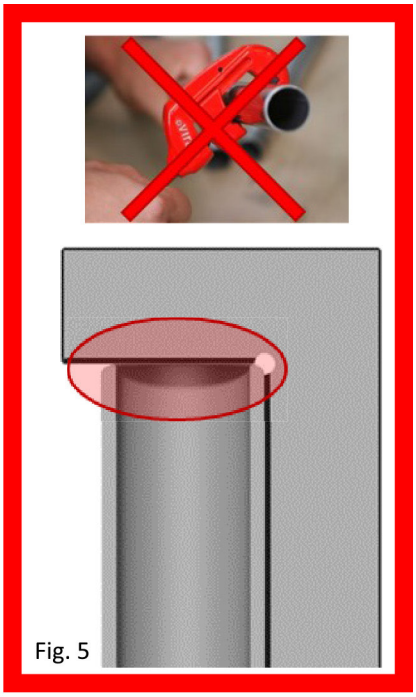
• Cut the pipe at a right angle with the appropriate hacksaw (fig. 3 and 4) and do not use a roller cutter (fig. 5). Check that the cut has been made correctly at 90°. Lightly remove internal and external burrs with the deburring tool and remove internal and external processing residues.



COMPLIANT



COMPLIANT



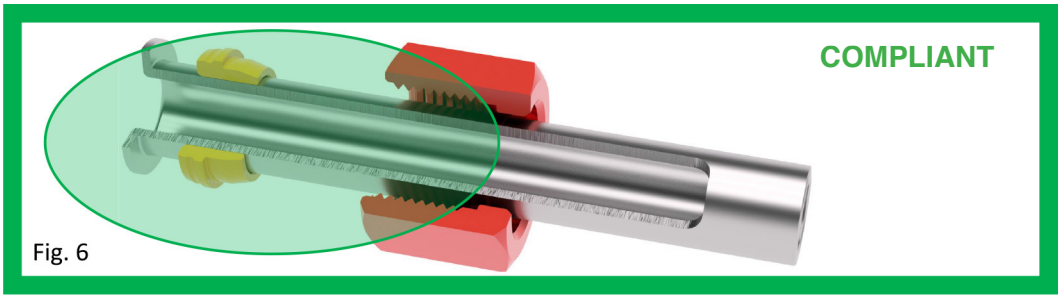
NON-COMPLIANT

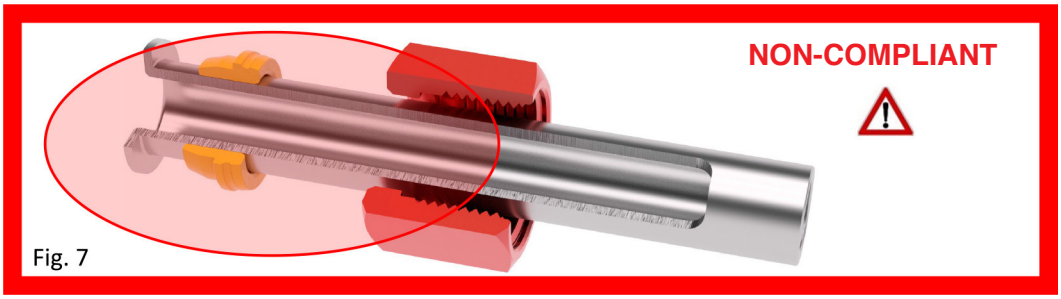
3. PIPE CLEANING AND LUBRICATION

• Carefully clean the part of the pipe to be processed and lubricate with the appropriate products.

4. PREPARING COMPONENTS

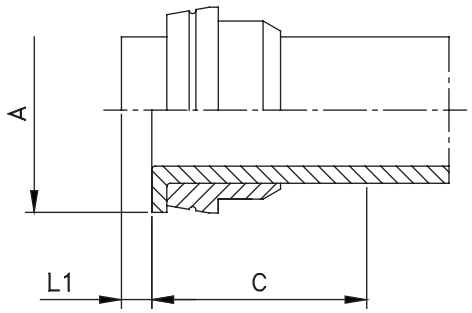
• Put the nut and pressure ring on the pipe as shown in figure 6. Pay particular attention to the orientation of the components: the threaded opening of the nut must face the end of the pipe to be flanged, just as the larger diameter of the pressure ring must also face the end of the pipe to be flanged.





5. TECHNICAL DATA FOR PREPARING FLANGED PIPES

• Flange the pipe with the special flanging unit, precisely following the data in the following table. The drawing indicates the dimensions that must be taken into account.



Pipe Ø Metric	Pipe Ø inches	Ø Flanging A min	Ø Flanging A max	L1	C
6x1	1/4 x 0,035	12,10	12,75	-	32
6x1,5	1/4 x 0,065			-	
8x1	5/16 x 0,035	14,85	15,75	-	40
8x1,5	5/16 x 0,065			-	
10x1	3/8 x 0,035			2.5	
10x1,5	3/8 x 0,065			2	
10x2	3/8 x 0,083			1.5	
12x1	1/2 x 0,035	18	18,90	-	45
12x1,5	1/2 x 0,065			3	
12x2	1/2 x 0,083			2.5	
12x2,5	1/2 x 0,095			2	
14x1,5	-	22,20	23,45	-	45
14x2	-			-	
14x2,5	-			-	
15x1,5	-			4.5	
15x2	-			4	
15x2,5	-			3.5	
16x1,5	5/8 x 0,065			4	
16x2	5/8 x 0,083			3.5	
16x2,5	5/8 x 0,095			3	
16x3	5/8 x 0,120			2.5	
18x1,5	-	26,60	27,85	-	50
18x2	-			5	
18x2,5	-			4,5	
18x3	-			4	

Pipe Ø Metric	Pipe Ø inches	Ø Flanging A min	Ø Flanging A max
20x2	3/4x0,083	26,60	27,85
20x2,5	3/4 x 0,095		
20x3	3/4 x 0,120		
20x3,5	3/4 x 0,134		
22x2	7/8 x 0,083	32,95	34,20
22x2,5	7/8 x 0,095		
22x3	7/8 x 0,120		
25x2,5	1 x 0,095		
25x3	1 x 0,120		
25x4	1 x 0,156		
25x5	1 x 0,188		
28x2	-	39,35	40,55
28x2,5	-		
28x3	-		
30x2	-		
30x2,5	-		
30x3	-		
30x4	-		
32x3	1.1/4 x 0,120		
32x4	1.1/4 x 0,156		
35x3	-	47,25	48,50
35x4	-		
38x3	1.1/2 x 0,120		
38x4	1.1/2 x 0,156		

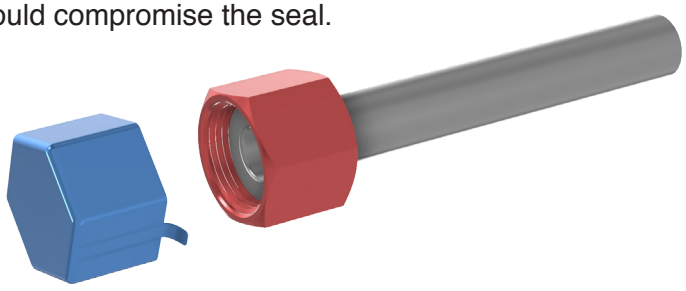
Nota: (1) The “C” value may vary depending on the type of tool used in the process.

6. CHECK THE PIPE FLANGING

• Check that the flanging of the pipe has been carried out in a correct and functional manner and that there are no material flaws inside the pipe that could compromise the seal.

7. PROTECTING THE ASSEMBLED PIPE

• Remove internal and external processing residues from the pipe. • If the pipe is not use immediately for final assembly on the machine, protect the end with plastic plugs.

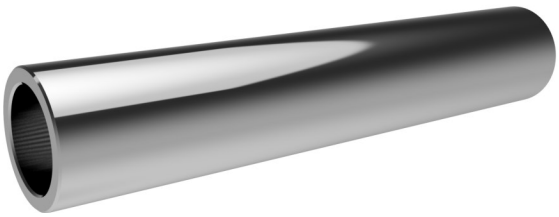


INSTRUCTIONS FOR PREPARING THE SOLDERED PIPE

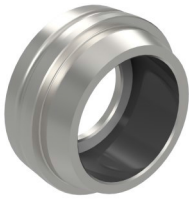
1. CHECKING INSTRUMENTS TO BE USED

• Before starting pipe soldering work on the soldered pipe bushing, and assembly, you must ensure that the necessary equipment and components (equipment, fittings, pipes, etc.) are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

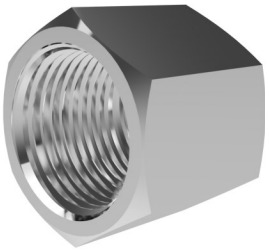
Fitting



Pipe



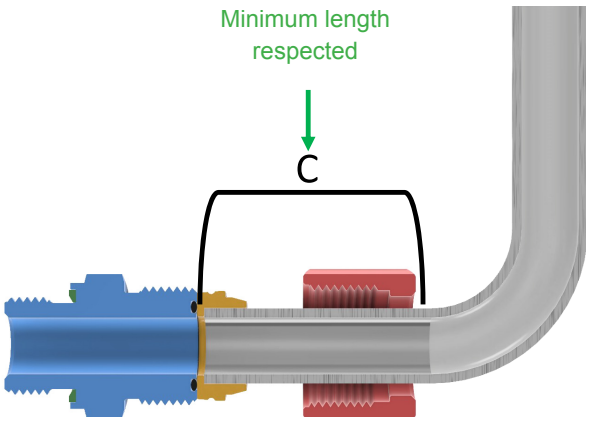
Bushing for soldered pipe



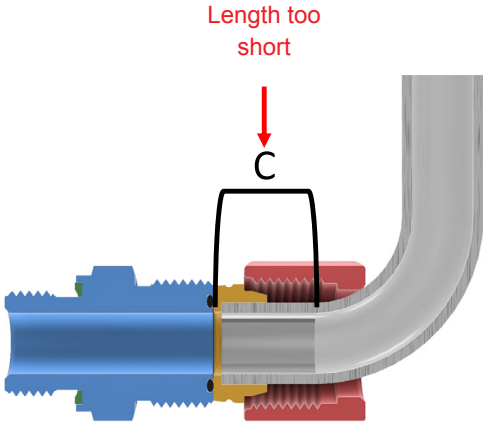
Nut

2. PREPARING THE PIPE

• To obtain the desired pipe length, you must add to the pipe length you wish to obtain the “L2” value which can be found in the table on page 167 in the paragraph “Technical data for the preparation of soldered pipes”. • The straight pipe segment where soldering (length C) is being prepared to be carried out must be at least twice the length of the nut.



COMPLIANT



NON-COMPLIANT

• Check that there are no drawing lines or other structural defects in the pipe which could compromise the seal between the pipe and the fitting body, or the integrity of the pipe itself. Discard the non-compliant pipe.
• Cut the pipe at a right angle with the appropriate hacksaw (fig. 3 and 4) and do not use a roller cutter (fig. 5). Check that the cut has been made correctly at 90°. Lightly remove internal and external burrs with the deburring tool and remove internal and external processing residues.

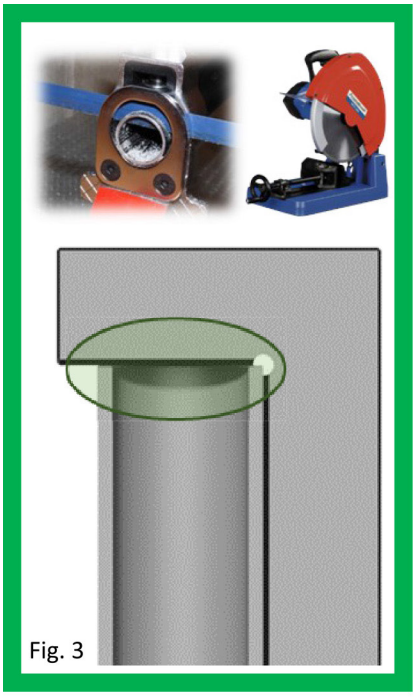


Fig. 3

COMPLIANT

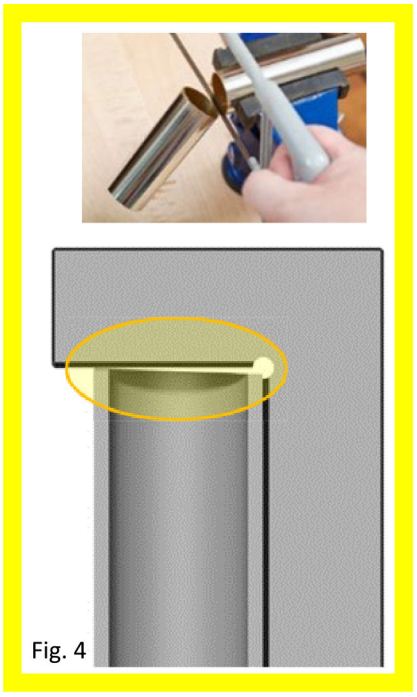


Fig. 4

COMPLIANT

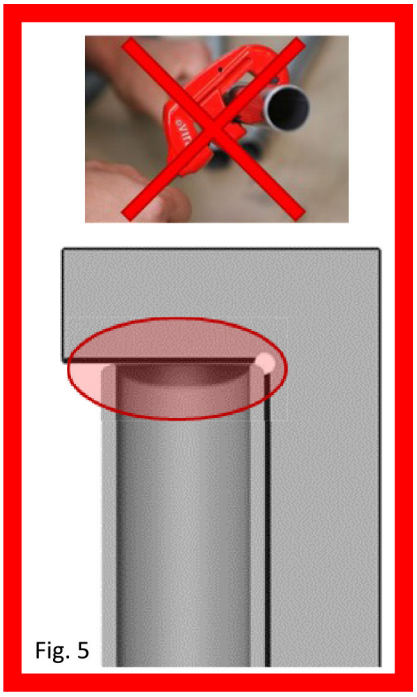


Fig. 5

⚠ NON-COMPLIANT

3.PIPE CLEANING AND LUBRICATION

• Carefully clean and degrease the part of the pipe to be soldered.

4. PREPARING COMPONENTS

• Push the nut and the bushing to be soldered onto the pipe as shown in figure 6 and push the bushing to the stop. Pay particular attention to the orientation of the components: the threaded opening of the nut must face the end of the pipe to be soldered..

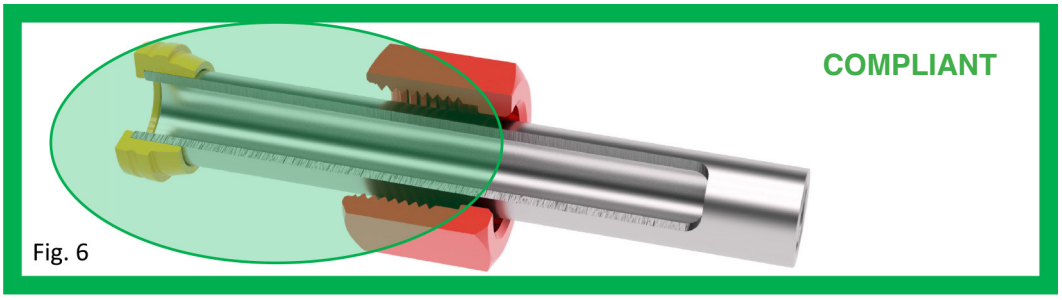


Fig. 6

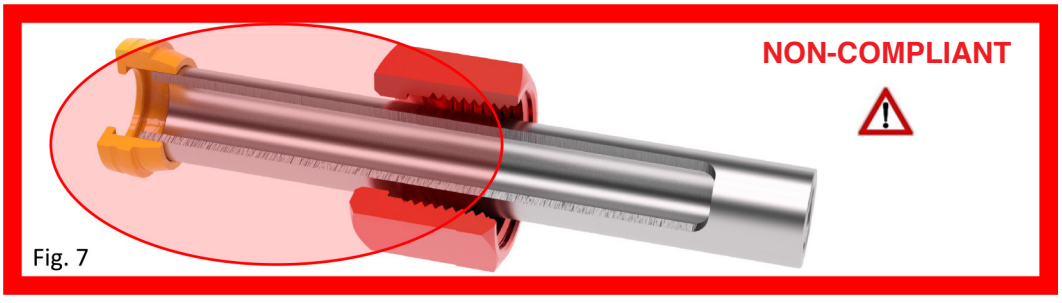


Fig. 7

• Check that the pipe is correctly inserted into the correct seat in the bushing as shown below in Fig.8..

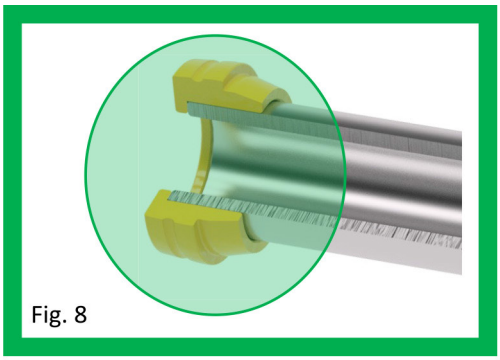


Fig. 8

COMPLIANT

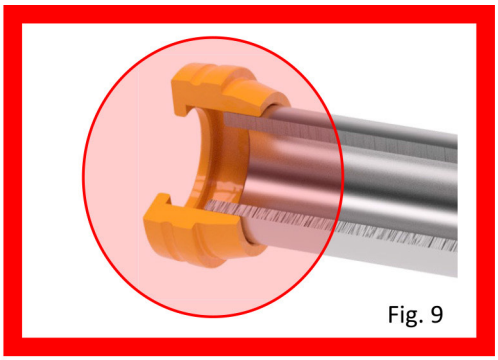
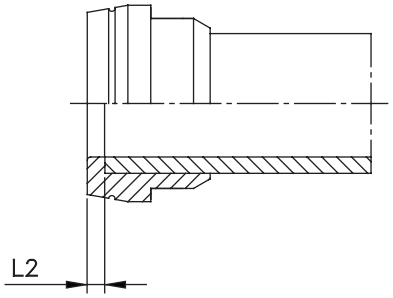


Fig. 9

NON-COMPLIANT

5. TECHNICAL DATA FOR PREPARING SOLDERED PIPES



Pipe Ø Metric	Pipe Ø inches	L2
6x1	1/4 x 0,035	1
6x1,5	1/4 x 0,065	
8x1	5/16 x 0,035	1
8x1,5	5/16 x 0,065	
10x1	3/8 x 0,035	
10x1,5	3/8 x 0,065	
10x2	3/8 x 0,083	
12x1	1/2 x 0,035	1
12x1,5	1/2 x 0,065	
12x2	1/2 x 0,083	
12x2,5	1/2 x 0,095	
14x1,5	-	1.5
14x2	-	
14x2,5	-	
15x1,5	-	
15x2	-	
15x2,5	-	
16x1,5	5/8 x 0,065	
16x2	5/8 x 0,083	
16x2,5	5/8 x 0,095	
16x3	5/8 x 0,120	
18x1,5	-	1.5
18x2	-	
18x2,5	-	
18x3	-	

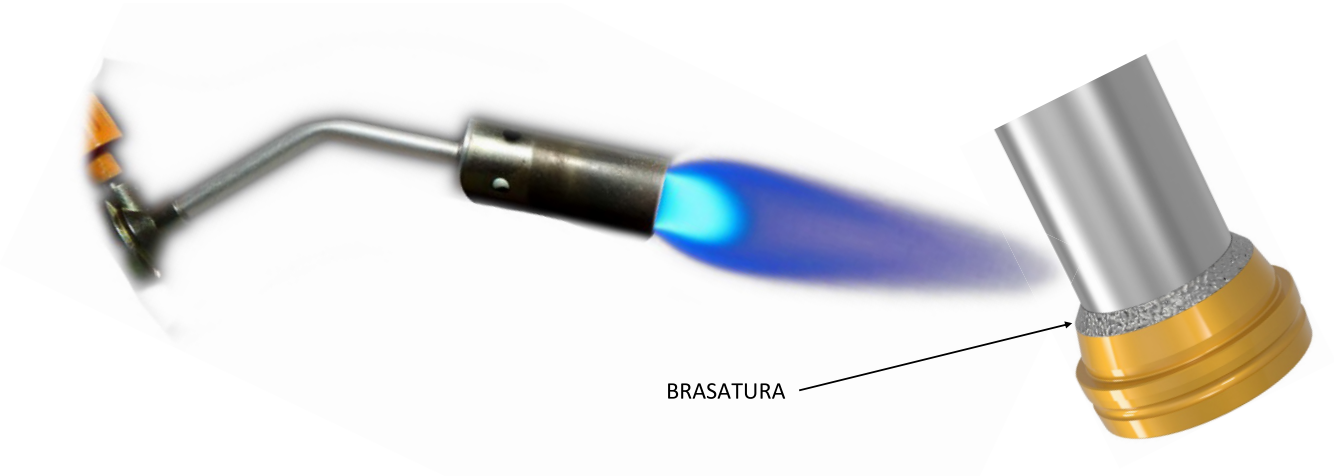
Pipe Ø Metric	Pipe Ø inches	L2
20x2	3/4 x 0,083	1.5
20x2,5	3/4 x 0,095	
20x3	3/4 x 0,120	
20x3,5	3/4 x 0,134	
22x2	7/8 x 0,083	1.5
22x2,5	7/8 x 0,095	
22x3	7/8 x 0,120	
25x2,5	1 x 0,095	
25x3	1 x 0,120	
25x4	1 x 0,156	
25x5	1 x 0,188	
28x2	-	1.5
28x2,5	-	
28x3	-	
30x2	-	
30x2,5	-	
30x3	-	
30x4	-	
32x3	1.1/4 x 0,120	
32x4	1.1/4 x 0,156	
35x3	-	1.5
35x4	-	
38x3	1.1/2 x 0,120	
38x4	1.1/2 x 0,156	

6. CLEANING COMPONENTS

• Carefully clean the bushing and the part of the pipe to be soldered.

7. SOLDERING

• Ensuring that the pipe is fully seated in the bushing, apply flux around the entire circumference of the bushing in the pipe insertion area and solder, taking care not to overheat and char the flux.



8. VERIFICA BRASATURA

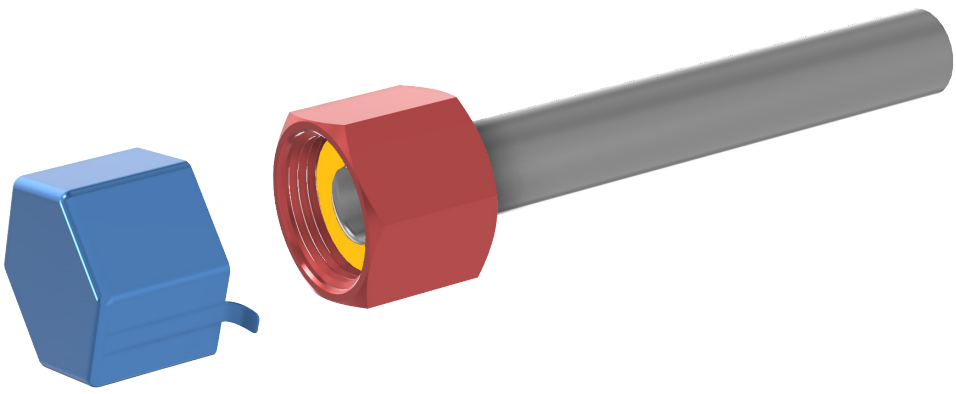
• • Check that the soldering has been performed correctly, in a functional manner and that it is uniform and present on the entire circumference of the pipe.

9. FINAL CLEANING

• Clean the soldering area and check that the soldering bead extends evenly over the entire outside diameter of the pipe.

10. PROTECTING THE ASSEMBLED PIPE

• Remove internal and external processing residues from the pipe. • If the pipe is not used immediately for final assembly on the machine, protect the end with plastic plugs.



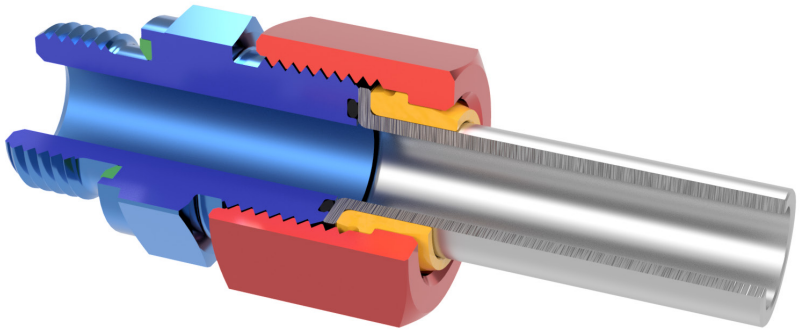
INSTRUCTIONS FOR FINAL ASSEMBLY ON THE MACHINE
VALID FOR PIPES WITH FLANGED ENDS AND SOLDERED BUSHING

1. CHECKING COMPONENTS TO BE USED

- Before starting the final tightening operations on the machine of the previously flanged / soldered pipe, you must ensure that the necessary components (bushings, clamping nuts, fittings, pipes, etc.) are 100% efficient, compliant and free from defects. Replace those that are non-compliant.
- Remove any plastic plugs from the ends of the pipes.
- Check that correct flanging/ soldering has been carried out on all pipes to be mounted. You must respect the measurements on the relevant tables. The machined surface must be free of imperfections, cracks or flaking and the flanging, viewed from the front, must be uniform across the crown.
- Check that the pipes to be assembled are free from occlusions, constrictions or damage resulting from the various preparation processes. Replace non-compliant pipes.
- Check that the pipes are free from internal impurities resulting from the various processes.

2. FINAL TIGHTENING ON THE MACHINE

- Clean the fittings carefully, lubricate the o-Ring and for stainless steel fittings lubricate the threads with the recommended products
- Place the flanged / soldered pipe on the body of the fitting, screw the nut by hand and check the alignment of the parts. Tighten the swivel nut using a torque wrench in accordance with the tightening torques given in the table below, opposing key against key.
- Take great care to prevent rotation of the pipe when tightening the nut.

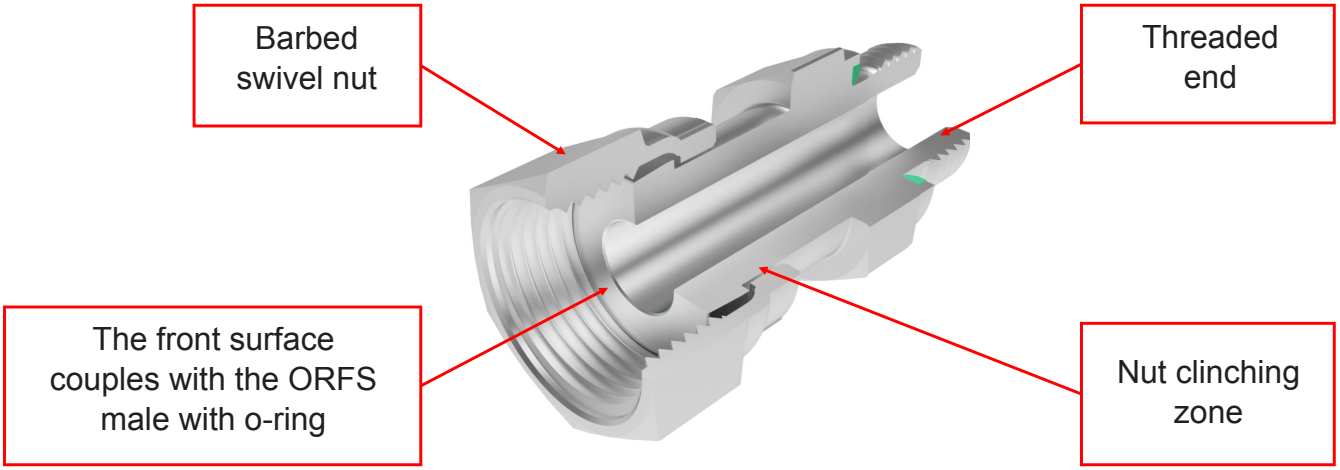


Series	Pipe Ø Metric	Pipe Ø inches	Thread UN/UNF/UNS-2A	Clinched nut torque [Nm] $^{+10\%}_{0}$
UNIVERSAL	6	1/4	9/16-18	25
	8-10	5/16-3/8	11/16-16	40
	12	1/2	13/16-16	55
	14-15-16	5/8	1-14	60
	18-20	3/4	1.3/16-12	90
	22-25	7/8-1	1.7/16-12	125
	28-30-32	1.1/4	1.11/16-12	170
	35-38	1.1/2	2-12	200

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the pipe-side tightening torques on the ORFS side represent the torque required, calculated on the maximum usable thickness of the pipe, which is required for correct tightening of the nut..

FITTING WITH SWIVEL NUT SERIES 40...
ISO 8434-3 / SAE J1453

This series of fittings with a clinched swivel nut and front seal meets the needs of users who increasingly demand high pressures, absolute airtightness, low tightening torques, compact dimensions and low industrial costs.



ASSEMBLY INSTRUCTIONS

• Before starting the assembly of the fittings with Cast swivel nut and front seal, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

• Clean the fittings carefully and for stainless steel fittings lubricate the threads with the recommended products.

• Screw the clinched nut onto the fitting body by hand and check the alignment of the parts. Tighten the nut until there is contact between the metal-to-metal parts, in accordance with the tightening torques given in the table below, contrasting key against key with a torque wrench.

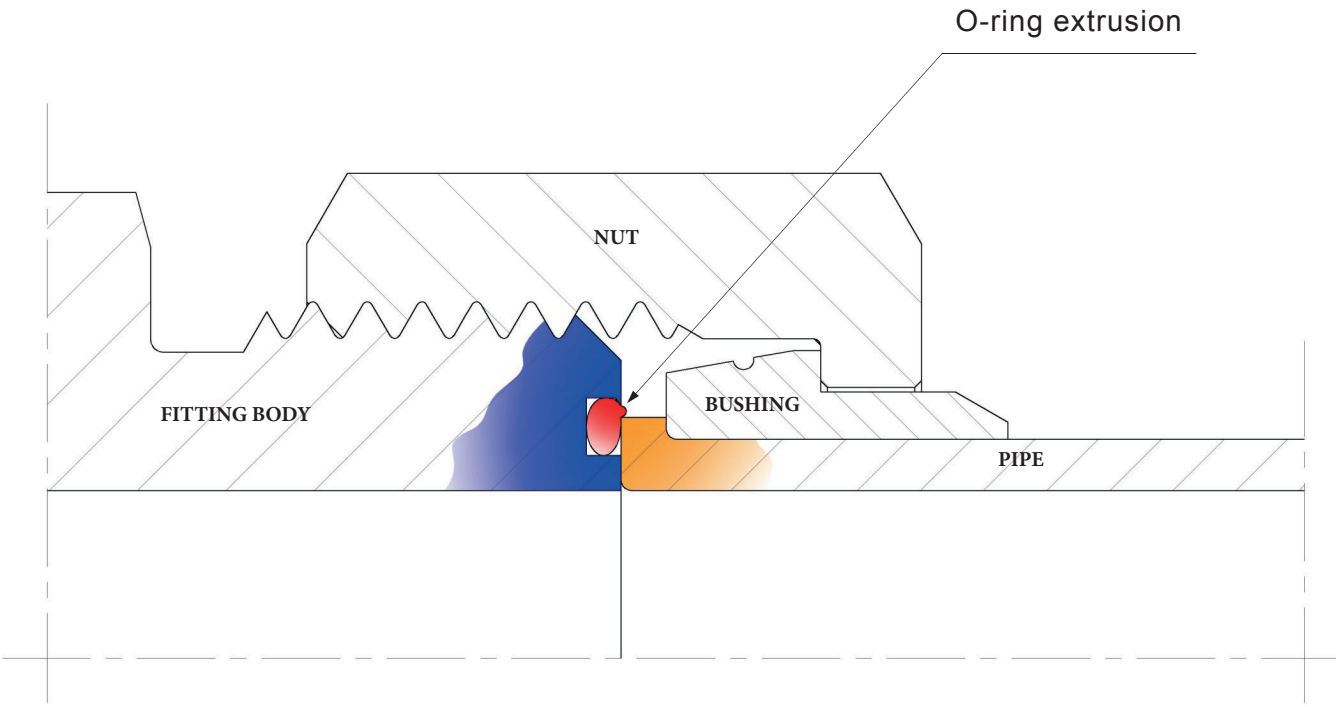
Series	Pipe Ø Metric	Pipe Ø Inches	Thread UNF/UNS-2A	Clinched nut torque [Nm] $^{+10\%}_{0}$
UNIVERSAL	6	1/4	9/16-18	25
	8-10	5/16-3/8	11/16-16	40
	12	1/2	13/16-16	55
	14-15-16	5/8	1-14	60
	18-20	3/4	1.3/16-12	90
	22-25	7/8-1	1.7/16-12	125
	28-30-32	1.1/4	1.11/16-12	170
	35-38	1.1/2	2-12	200

Nota: Tightening torques valid for carbon and stainless steel

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.
The values in Nm for the tightening torques on the swivel nut represent the torque required for correct tightening.

FITTINGS FOR 90° ORFS FLANGED PIPES

SMALL FLANGE DIAMETER (NON-COMPLIANT)



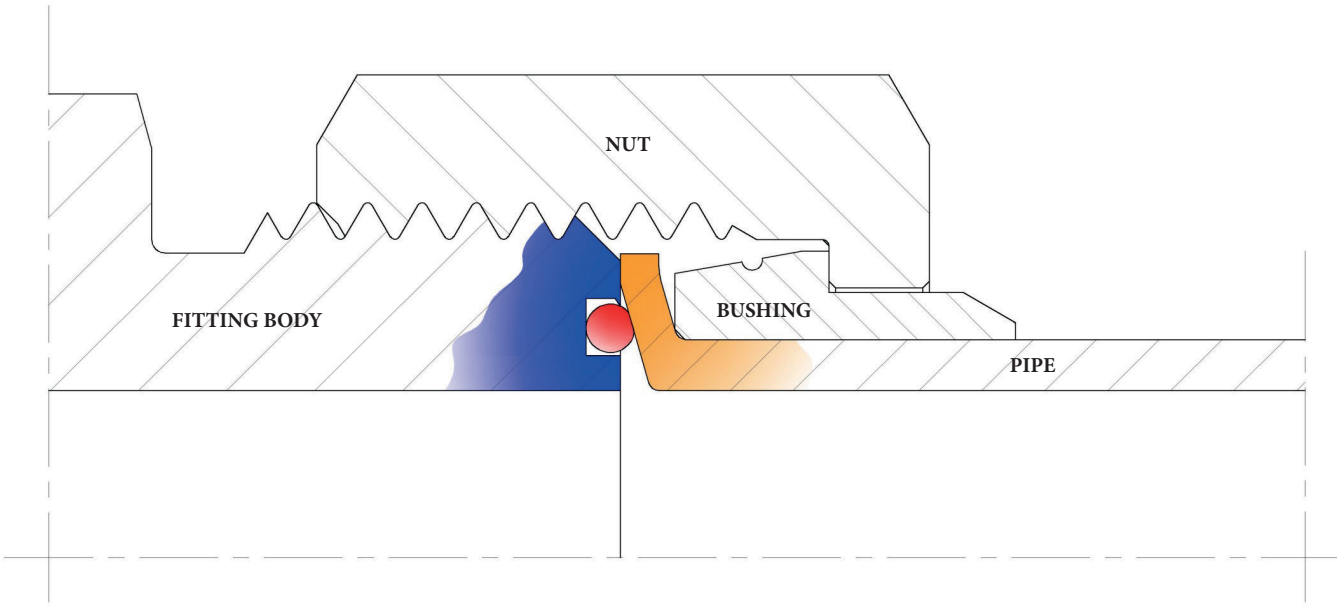
ASSEMBLY BEHAVIOUR:
The 90° flanged steel pipe only covers part of the sealing surface of the fitting body.

CONSEQUENCES:
Extrusion of the o-ring, loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flanged to the appropriate diameters.

FITTINGS FOR 90° ORFS FLANGED PIPES

FLANGING LESS THAN 90° (NON-COMPLIANT)



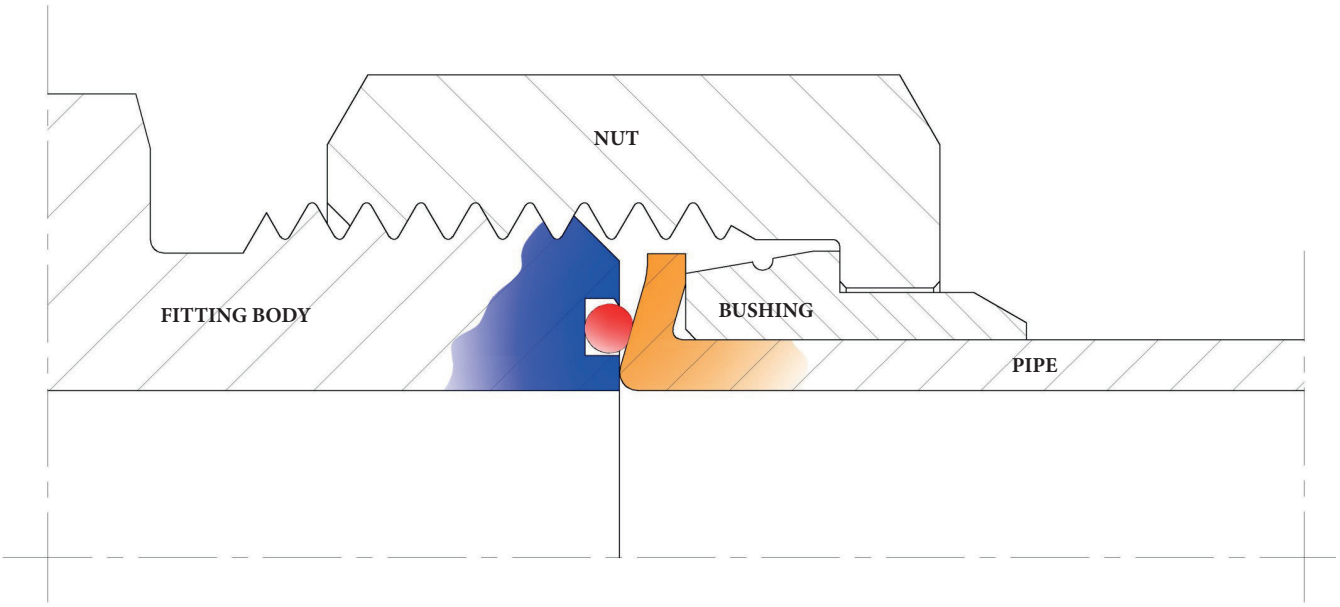
ASSEMBLY BEHAVIOUR:
The flanged steel pipe only covers the peripheral part of the sealing surface of the fitting body.

CONSEQUENCES:
Extrusion of the o-ring and loss of fluid from the fitting.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flanged to the appropriate diameters.

FITTINGS FOR 90° ORFS FLANGED PIPES

FLANGING GREATER THAN 90° (NON-COMPLIANT)



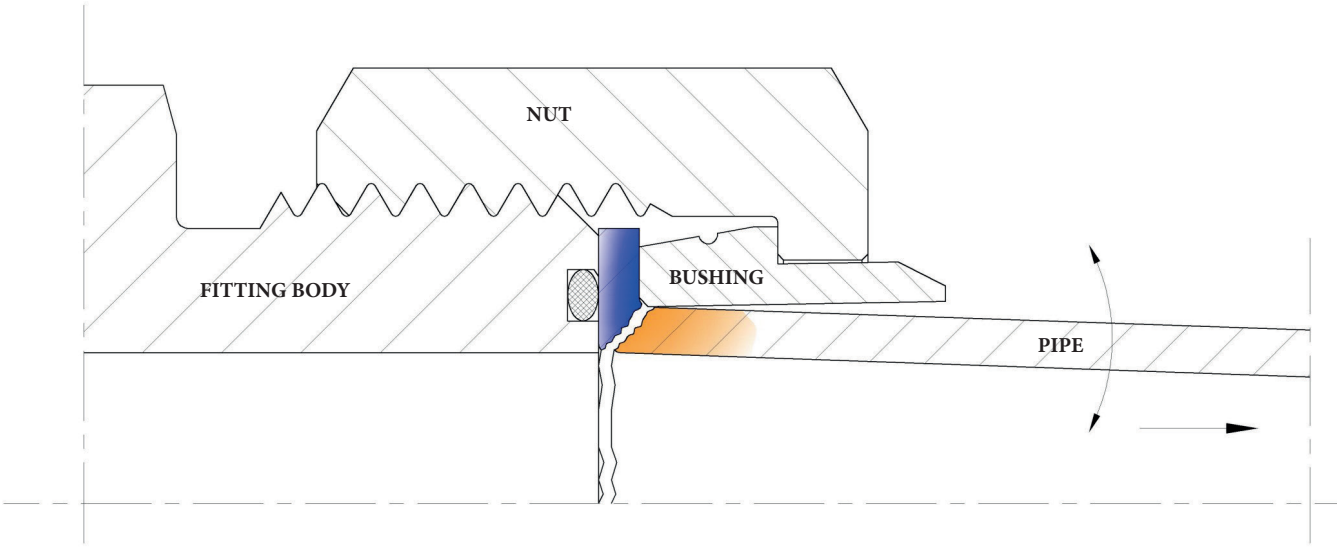
ASSEMBLY BEHAVIOUR:
The flared steel pipe only covers the front part of the sealing surface of the fitting body.

CONSEQUENCES:
Extrusion of the o-ring and loss of fluid from the fitting.

MEASURES TO BE APPLIED:
Reassemble with a steel pipe flanged to the appropriate diameters.

FITTINGS FOR 90° ORFS FLANGED PIPES

UNCLAMPED FLANGED PIPE



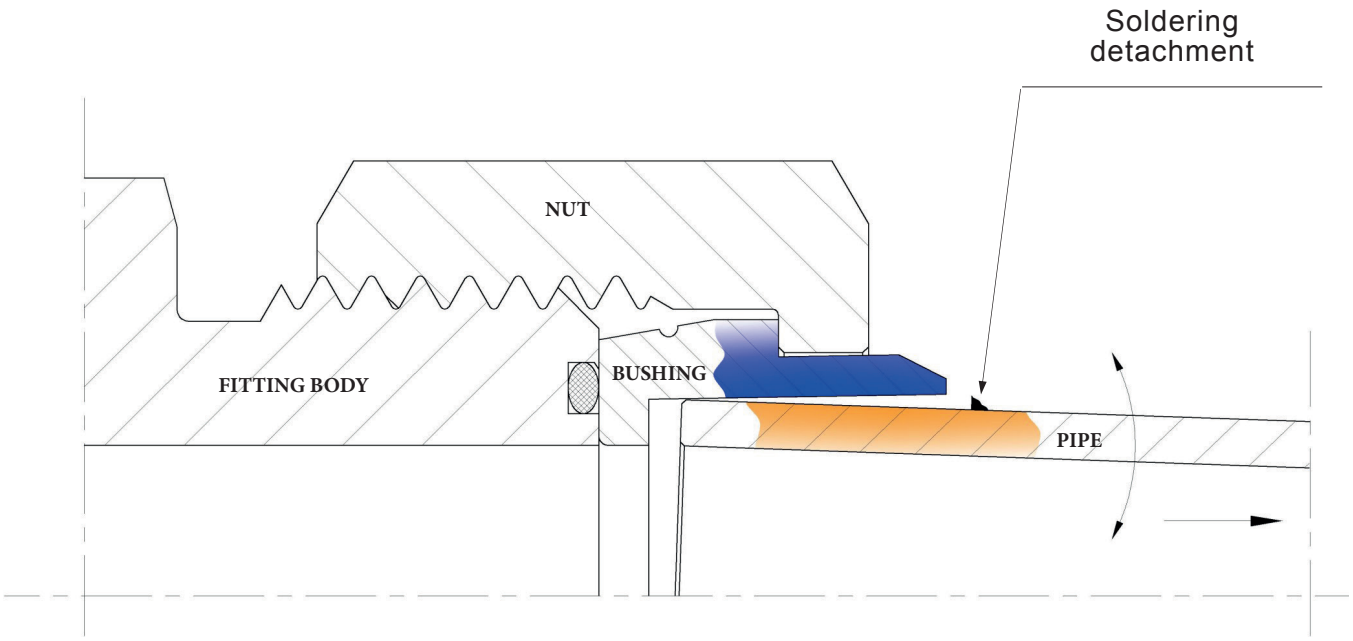
ASSEMBLY BEHAVIOUR:
During use (under pressure) the seal between the flanged steel pipe and the fitting body may be compromised by “pipe breakage” due to bending stress.

CONSEQUENCES:
Loss of fluid from the fitting and possible breakage of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
The pipe must be secured with the appropriate brackets.

FITTINGS FOR ORFS SOLDERED PIPES

UNCLAMPED SOLDERED PIPE



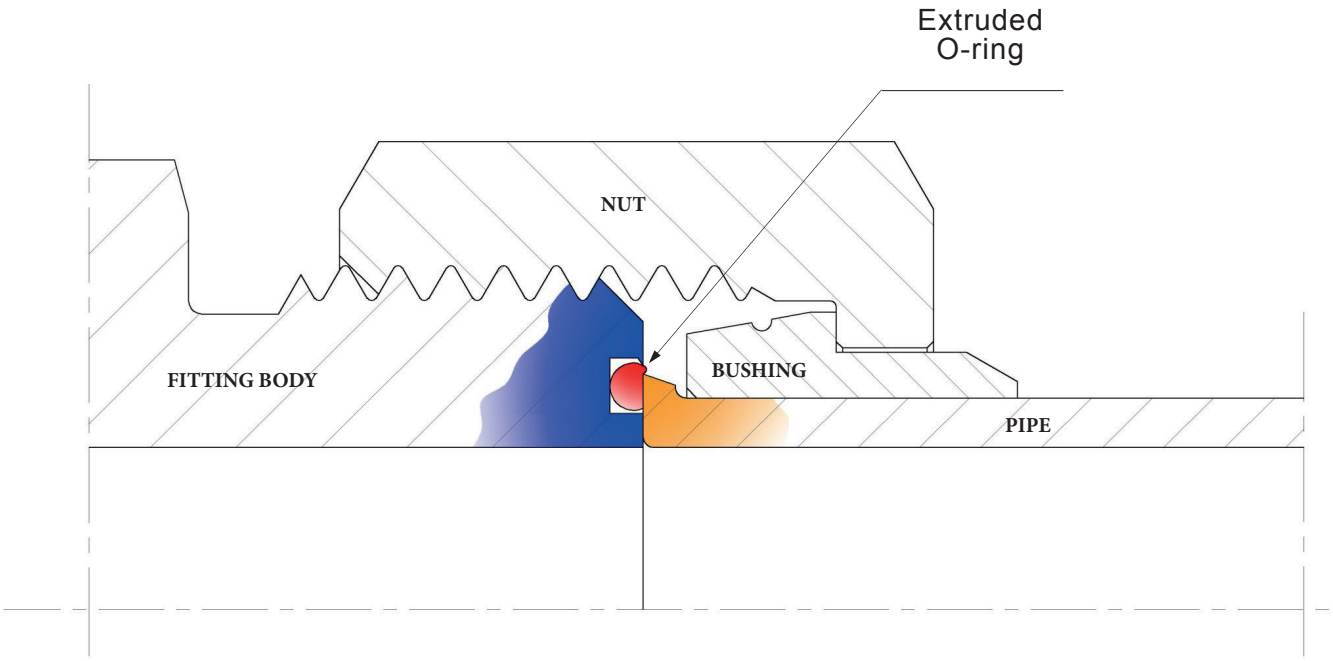
ASSEMBLY BEHAVIOUR:
During use (under pressure) the seal between the steel pipe and the bushing to be soldered may be compromised by failure of the soldering due to bending stress.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
The pipe must be secured with the appropriate brackets.

FITTINGS FOR 90° ORFS FLANGED PIPES

PIPE CUT OUT OF SQUARE (NON-COMPLIANT)



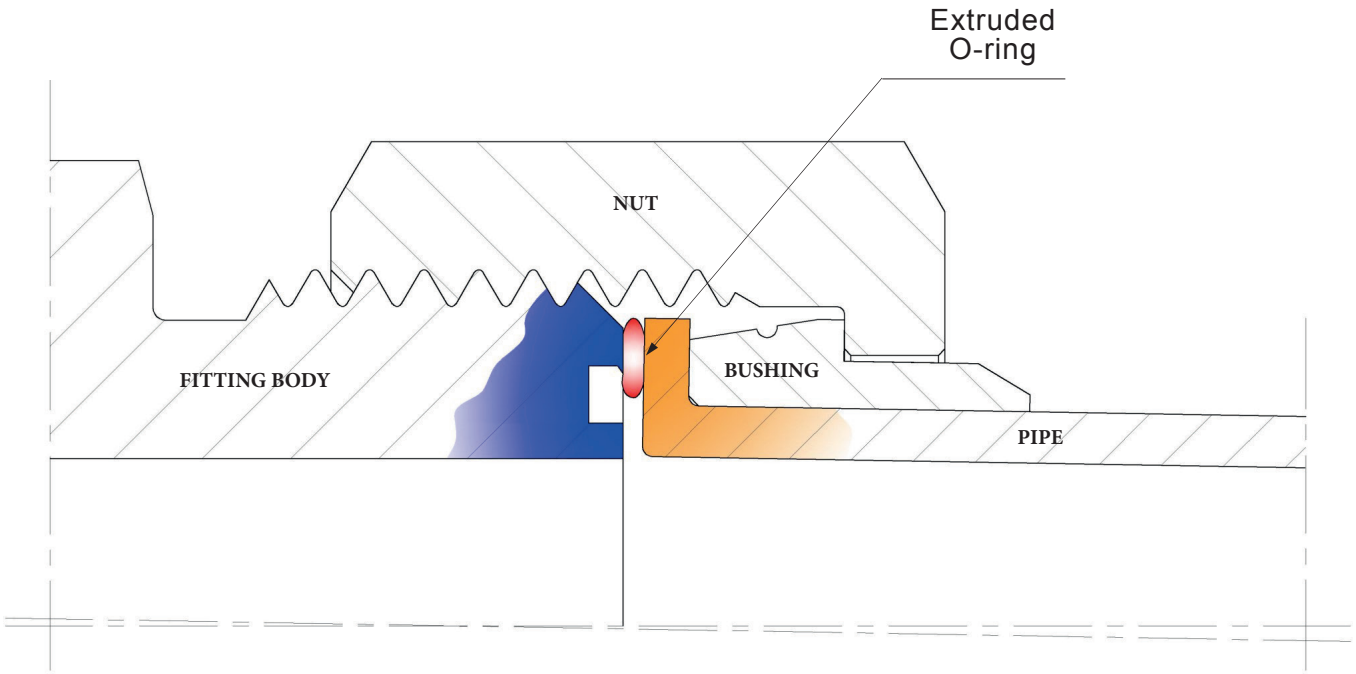
ASSEMBLY BEHAVIOUR:
The 90° flanged steel pipe only covers part of the sealing surface of the fitting body.

CONSEQUENCES:
Extrusion of the o-ring and loss of fluid from the fitting, with the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble ensuring that the steel pipe has been cut correctly.

FITTINGS FOR 90° ORFS SOLDERED AND FLANGED PIPES

EXTRUDED O-RING



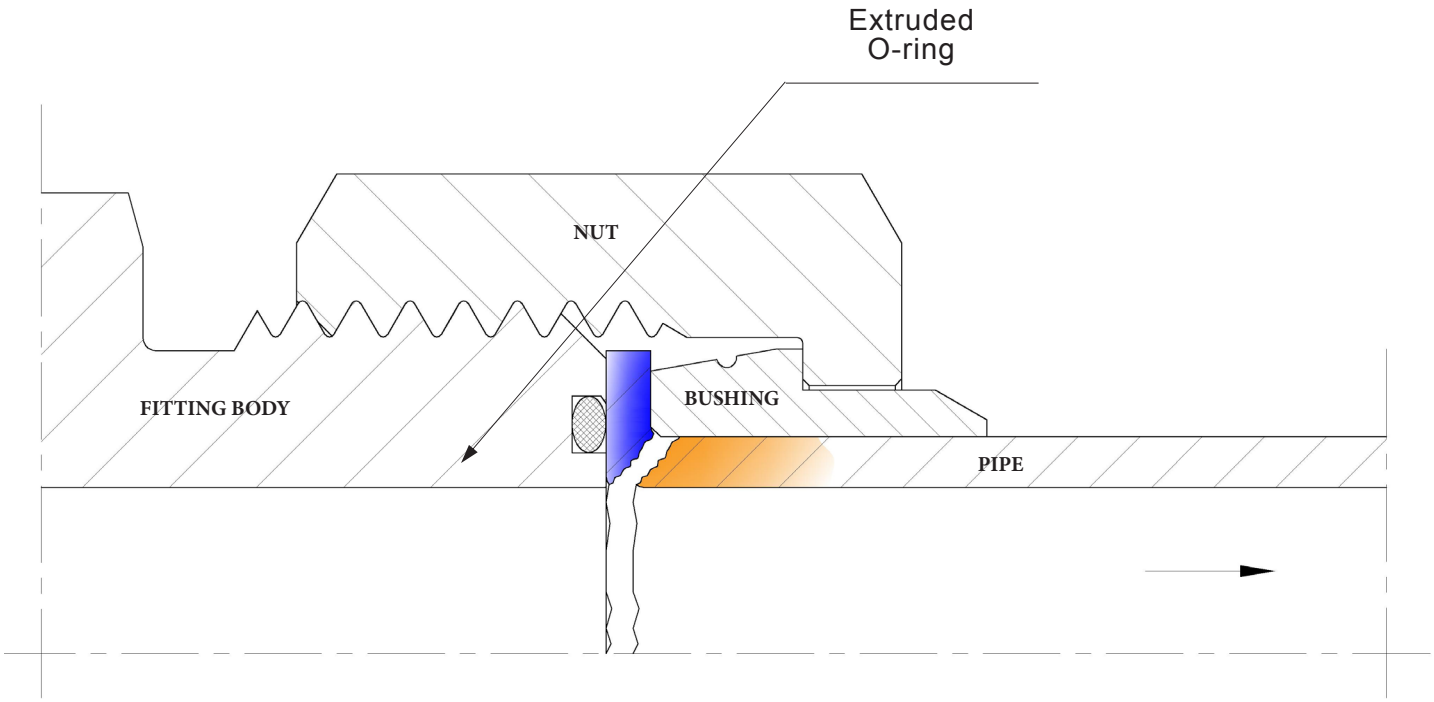
ASSEMBLY BEHAVIOUR:
When tightening the fitting, the o-ring becomes pinched out of its seat.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious personal injury and property damage.

MEASURES TO BE APPLIED:
Ensure that the o-ring does not come out of its seat, keeping the sealing surfaces in close contact and the fitting-pipe system aligned until the nut is firmly tightened.

FITTINGS FOR 90° ORFS FLANGED PIPES

SYSTEM WITH HIGHER THAN PERMITTED PRESSURE PEAKS.



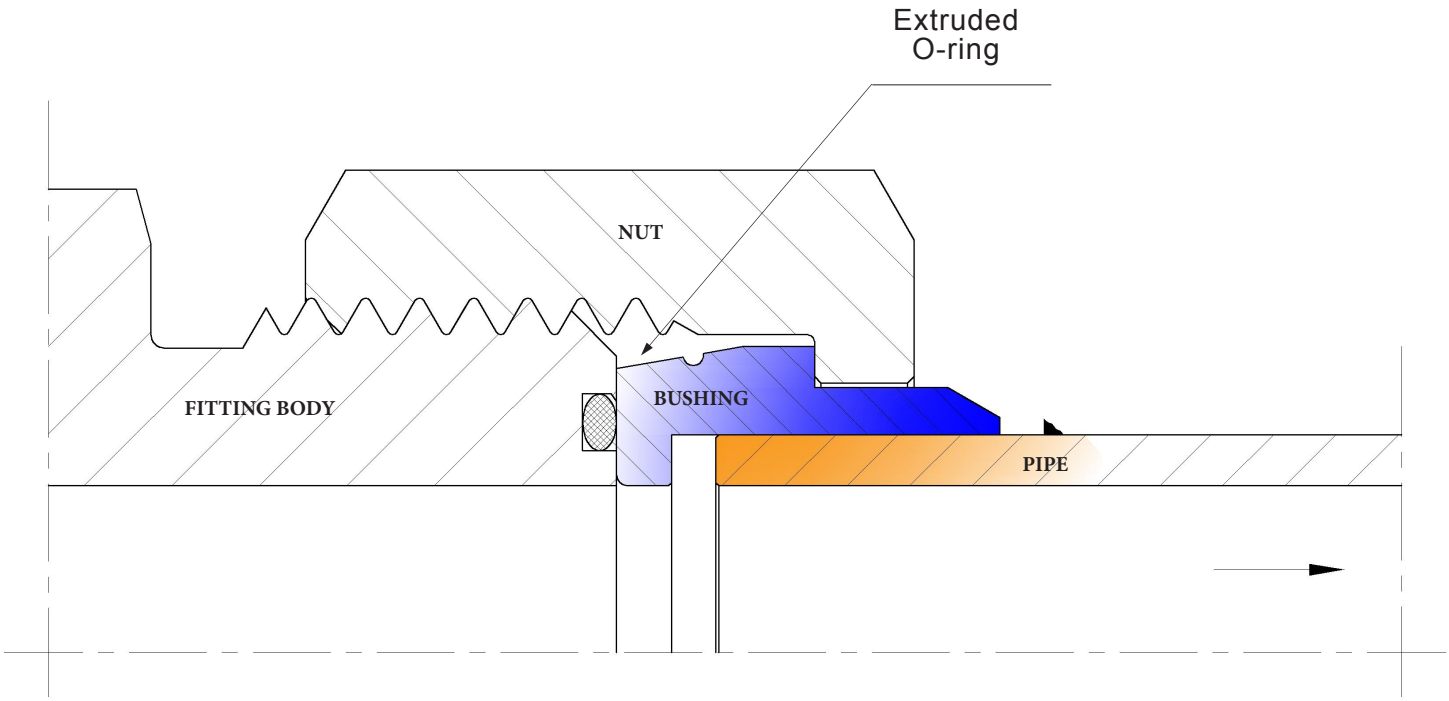
ASSEMBLY BEHAVIOUR:
During use (under pressure) the 90° flanged steel pipe may break.

CONSEQUENCES:
Possible breakage of the flanging and loss of fluid from the fitting with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressures that are higher than permitted

FITTINGS FOR ORFS SOLDERED PIPES

SYSTEM WITH PRESSURE HIGHER THAN PERMITTED.



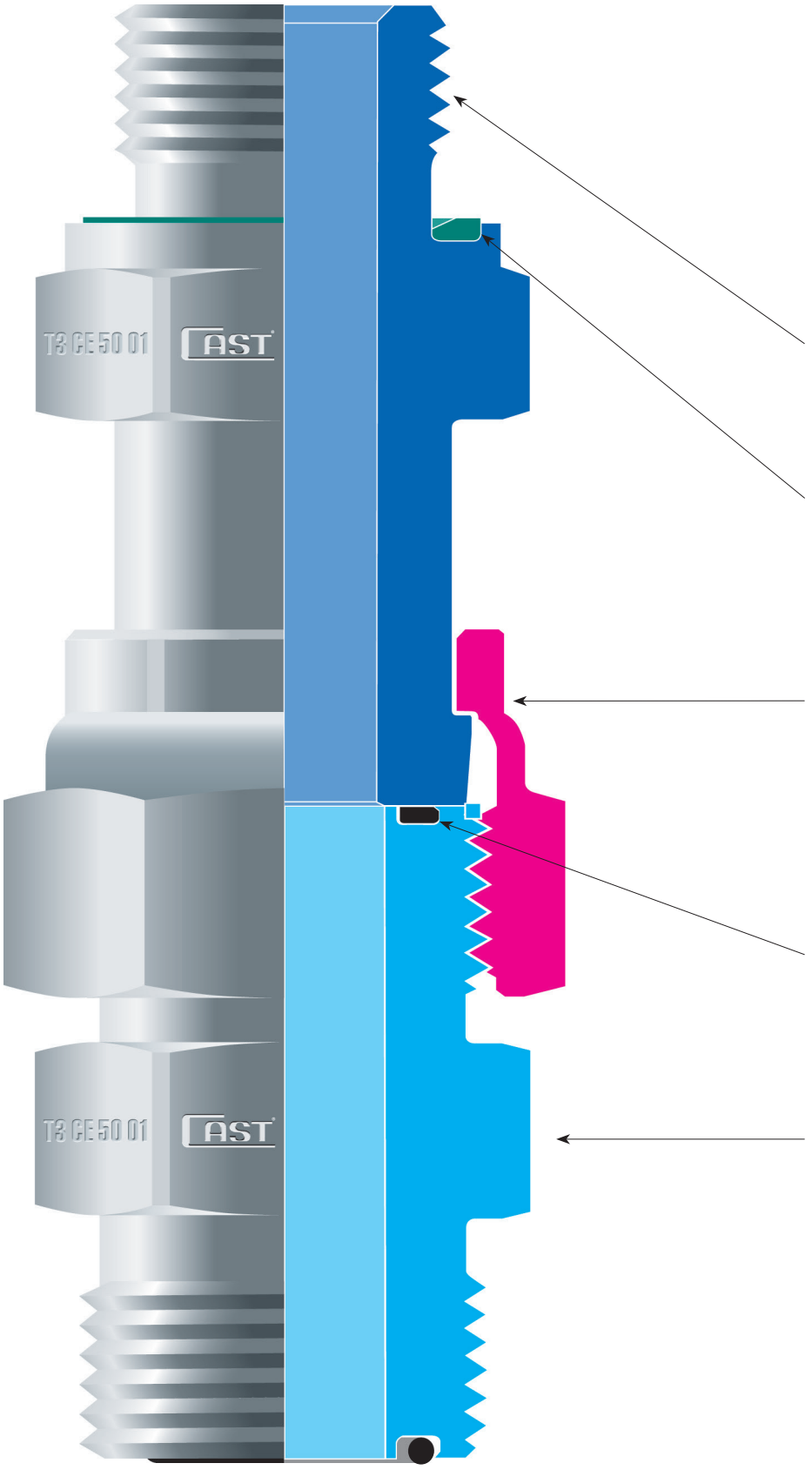
ASSEMBLY BEHAVIOUR:
During use (under pressure) the soldering joint between the pipe and the soldering sleeve may break.

CONSEQUENCES:
Loss of fluid from the fitting and possible unthreading of the steel pipe with the possibility of serious damage to people and property.

MEASURES TO BE APPLIED:
Design the system so as to avoid pressures that are higher than permitted

ISO 8434-3, SAE J1453 JOINT WITH CLINCHED SWIVEL NUT

SCHEMATIC DIAGRAM FOR JOINT SYSTEM ISO 8434-2, SAE J514, WITH CLINCHED SWIVEL NUT



Reference standards:

Threaded end
ISO 1179-2

Seal seat
flat gaske
ISO 1179-2

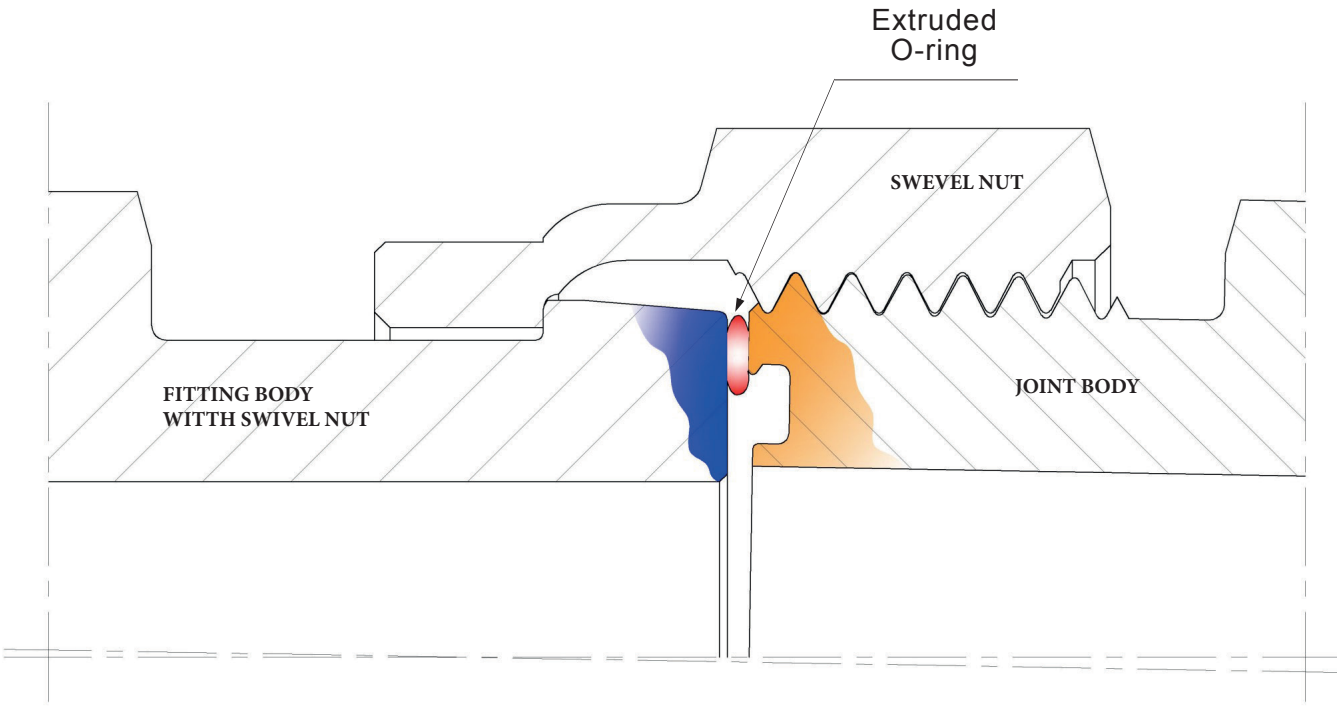
Barbed
swivel nut

O-ring seat
ISO 8434-3
SAE J1453

Intermediate
fitting body
ISO 8434-3

ORFS FITTINGS WITH CLINCHED SWIVEL NUT

EXTRUDED O-RING

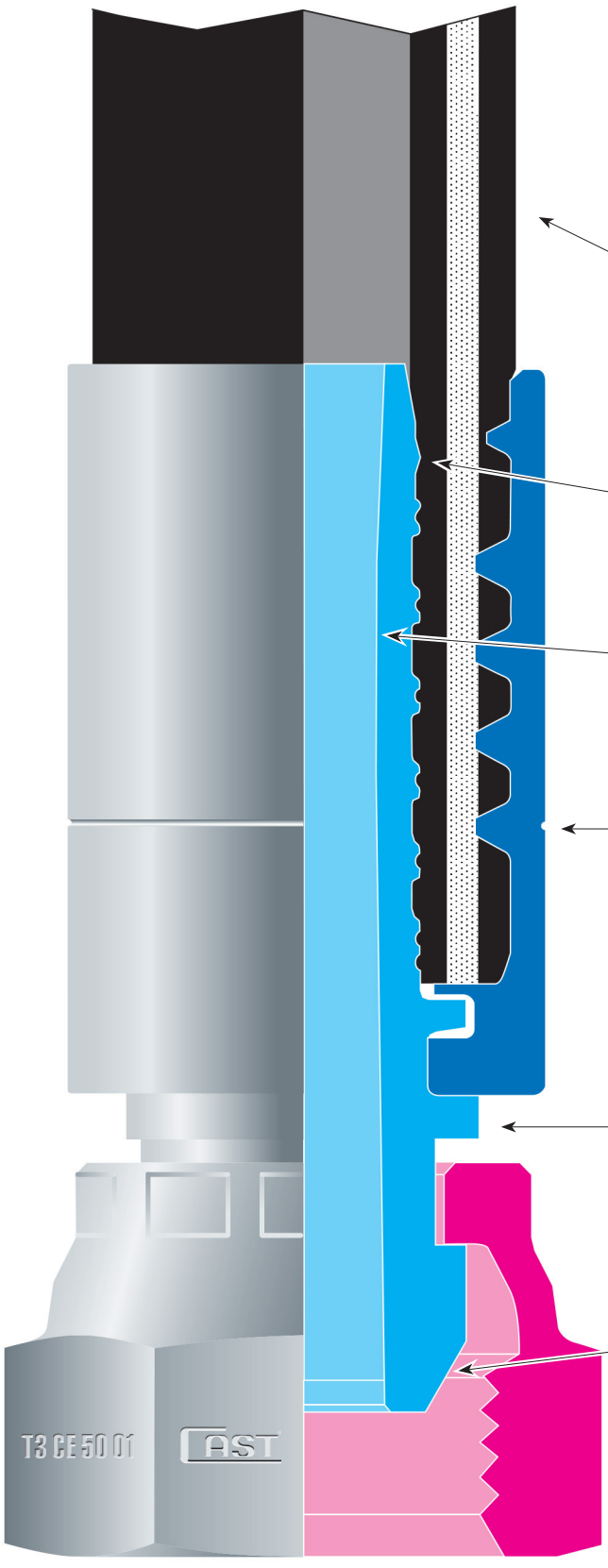


ASSEMBLY BEHAVIOUR:
When tightening the fitting, the o-ring becomes pinched out of its seat.

CONSEQUENCES:
Loss of fluid from the fitting with the possibility of causing serious personal injury and property damage
.
MEASURES TO BE APPLIED:
Ensure that the o-ring does not come out of its seat, keeping the sealing surfaces in close contact and the fitting-pipe system aligned until the nut is firmly tightened.

ISO 12151 JOINT FOR FLEXIBLE PIPE

OVERALL DIAGRAM
WITH NO-SKIVE PRESS FIT BUSHING



Reference standards:

Rubber pipe
EN 853 1SN
SAE 100 R1AT

Tear-proof final seal

Fitting body collapse

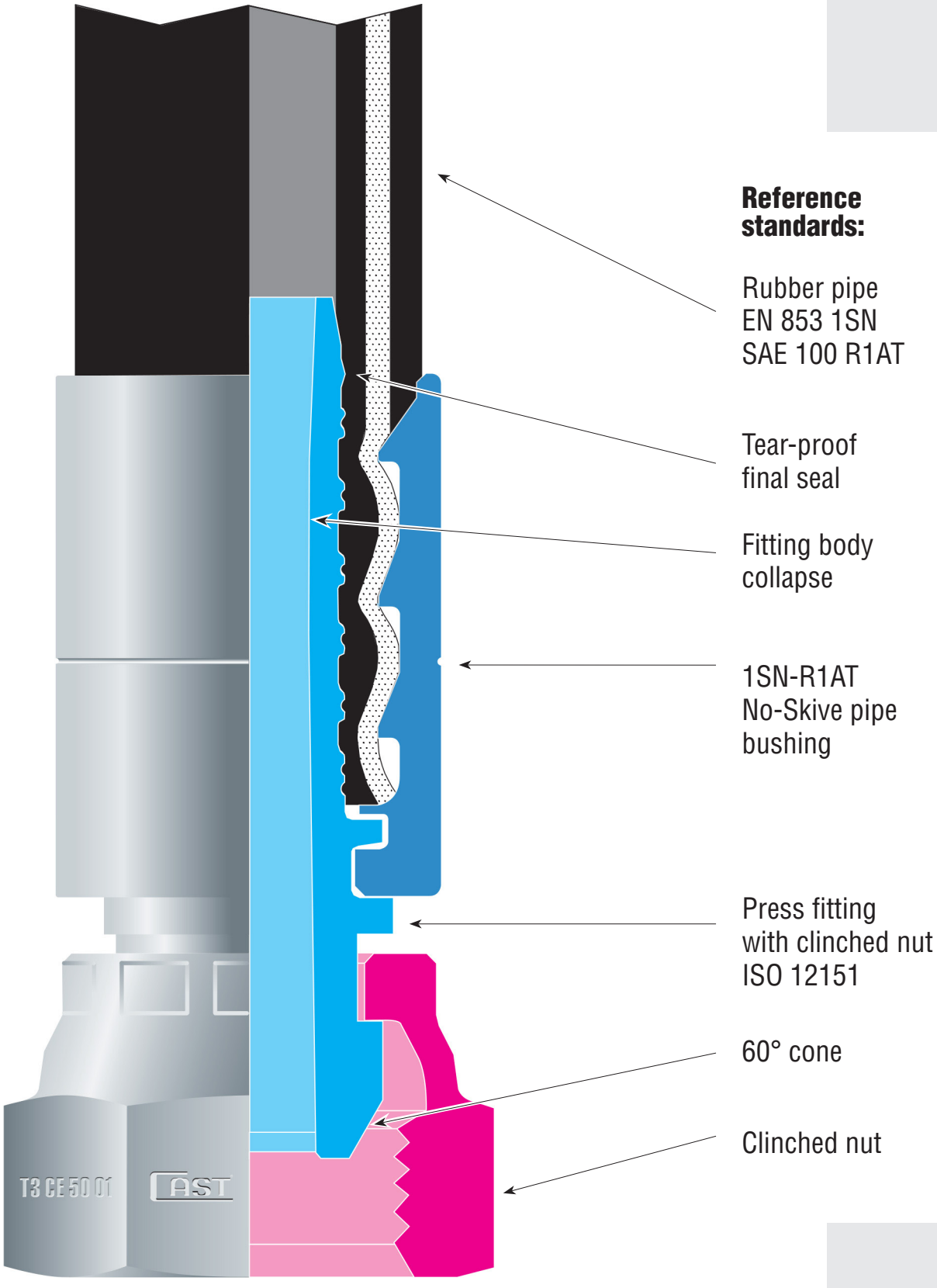
1SN-R1AT
No-Skive pipe bushing

Press fitting with clinched nut
ISO 12151

60° cone

Clinched nut

OVERALL DIAGRAM
WITH SKIVE PRESS FIT BUSHING



Reference standards:

Rubber pipe
EN 853 1SN
SAE 100 R1AT

Tear-proof final seal

Fitting body collapse

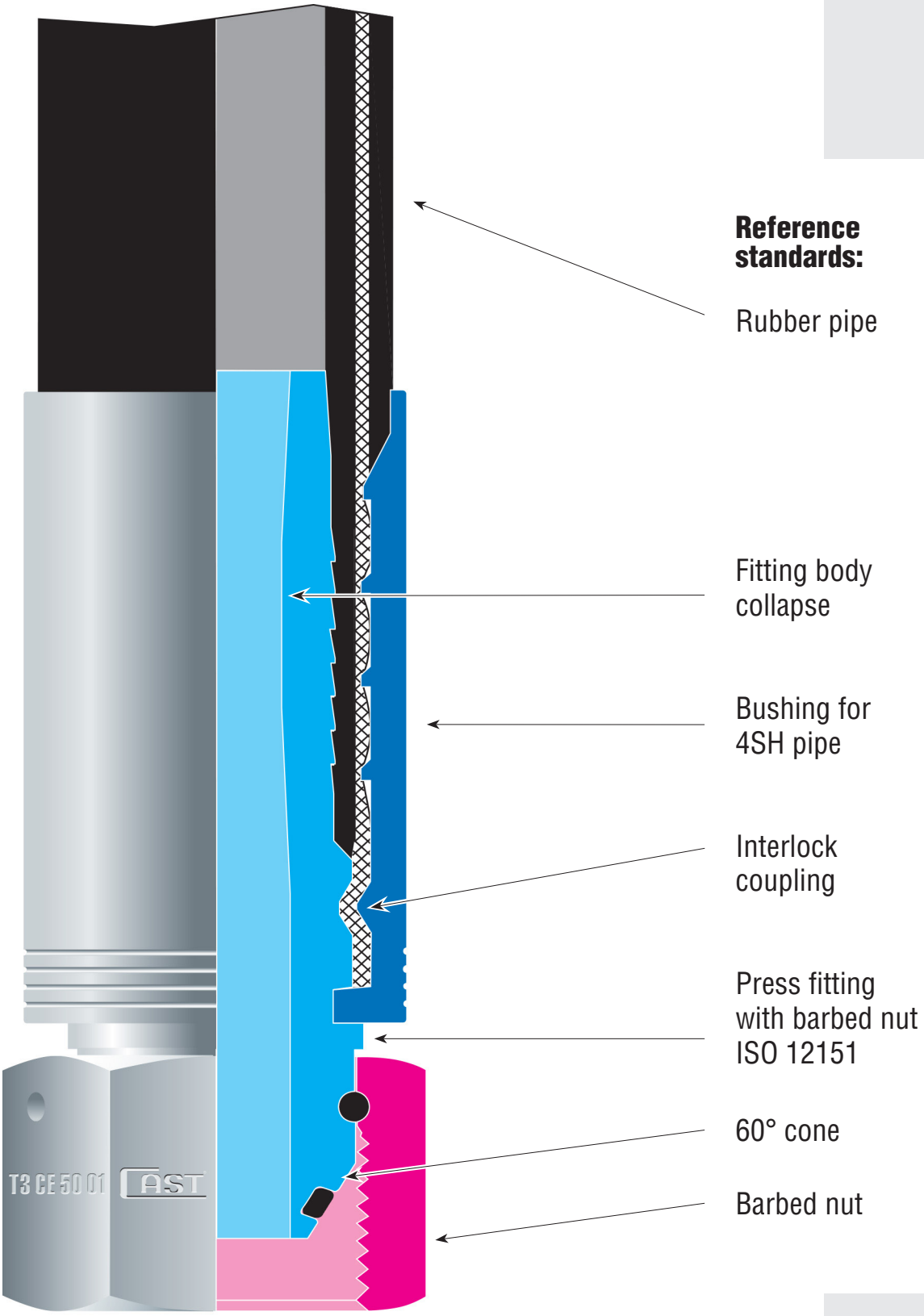
1SN-R1AT
No-Skive pipe bushing

Press fitting with clinched nut
ISO 12151

60° cone

Clinched nut

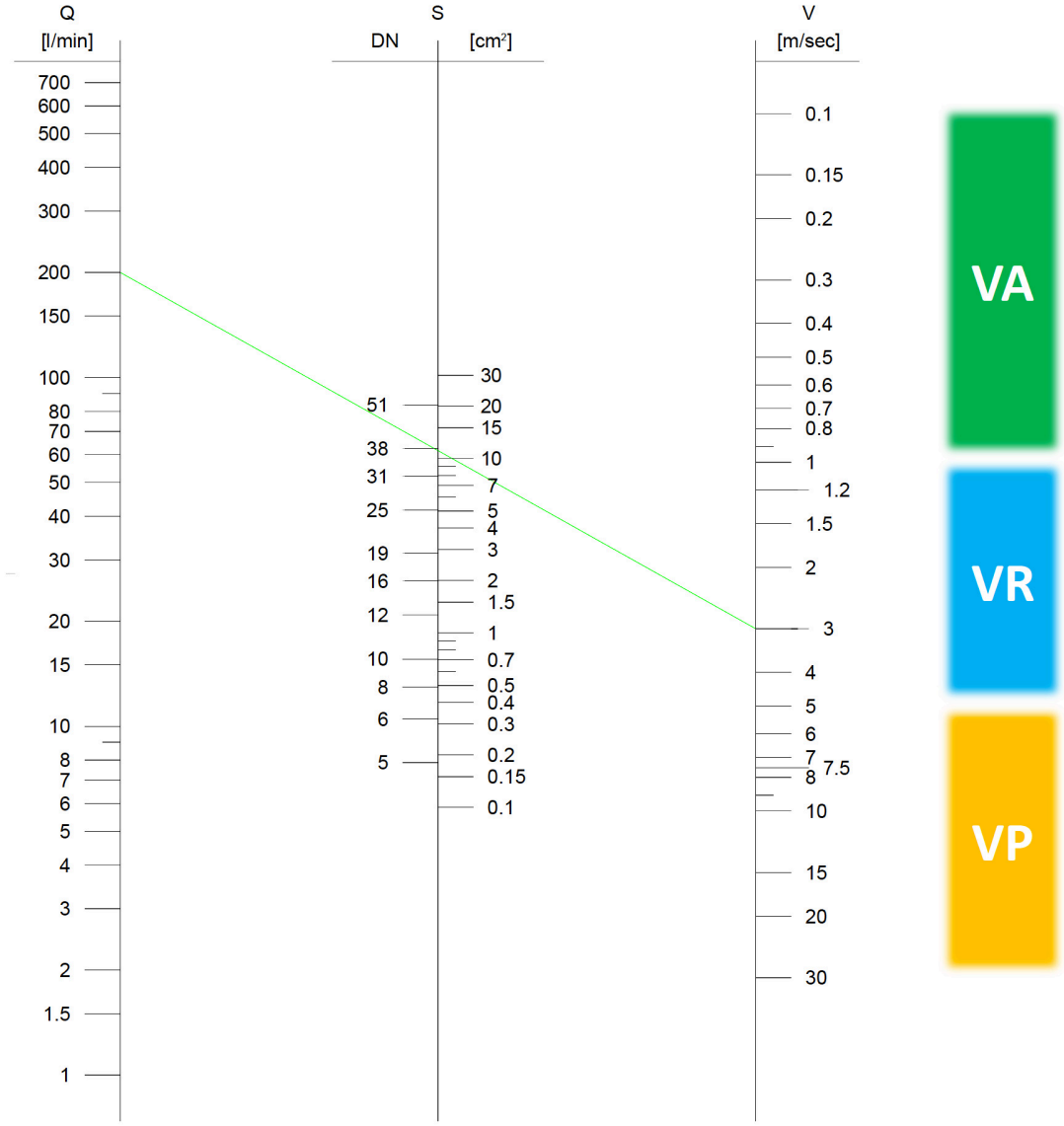
OVERALL DIAGRAM
WITH INTERLOCK PRESS FIT BUSHING



CHOOSING FLEXIBLE PIPE SIZE

For the correct choice of pipe internal diameter, you can use the graph below to determine the size of the pipe as a function of flow rate and fluid velocity.

To find the desired pipe size, simply join the known values for flow rate and velocity with a straight line. The intersection of the line thus drawn determines the pipe diameter value to be chosen on the central graph. If the value found does not correspond to one of the indicated DN diameters, choose the higher value. Use the recommended speeds for pressurised, suction or return systems to achieve optimum system operating conditions.



Example

Given the fluid flow rate Q=200l/min and the fluid velocity V=3m/s a DN38 is obtained.

Key

Q = Pipe flow rate in l/min

S = section of the flexible pipe in cm2
(DM corresponding diameter)

V = fluid velocity

VP = recommended maximum speed for pressurised systems

VA = recommended maximum speed for suction systems

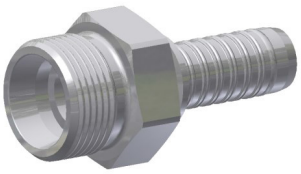
VR = recommended maximum speed for return systems

ASSEMBLY INSTRUCTIONS FOR PIPE CONNECTIONS WITHOUT EXTERNAL PEEL (NO-SKIVE) - STANDARD SERIES

1. CHECKING INSTRUMENTS TO BE USED

• Before starting the assembly of Cast fittings for flexible pipes, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

Test pin



Straight fitting for flexible pipe

Bushing for no-skive flexible pipe

Gauge

1SN - R1AT pipe

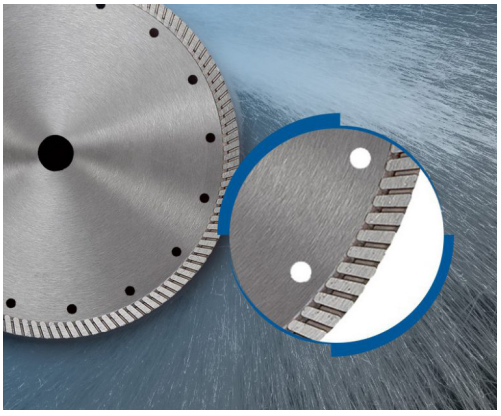
2. CUTTING THE PIPE

• It must be carried out using special tool, namely a disc cutter, which allows a uniform cut without tearing or permanent distortion of the pipe and the steel reinforcement.

• Cut the pipe to the desired length and at right angles.

• Remove any residue from the cut at the pipe inlet.

Note: it is advisable to cut the first and last centimetres of each new hank of pipe.



3. ASSEMBLING THE BUSHING

- Push the bushing onto the pipe until it stops naturally, as shown in figure 1.

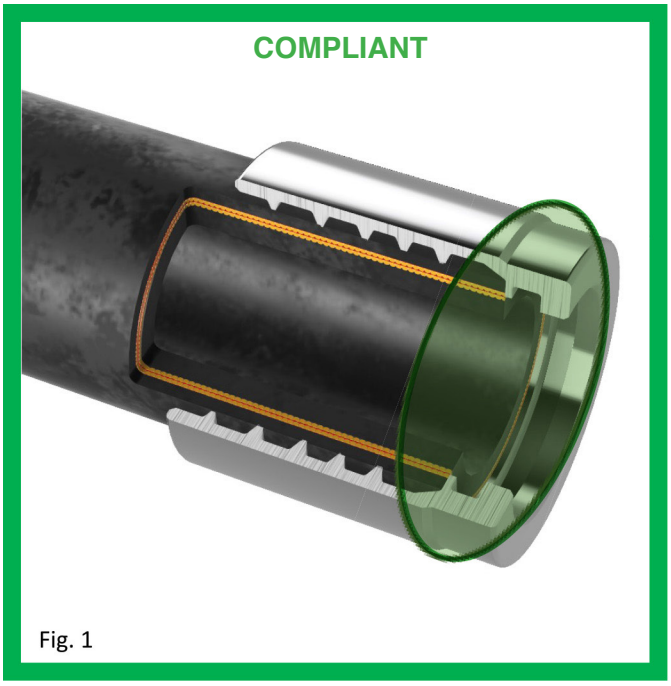


Fig. 1

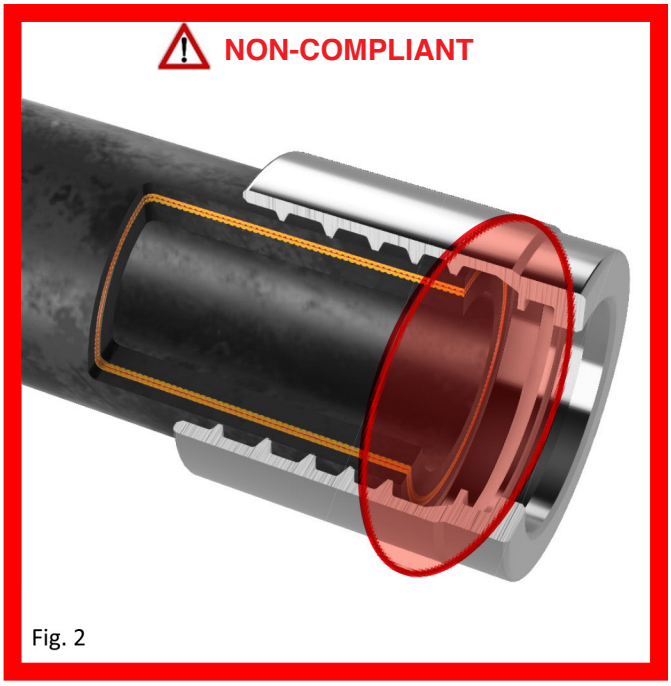


Fig. 2

4. ASSEMBLING THE SHANK

- Insert the shank of the fitting into the pipe until the fitting comes into contact with its bushing as shown in figure 3.

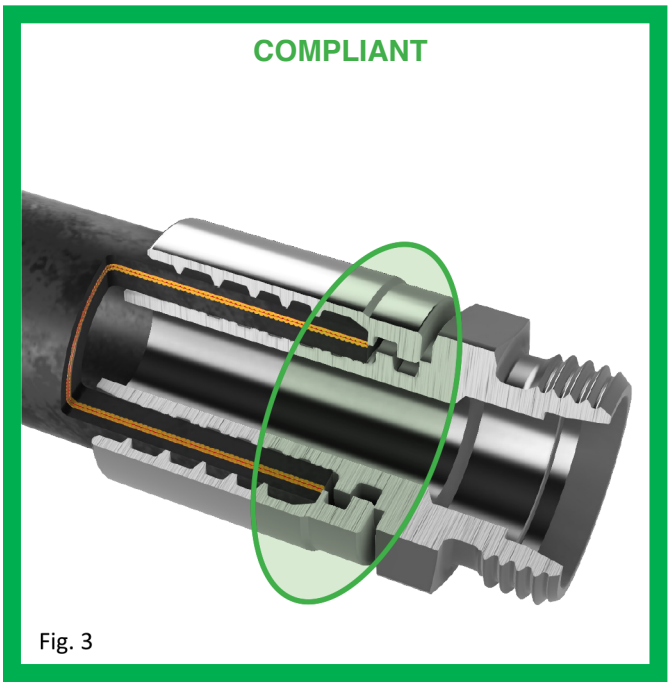


Fig. 3

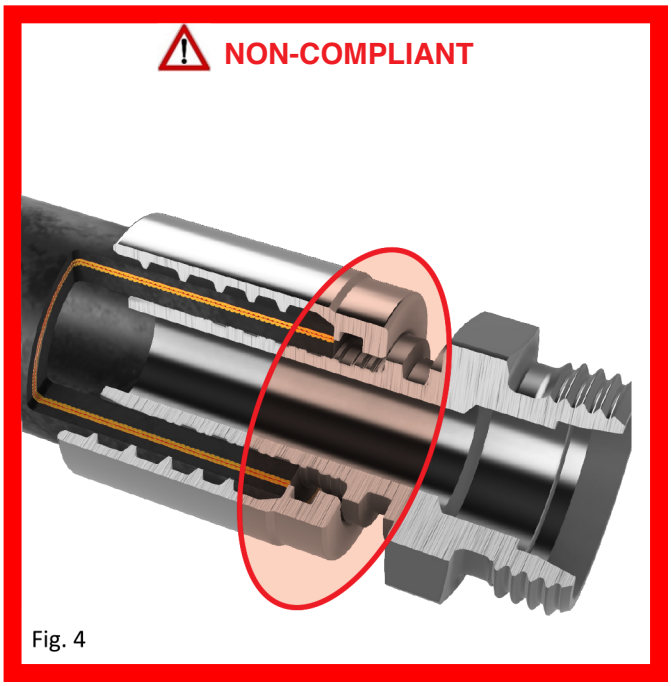


Fig. 4

5. PRESSING

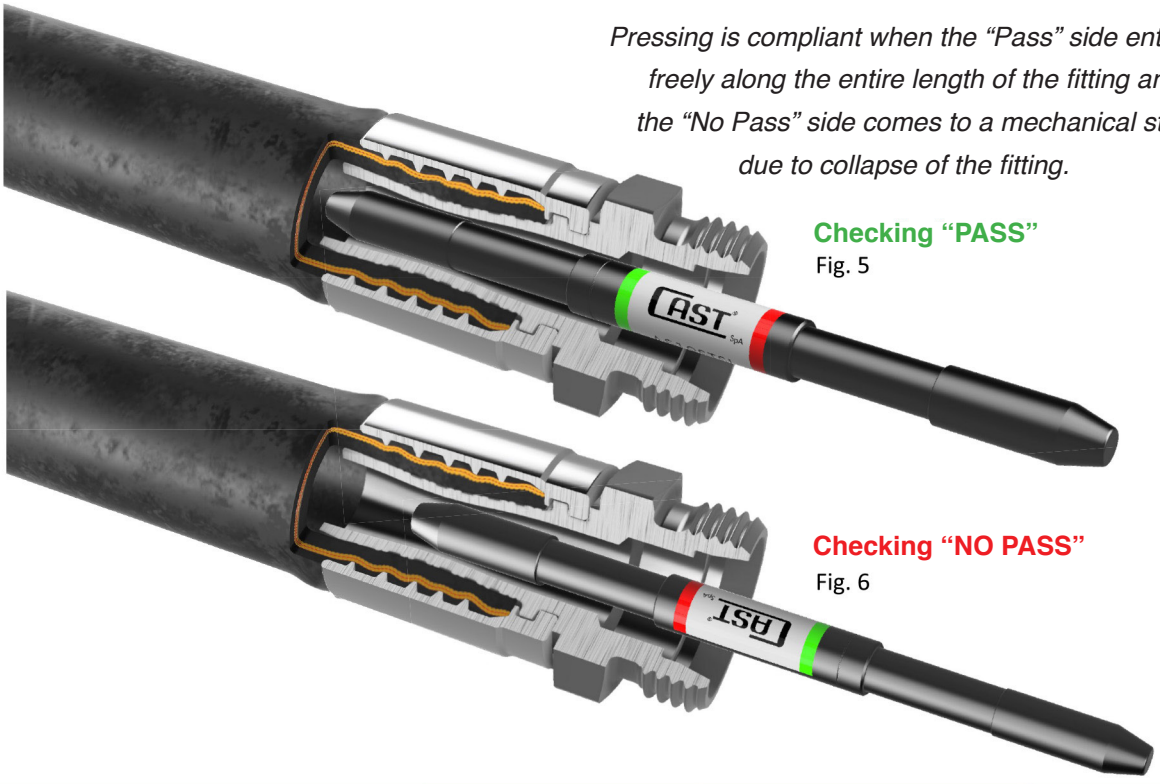
- Press the bushing onto the pipe using the appropriate clamps, following the instructions in the pressing table.

6. CHECKING

- It is mandatory to check the collapse of the fitting hole with the special P/NP plugs. Connected machines that do not meet the collapse parameters cannot be used and will have to be rebuilt as they are not compliant.

COMPLIANT PRESSING

Pressing is compliant when the "Pass" side enters freely along the entire length of the fitting and the "No Pass" side comes to a mechanical stop due to collapse of the fitting.

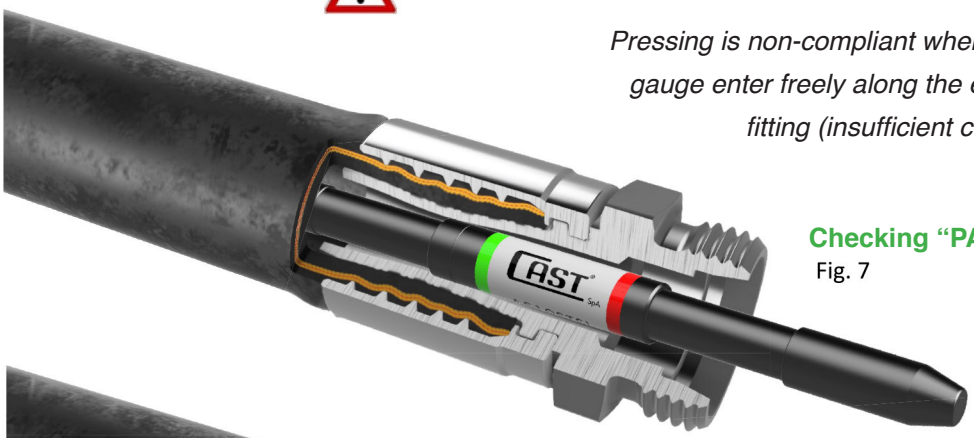


Checking "PASS"
Fig. 5

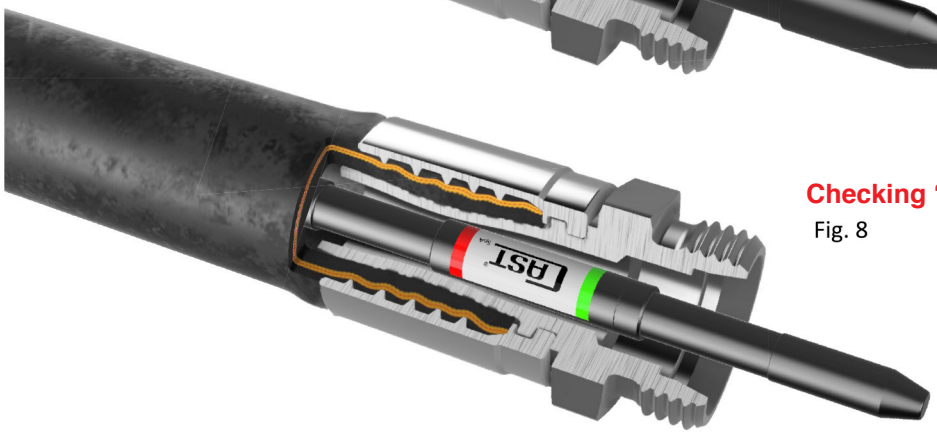
Checking "NO PASS"
Fig. 6

NON-COMPLIANT PRESSING

Pressing is non-compliant when both sides of the gauge enter freely along the entire length of the fitting (insufficient collapse).



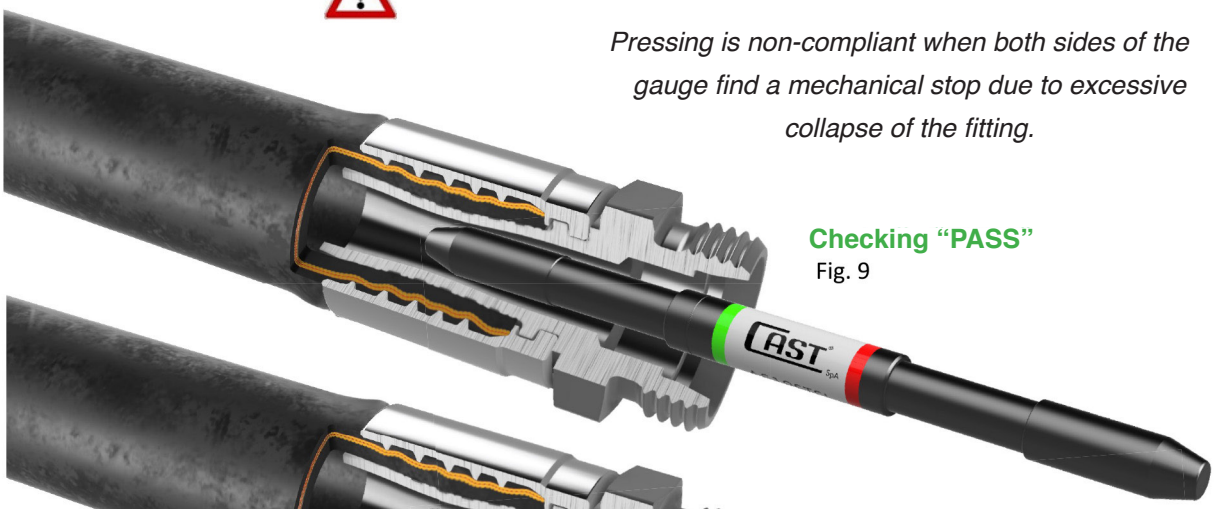
Checking "PASS"
Fig. 7



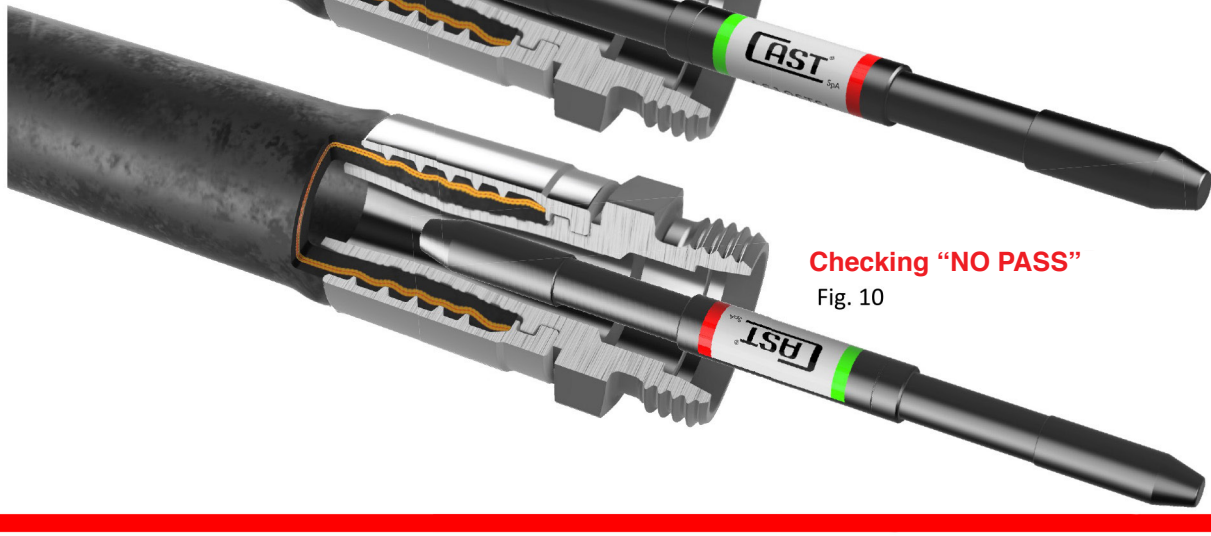
Checking "NO PASS"
Fig. 8

NON-COMPLIANT PRESSING

Pressing is non-compliant when both sides of the gauge find a mechanical stop due to excessive collapse of the fitting.



Checking "PASS"
Fig. 9



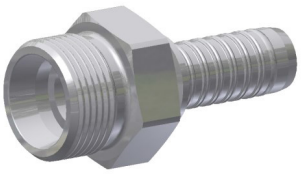
Checking "NO PASS"
Fig. 10

ASSEMBLY INSTRUCTIONS FOR PIPE FITTINGS WITH EXTERNAL PEEL (SKIVE) - STANDARD SERIES

1. CHECKING INSTRUMENTS TO BE USED

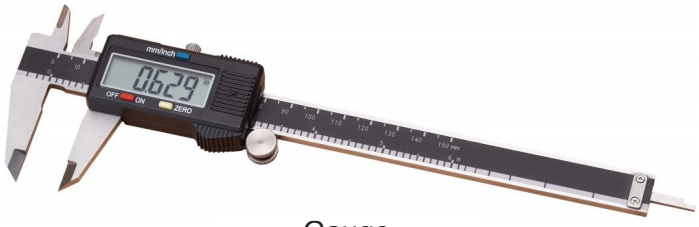
• Before starting the assembly of Cast fittings for flexible pipes, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

Test pin



Straight fitting for flexible pipe

Bushing for no-skive flexible pipe



Gauge

1SN - R1AT pipe

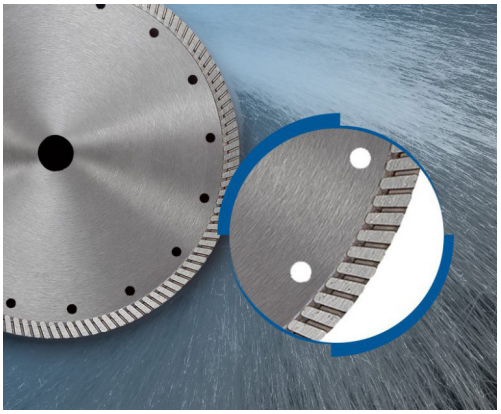
2. CUTTING THE PIPE

• It must be carried out using a special tool, namely a disc cutter, which allows a uniform cut without tearing or permanent distortion of the pipe and the steel reinforcement.

• Cut the flexible pipe to the desired length and at right angles.

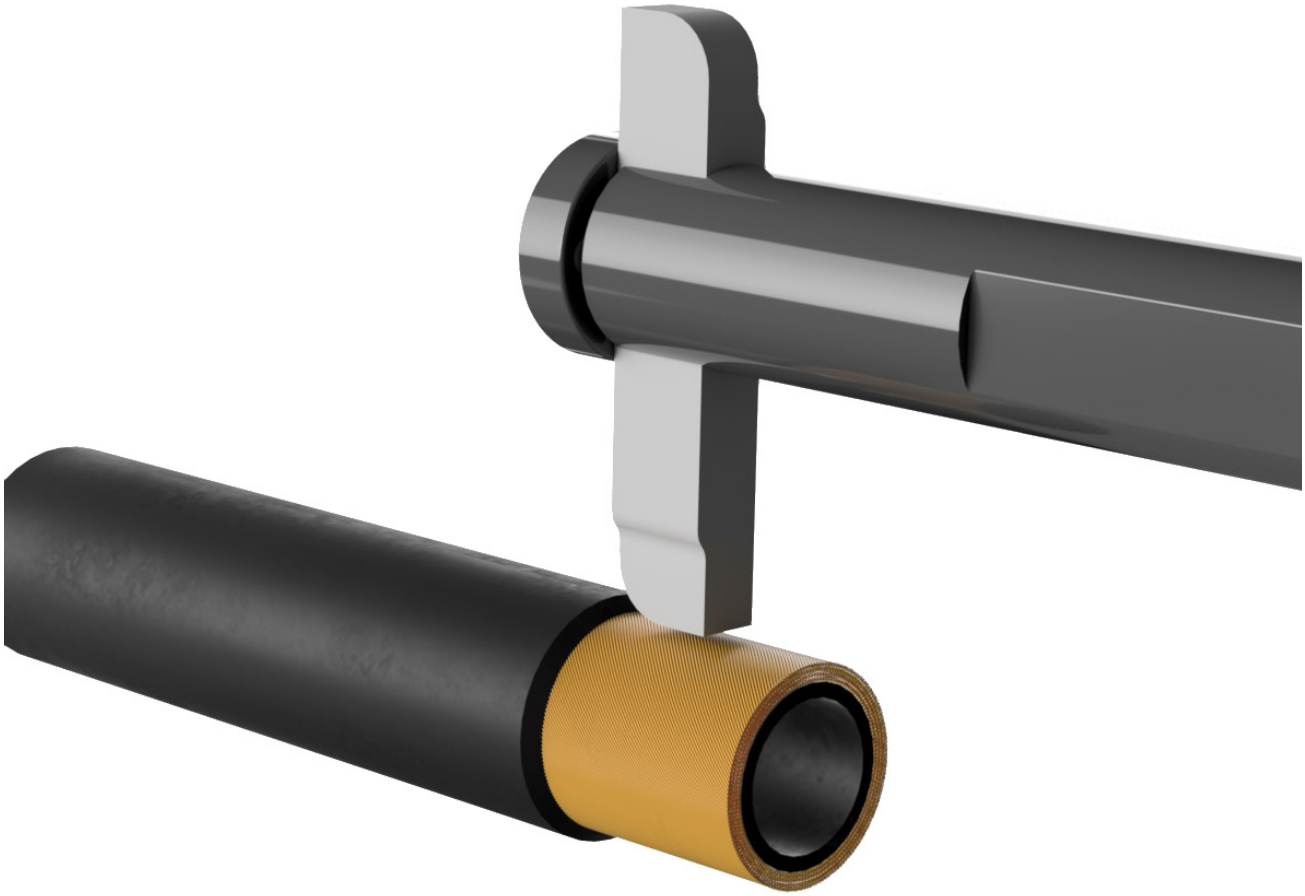
• Remove any residue from the cut at the pipe inlet.

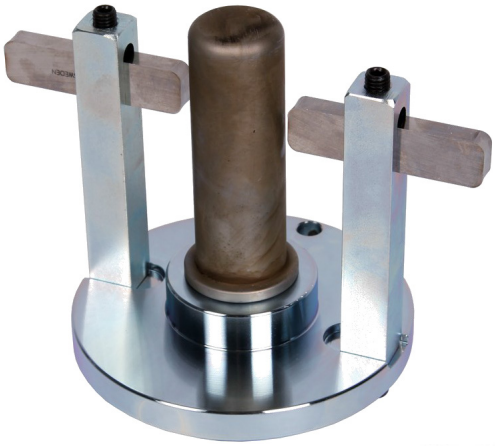
Nota: it is advisable to cut the first and last centimetres of each new hank of pipe.



EXTERNAL PEELING OF THE PIPE

• Remove the outer rubber cover of the pipe by the length indicated in the pressing table up to the outer diameter of the metal reinforcement, without damaging it, and remove any resulting residue..





4. ASSEMBLING THE BUSHING

- Push the bushing onto the pipe until its stop, as shown in figure 1.

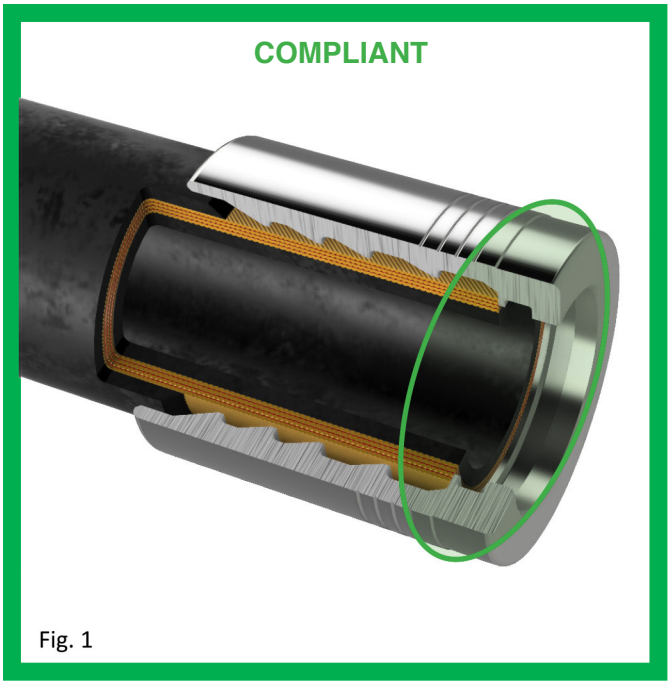


Fig. 1

Fig. 2

5. ASSEMBLING THE SHANK

- Insert the shank of the fitting into the pipe until the fitting comes into contact with its bushing as shown in figure 3.

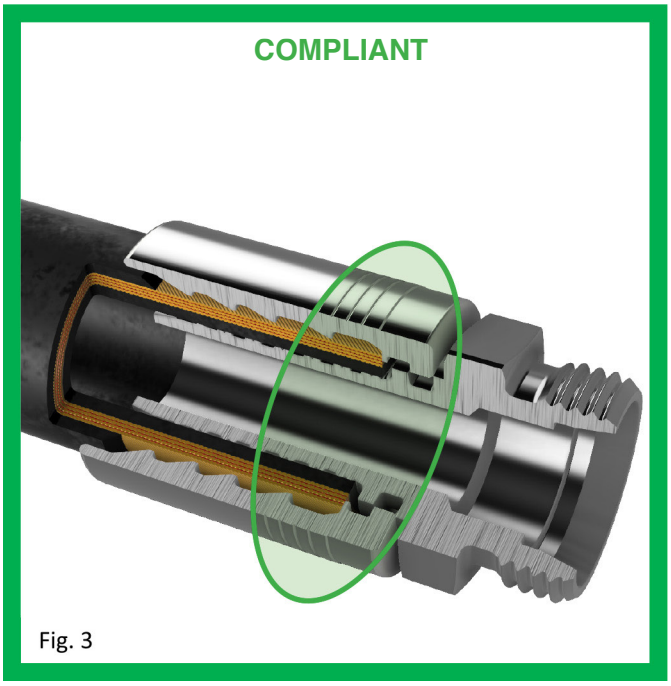


Fig. 3

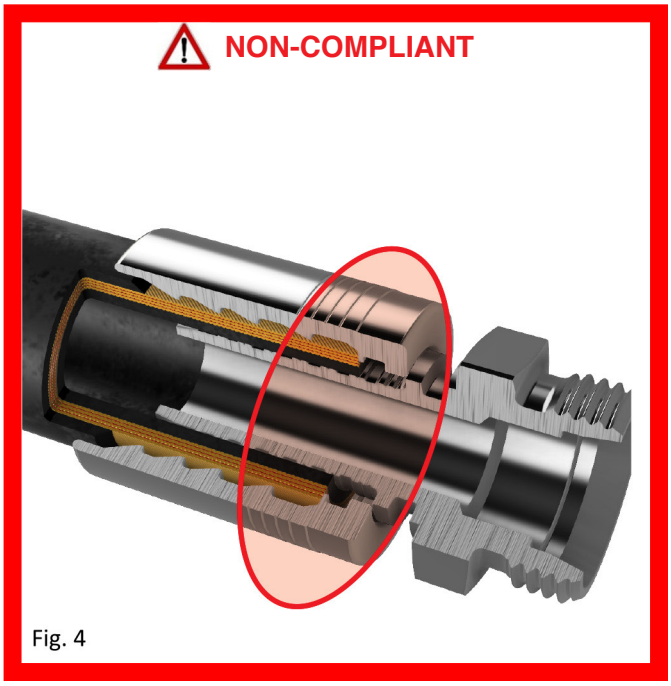


Fig. 4

6. PRESSING

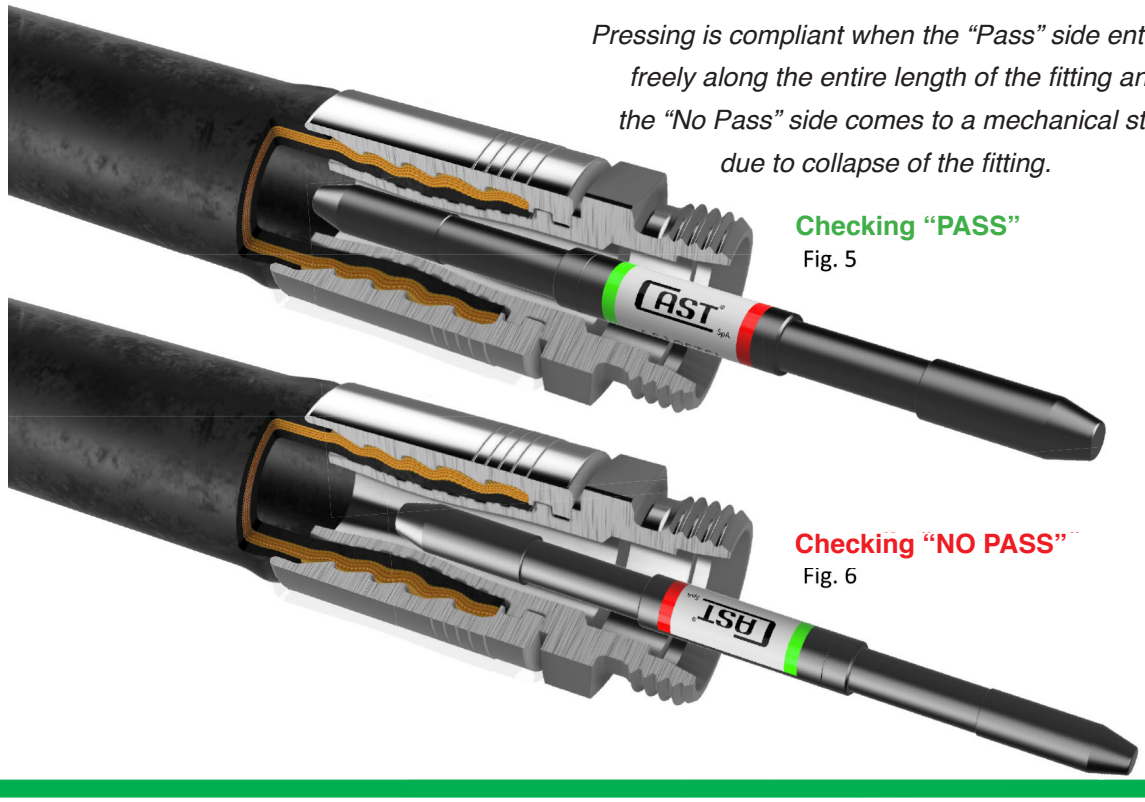
• Pressare la boccola sul tubo con gli appositi morsetti seguendo le indicazioni della tabella di pressatura.

7. CHECKING

• It is mandatory to check the collapse of the fitting hole with the special P/NP plugs. Fitted pipe sleeves that do not meet the collapse parameters cannot be used and will have to be rebuilt as they are not compliant.

COMPLIANT PRESSING

Pressing is compliant when the "Pass" side enters freely along the entire length of the fitting and the "No Pass" side comes to a mechanical stop due to collapse of the fitting.

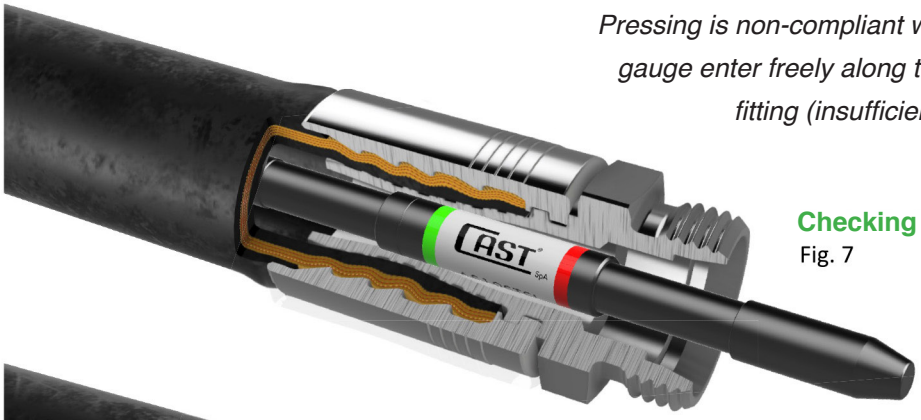


Checking "PASS"
Fig. 5

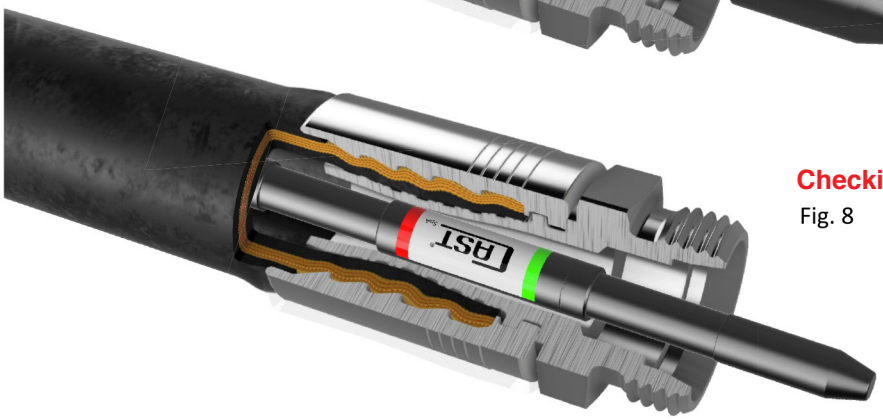
Checking "NO PASS"
Fig. 6

NON-COMPLIANT PRESSING

Pressing is non-compliant when both sides of the gauge enter freely along the entire length of the fitting (insufficient collapse).



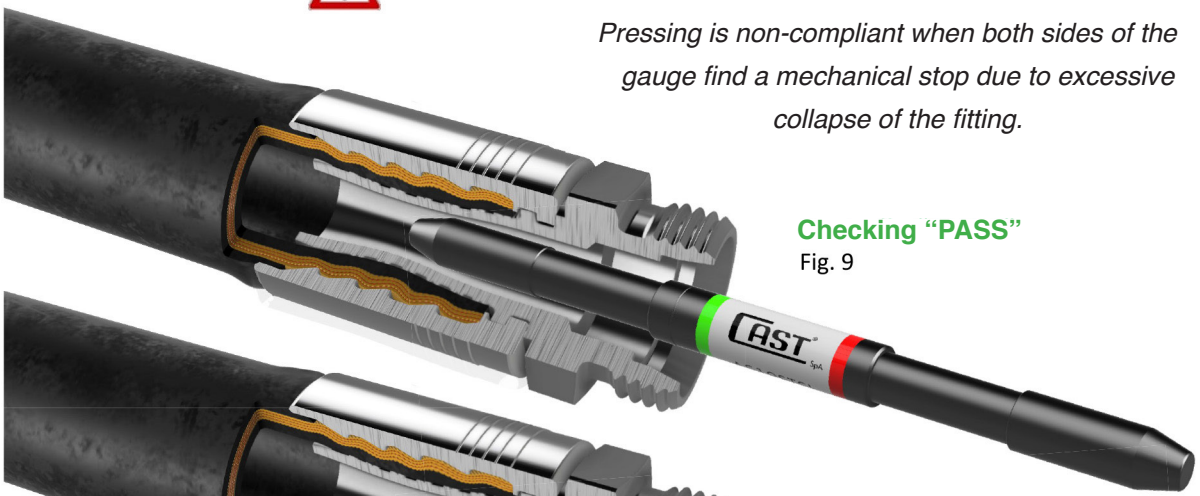
Checking "PASS"
Fig. 7



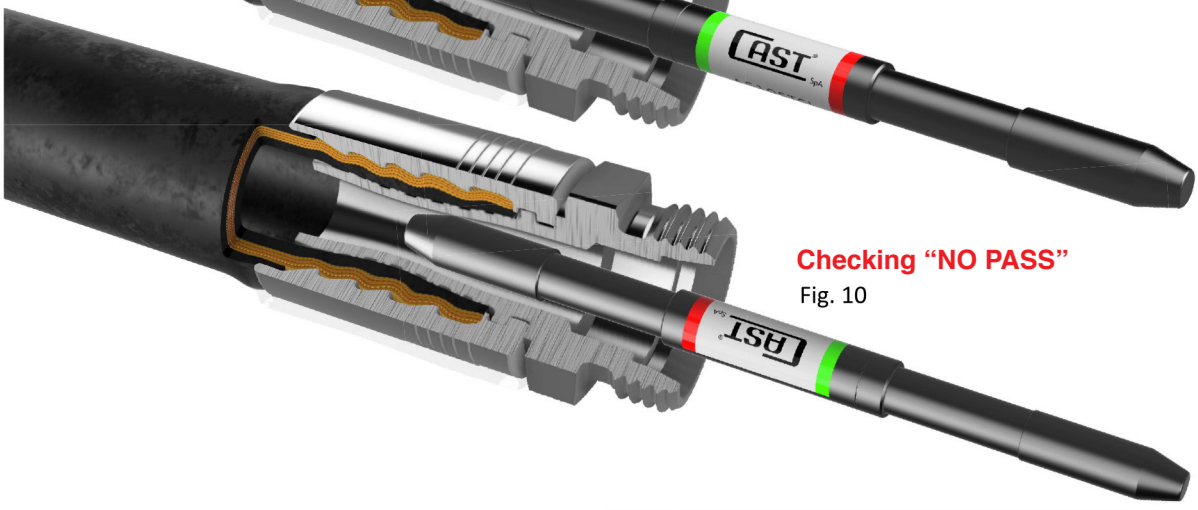
Checking "NO PASS"
Fig. 8

NON-COMPLIANT PRESSING

Pressing is non-compliant when both sides of the gauge find a mechanical stop due to excessive collapse of the fitting.



Checking "PASS"
Fig. 9



Checking "NO PASS"
Fig. 10

ASSEMBLY INSTRUCTIONS FOR FLEXIBLE PIPE FITTINGS WITH EXTERNAL AND INTERNAL PEEL - INTERLOCK SERIES

1. CHECKING INSTRUMENTS TO BE USED

• Before starting the assembly of Cast fittings for flexible pipes, you must ensure that the equipment and components (tools, fittings, etc.) required are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

Test pin

Straight fitting for flexible pipe

Bushing for no-skive flexible pipe

Gauge

1SN - R1AT pipe

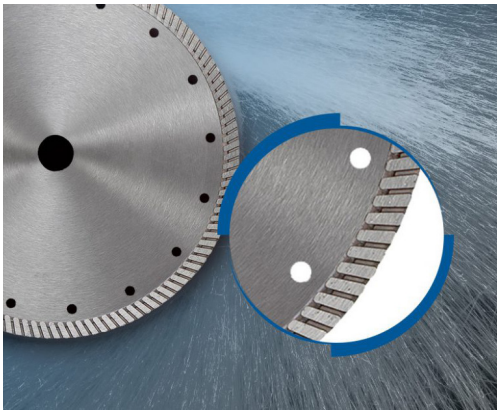
2. CUTTING THE PIPE

• It must be carried out using a special tool, namely a disc cutter, which allows a uniform cut without tearing or permanent distortion of the pipe and the steel reinforcement.

• Cut the flexible pipe to the desired length and at right angles.

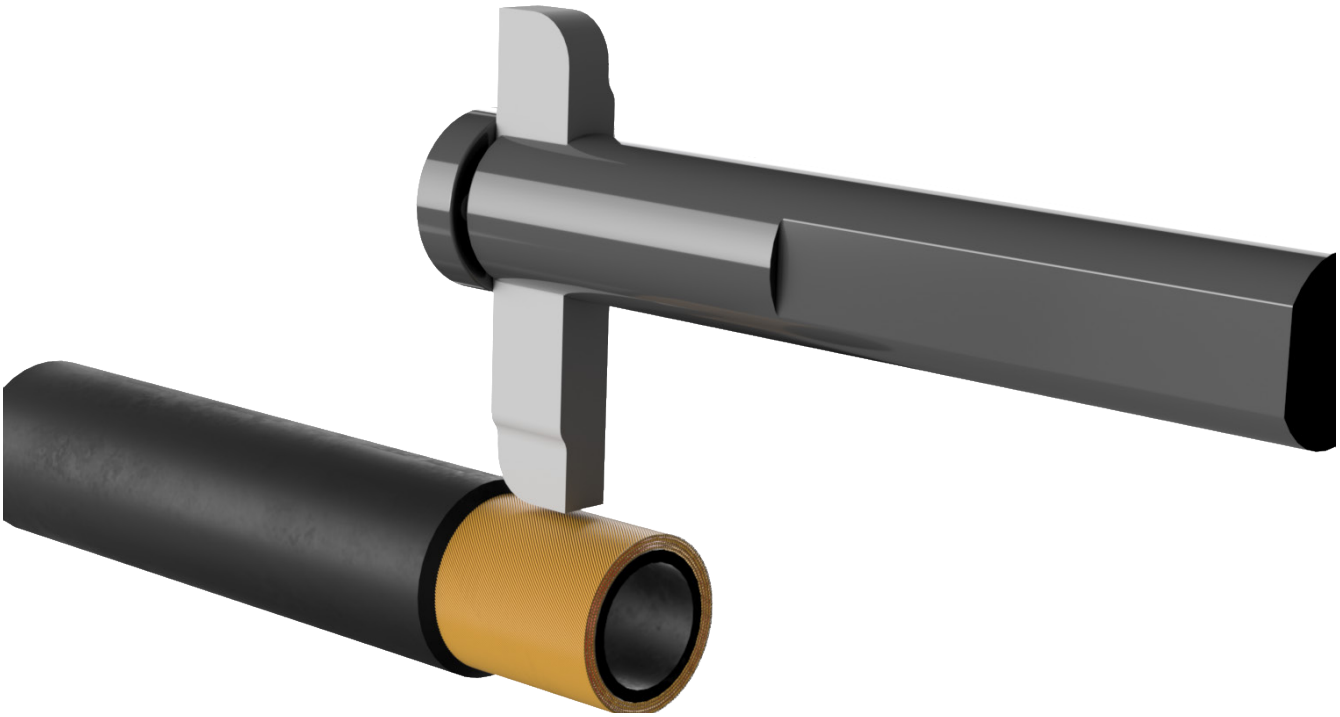
• Remove any residue from the cut at the pipe inlet.

Note: it is advisable to cut the first and last centimetres of each new hank of pipe.



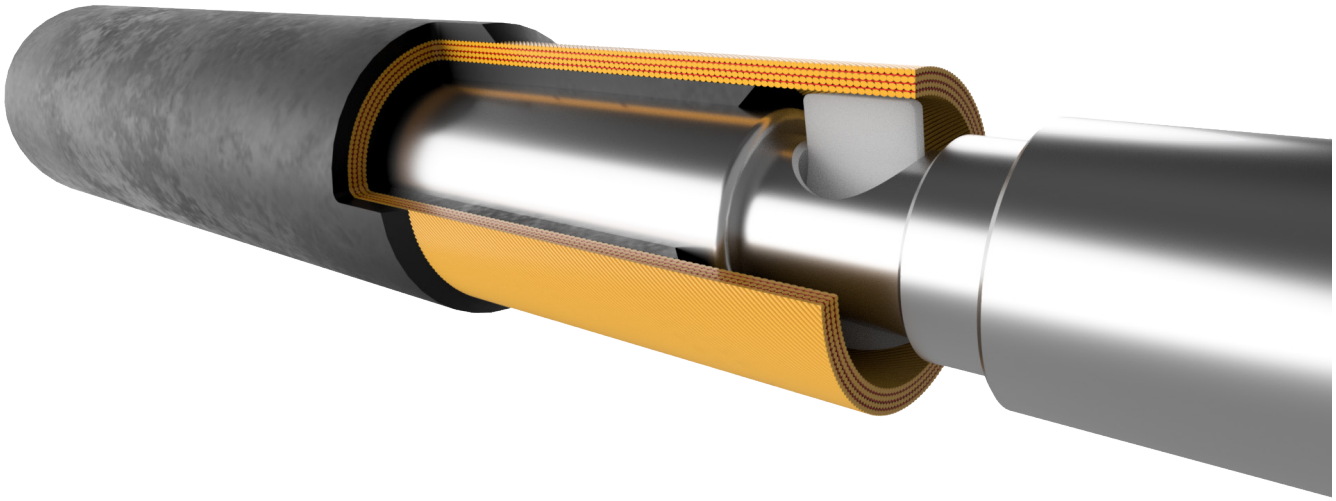
3. EXTERNAL PEELING OF THE PIPE

• Remove the outer rubber cover of the pipe by the length indicated in the pressing table up to the outer diameter of the metal reinforcement, without damaging it, and remove any resulting residue.



4. EXTERNAL PEELING OF THE PIPE

• Remove the inner rubber cover of the pipe by the length indicated in the pressing table up to the inner diameter of the metal reinforcement, without damaging it, and remove any resulting residue.



5. ASSEMBLING THE BUSHING

• Push the bushing onto the pipe until it stops naturally, as shown in figure 1.

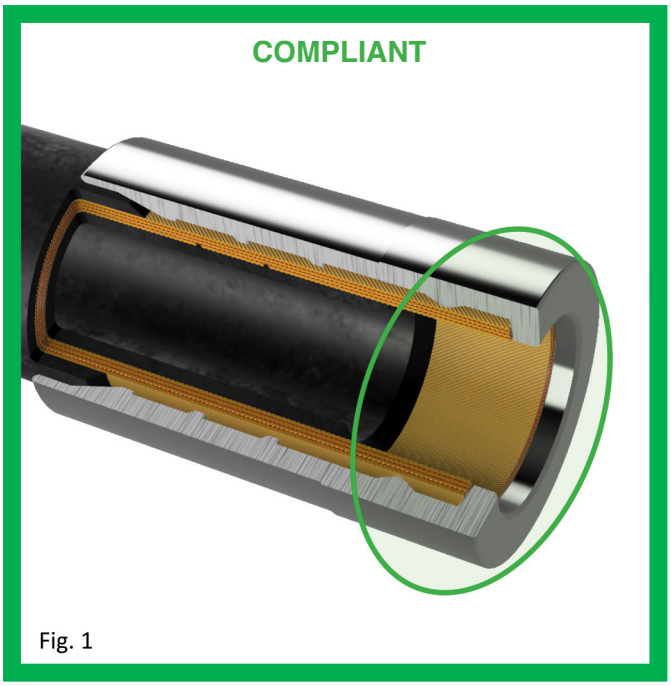


Fig. 1

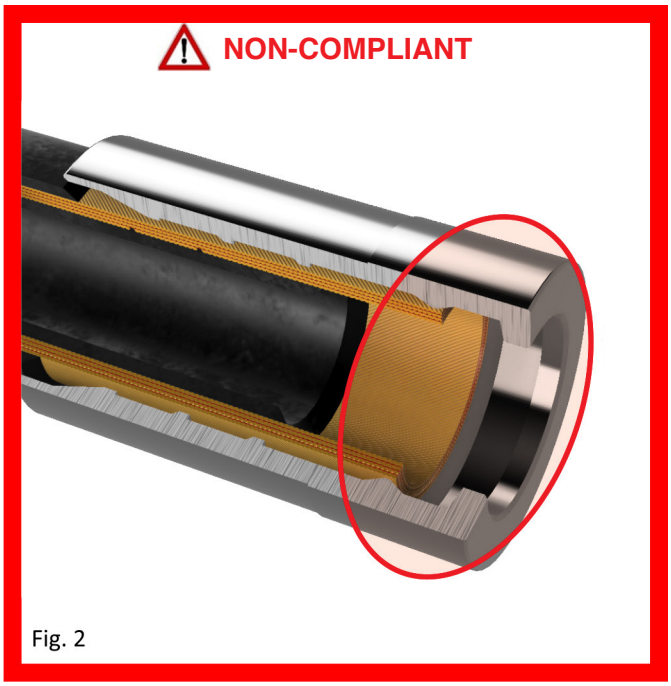


Fig. 2

6. ASSEMBLING THE SHANK

• Insert the shank of the fitting into the pipe until the fitting comes into contact with its bushing as shown in figure 3

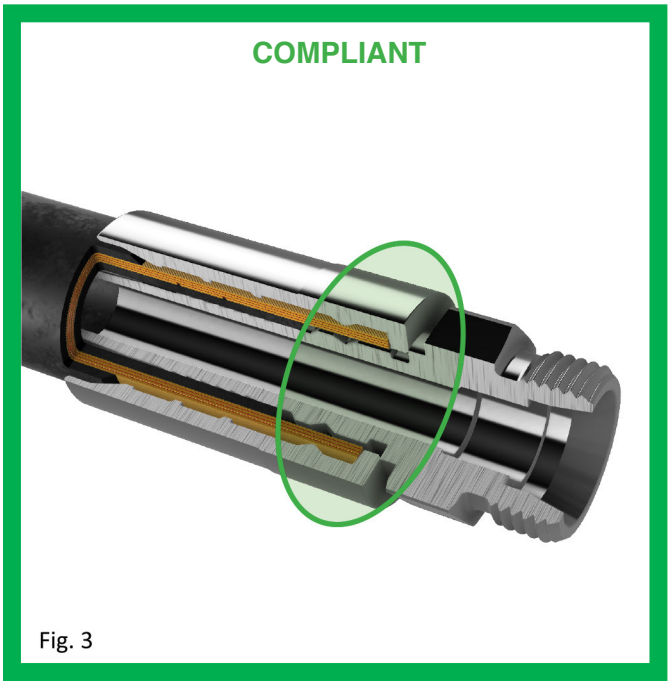


Fig. 3

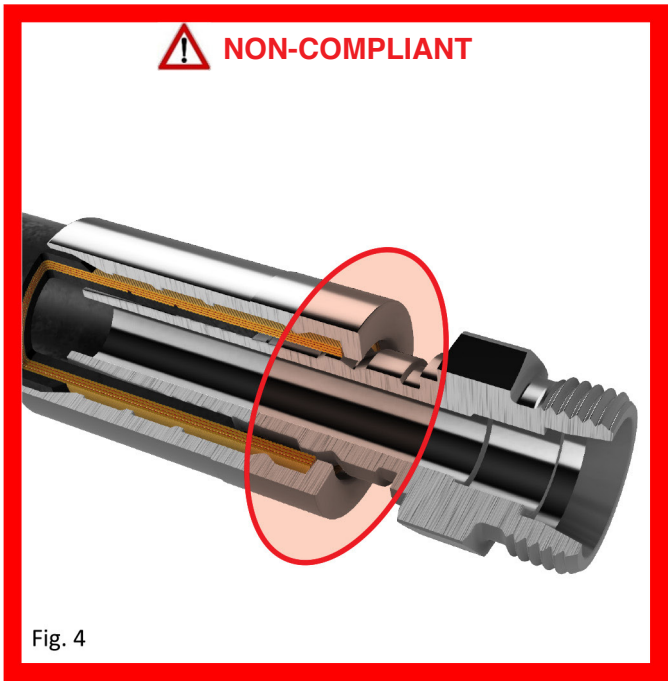
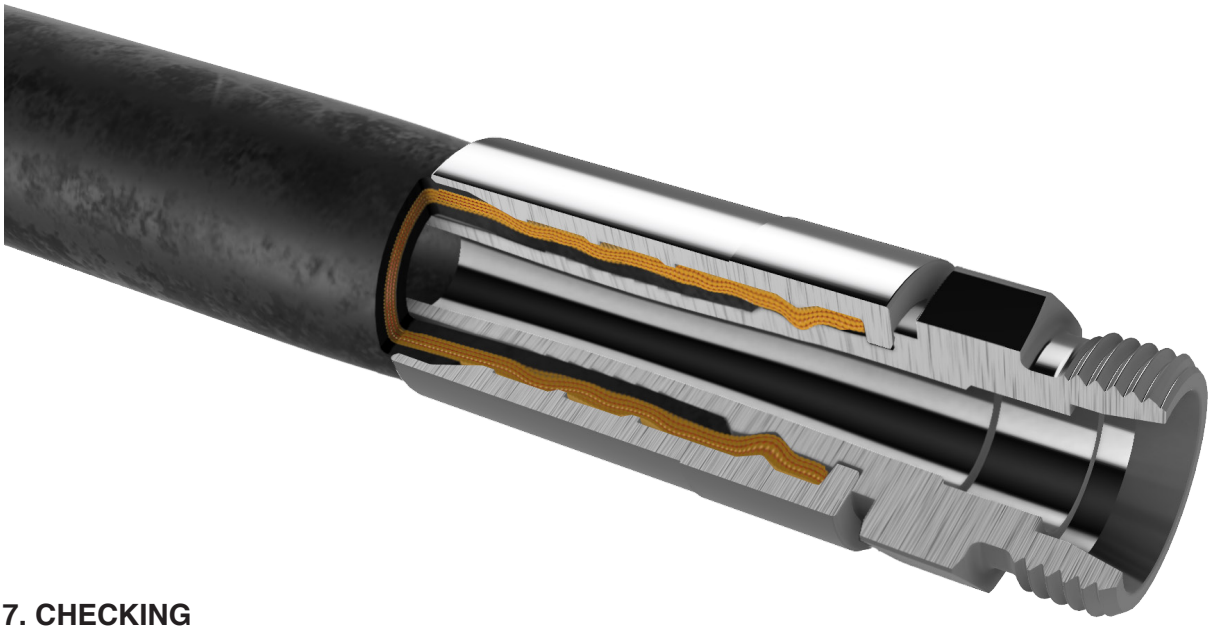


Fig. 4

6. PRESSING

• Press the bushing onto the pipe using the appropriate clamps, following the instructions in the pressing table.

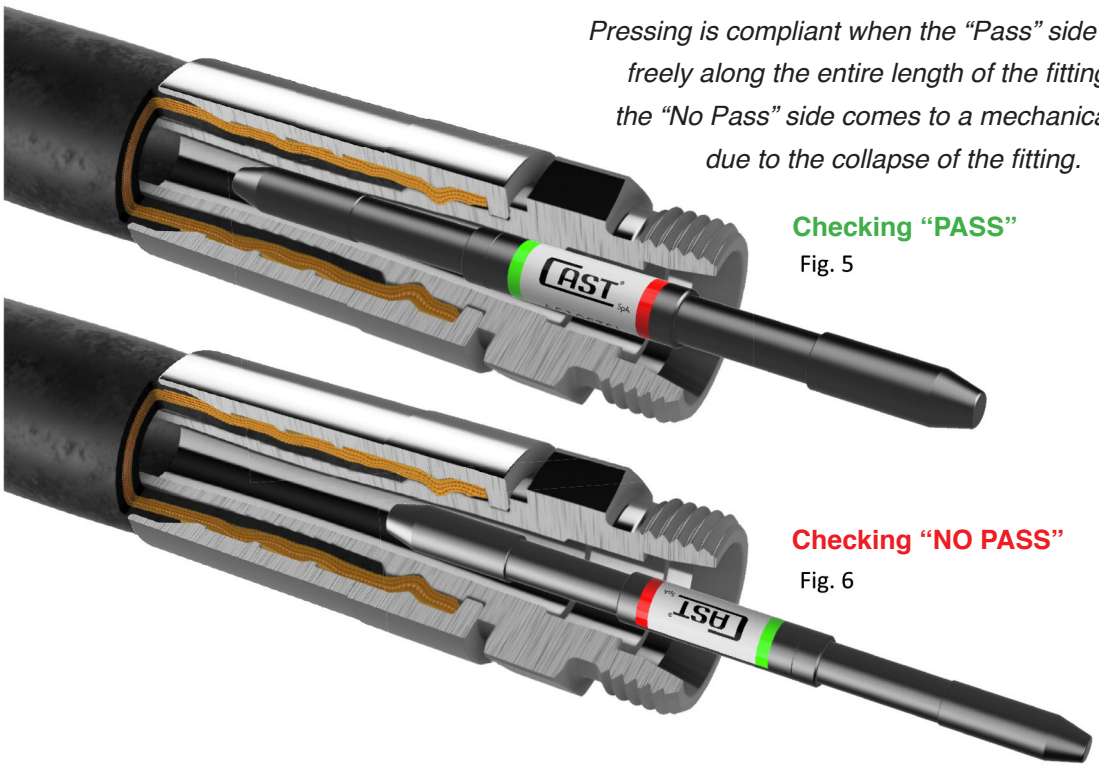


7. CHECKING

• It is mandatory to check the collapse of the fitting hole with the special P/NP plugs. Connected machines that do not meet the collapse parameters cannot be used and will have to be rebuilt as they are not compliant.

COMPLIANT PRESSING

Pressing is compliant when the "Pass" side enters freely along the entire length of the fitting and the "No Pass" side comes to a mechanical stop due to the collapse of the fitting.



Checking "PASS"
Fig. 5

Checking "NO PASS"
Fig. 6

NON-COMPLIANT PRESSING

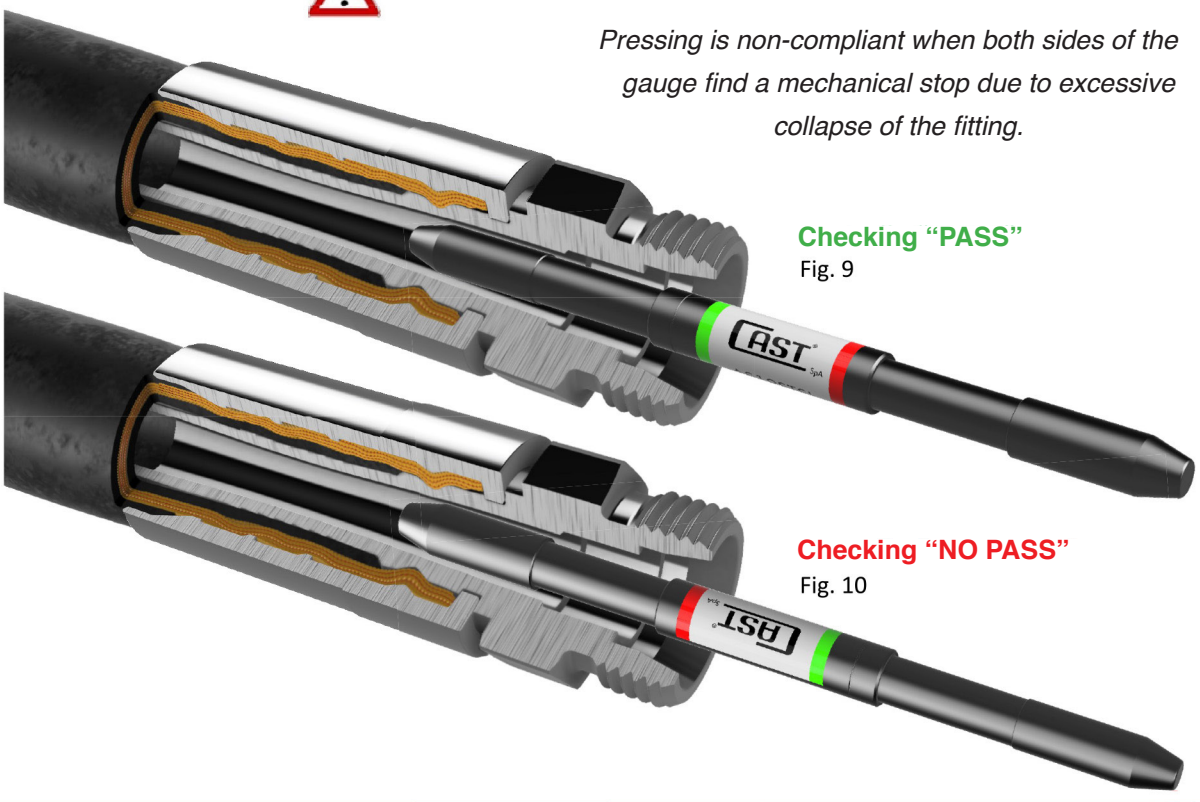
Pressing is non-compliant when both sides of the gauge enter freely along the entire length of the fitting (insufficient collapse).

Checking "PASS"
Fig. 7

Checking "NO PASS"
Fig. 8

NON-COMPLIANT PRESSING

Pressing is non-compliant when both sides of the gauge find a mechanical stop due to excessive collapse of the fitting.



Checking "PASS"
Fig. 9

Checking "NO PASS"
Fig. 10

ASSEMBLY INSTRUCTIONS FOR FLEXIBLE PIPE FITTINGS SKIVE, NO-SKIVE AND INTERLOCK FITTINGS

1. CHECKING INSTRUMENTS TO BE USED

• Before starting the final installation of the fitted flexible pipe onto the machine, you must ensure that the necessary components (bushings, clamping nuts, fittings, pipes, etc.) are 100% efficient, compliant and free from defects. Replace those that are non-compliant.

• Remove any plastic plugs from the ends of the fitted pipes.

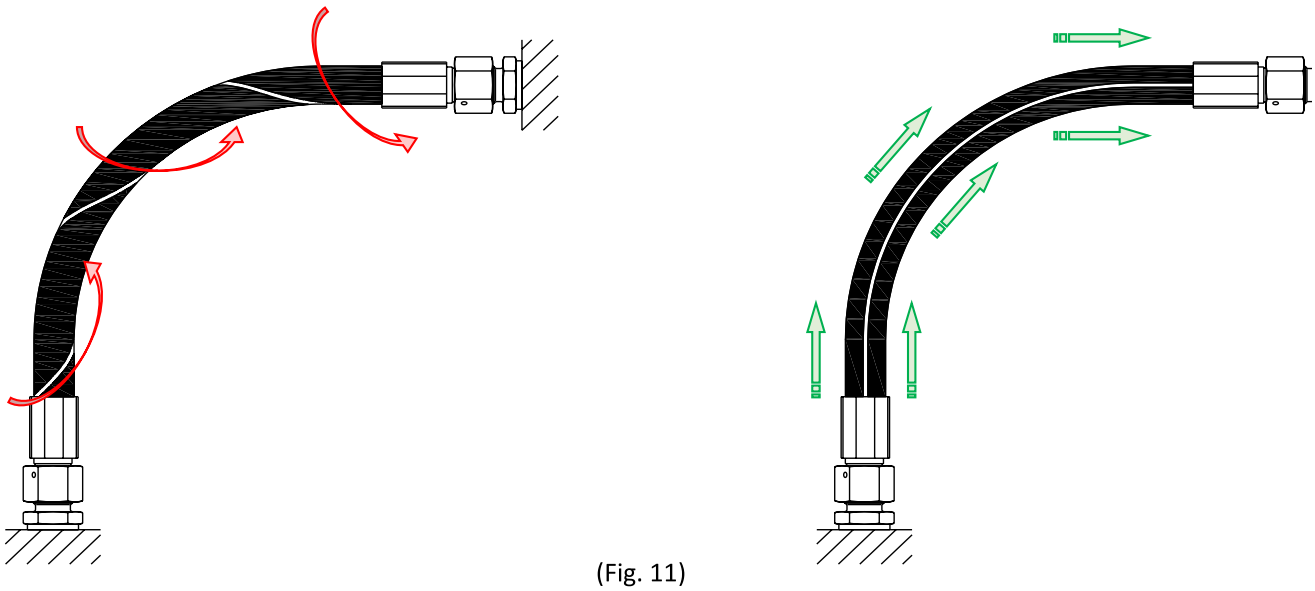
• Check that the flexible pipes to be assembled are free from occlusions, constrictions or damage caused during the various preparation processes. Replace non-compliant pipes.

• Check that the pipes are free from internal impurities resulting from the various processes.

2. REQUIREMENTS FOR INSTALLATION OF FLEXIBLE PIPES ACCORDING TO DIN 2006

To ensure the functionality, safety and durability of the pipes and their fittings, the maximum permissible working pressures and temperatures must not be exceeded, the pipes must be fitted correctly, the most suitable fittings must be used according to the installation conditions, and the length of the pipes must be determined by taking into account the movement of the pipes where applicable.
For correct installation of the assembled flexible pipes, the following requirements must be strictly observed:

• Do not apply torsion to the flexible pipe along its axis, as this can lead to its rupture, or failure and fluid leakage when the pipe is operating under pressure (Fig.11).

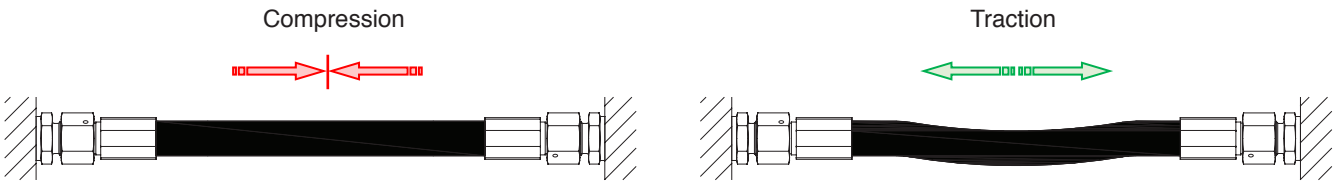


(Fig. 11)

NON-COMPLIANT

COMPLIANT

• The flexible pipe must be assembled in such a way that, under normal operating conditions, it will not be subjected to tensile stresses, other than those due to its own weight, or to compressive stresses in order to avoid breaking (Fig. 12).

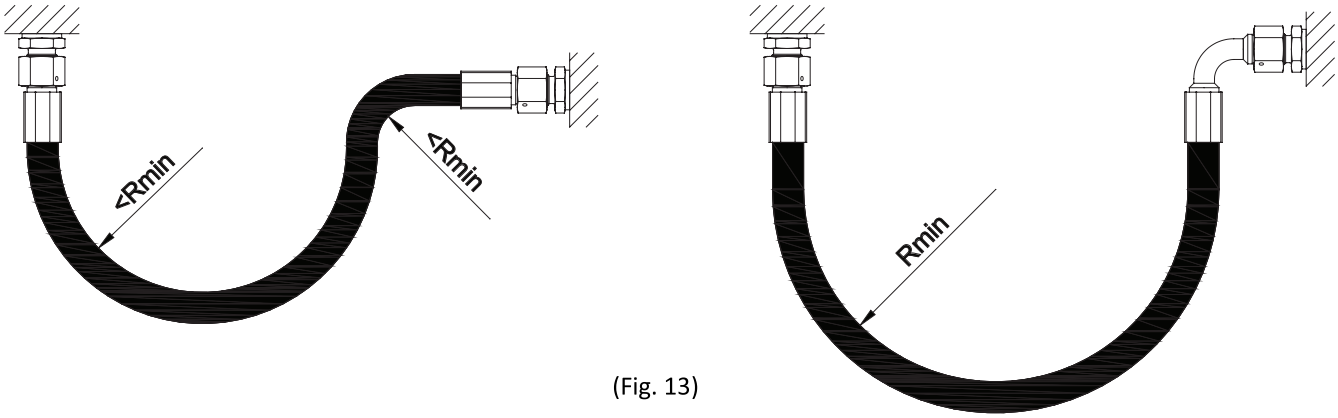


(Fig. 12)

NON-COMPLIANT

COMPLIANT

• As far as possible, the flexible pipe should be assembled following its natural curvature and maintaining the minimum radius of curvature allowed in order to avoid bottlenecks and collapses and so as not to reduce its life after assembly. Where it is not possible to follow this requirement, use elbow fittings to achieve a compliant installation (Fig. 13).

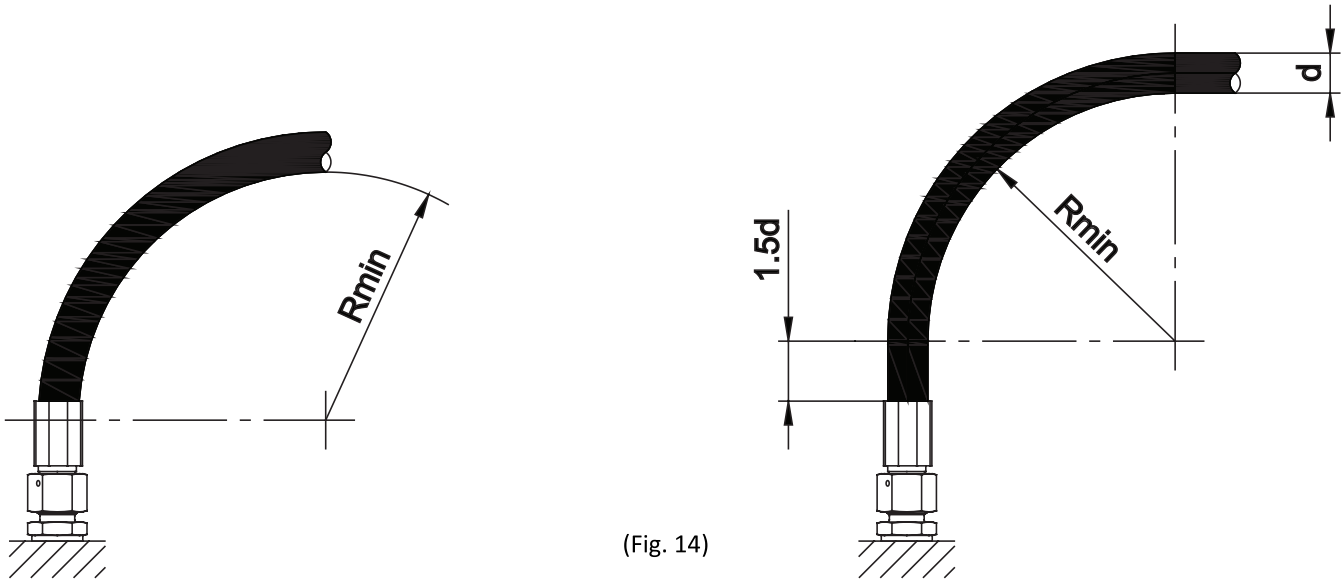


(Fig. 13)

NON-COMPLIANT

COMPLIANT

• If the flexible pipe has to be bent, its length must be such that the minimum permissible bending radius is maintained and the bend should only begin after a length of 1.5d (fig. 14). Where it is not possible to follow this requirement, provide bend-proof protection.

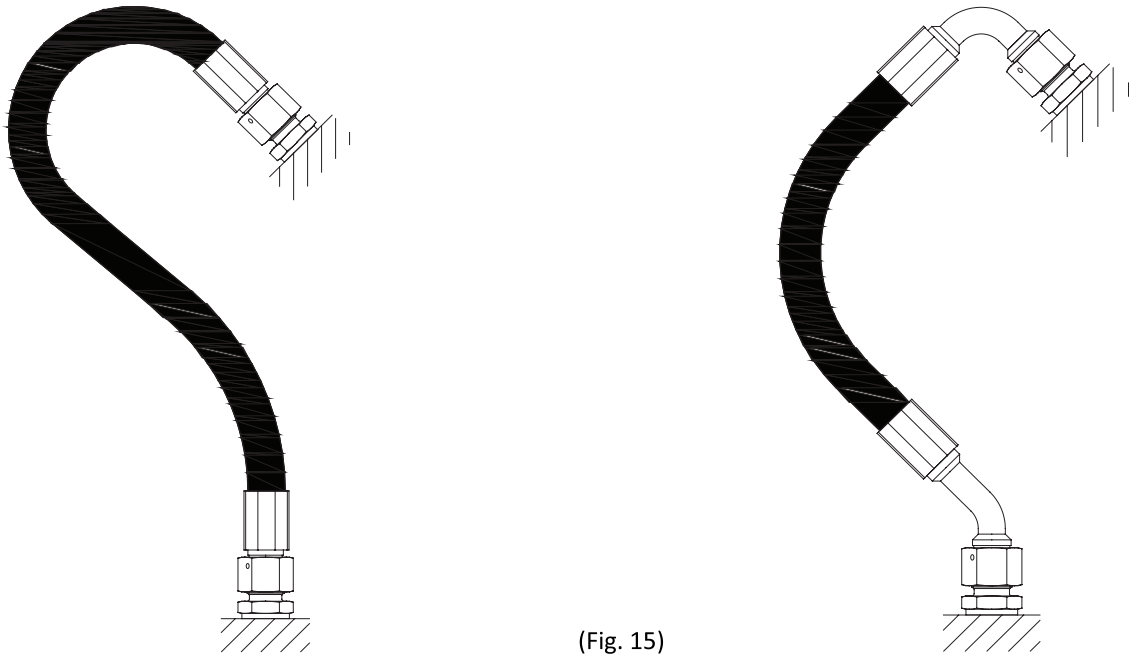


(Fig. 14)

NON-COMPLIANT

COMPLIANT

• Use suitable fittings to avoid unwanted additional stresses on the pipe in order to achieve a compliant installation (Fig.15).

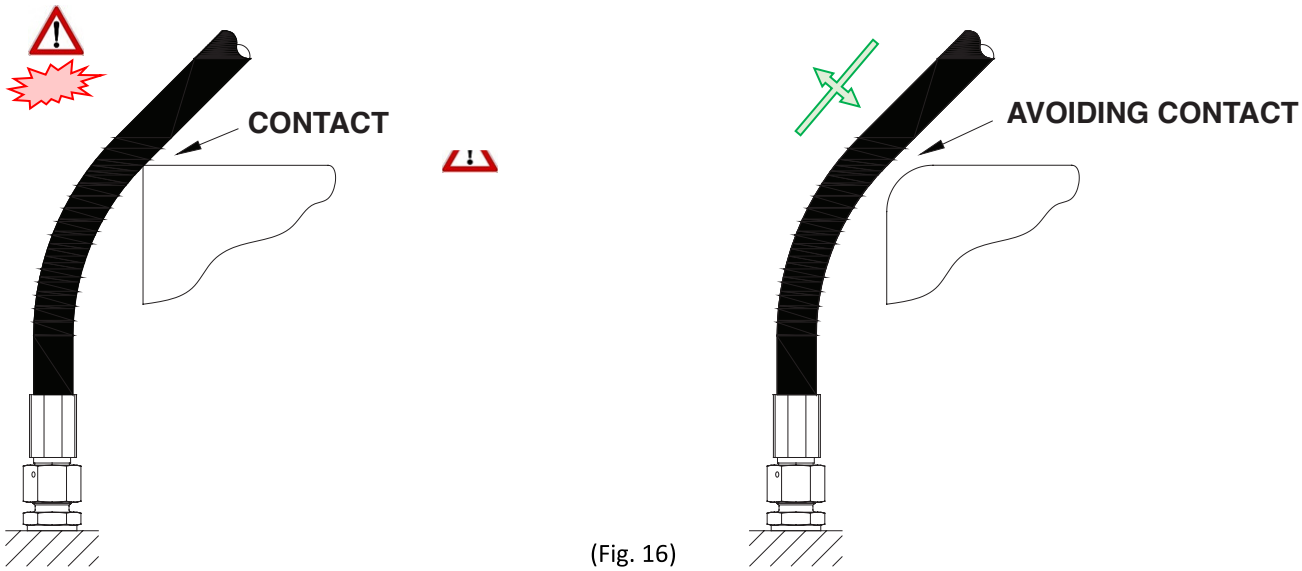


(Fig. 15)

NON-COMPLIANT

COMPLIANT

• In order to avoid damage to the flexible pipe from external factors, you must eliminate unwanted mechanical actions and prevent the pipe from rubbing against components of the supporting structure or other pipes. Provide a suitable assembly position for the flexible pipes and a suitable fixing. If necessary, protect the pipe with conduits or similar. Parts with sharp edges must be covered or removed (Fig.16).

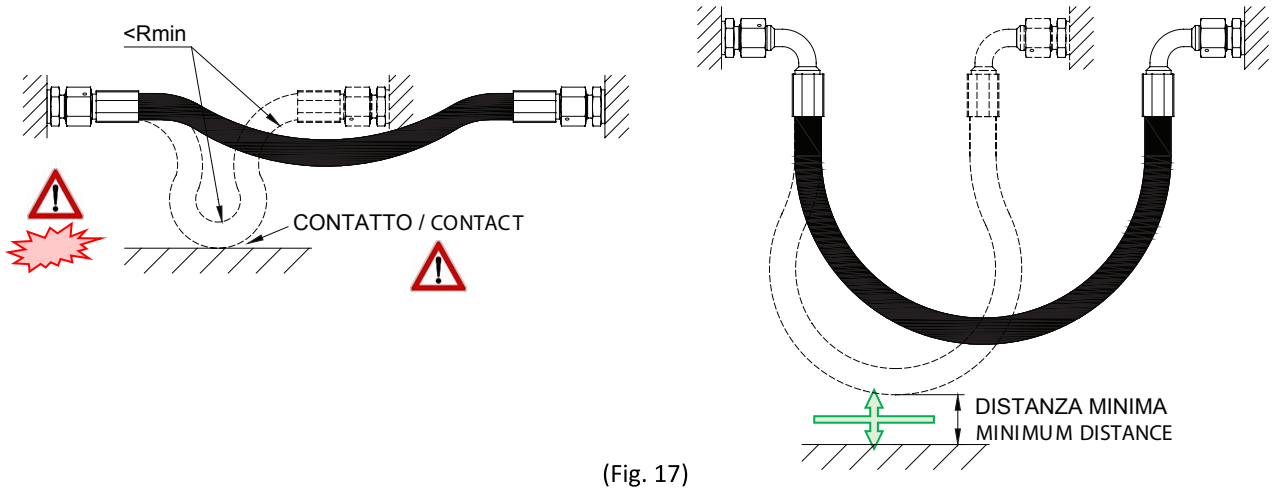


(Fig. 16)

NON-COMPLIANT

COMPLIANT

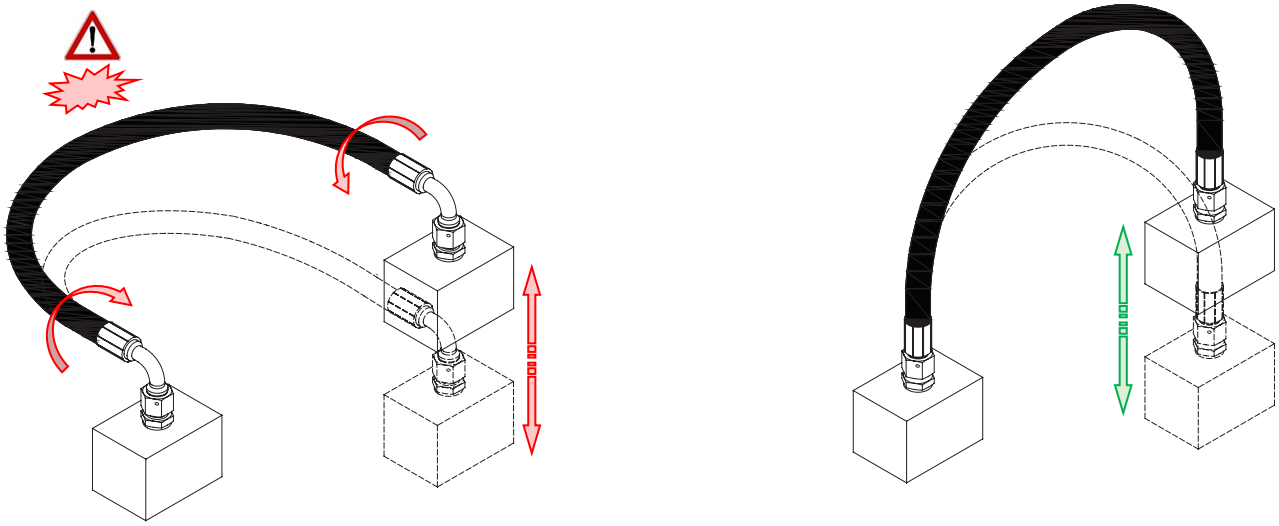
- For applications with moving parts, the flexible pipe length must be calculated in such a way that the minimum permissible bending radius is maintained within the range of movement and the pipe is not subject to tensile stress (Fig.17)



(Fig. 17)

NON-COMPLIANT **COMPLIANT**

- For applications with moving parts, torsion of the flexible pipe must be avoided when longitudinal movement and bending occur in the same plane. This condition can be achieved by correct installation, suitable constructional measures and the use of suitable fittings to achieve a compliant installation (Fig. 18).



(Fig. 18)

NON-COMPLIANT **COMPLIANT**

LENGTH AND ORIENTATION OF ASSEMBLED FLEXIBLE PIPES

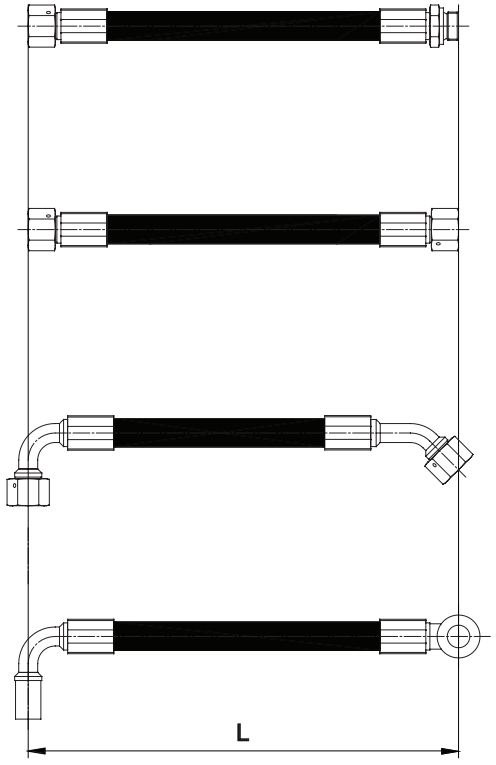
The length of a flexible pipe assembled with straight male fittings is measured at the ends of the two connections. For female fittings, the length is measured at the end of the conical seals or on the flat sealing surfaces. In the case of elbow and eye fittings, the length is measured over the centre distance, while maintaining the criteria described for straight fittings (Fig. 19). In order to determine the correct length of an assembled pipe, it is important to take into account the possible elongation or shortening under pressure, as prescribed by the construction standards, of the individual pipes (from -2% to +4% for pipe types 1SN, 2SN, 2SC, 4SP, 4SH, R13; and ±3% for pipe type R7)

.

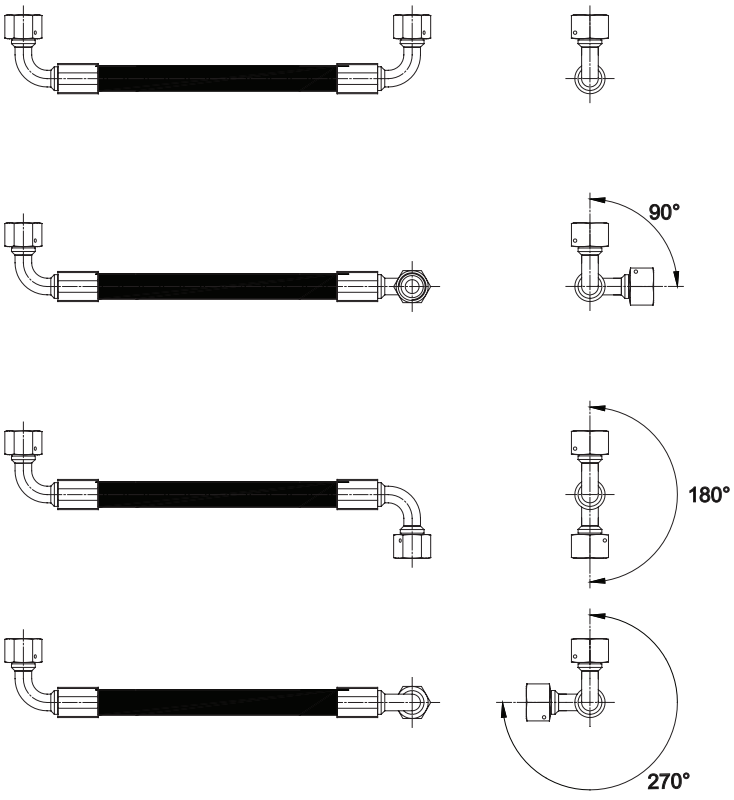
When a pipe is assembled with one or both of the elbow or eye fittings you must identify the orientation between them in order to perform the assembly correctly. Holding the pipe in a horizontal position, the relative angle between the fittings is determined by starting with the fitting closest to the observer's eye in a vertical downward position and turning the furthest fitting anti-clockwise (Fig.20).

(Fig.19) (Fig.20)

(Fig.19)



(Fig.20)

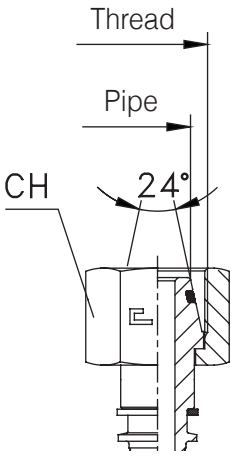


Tolerances on the lengths and orientation of assembled pipes according to DIN 20066

Pipe length L	Inside pipe Ø T		Orientation
	From DN 5 a DN 25	From DN >25 a DN 51	
Up a 630mm	From -3 a +7mm	From -4 a +12mm	±5°
From 630mm a 1250mm	From -4 a +12mm	From -6 a +20mm	
From 1250mm a 2500mm	From -6 a +20mm	From -6 a +25mm	
From 2500mm a 8000mm	From -0,5% a +1,5%		
Oltre 8000mm	From -1% a +3%		

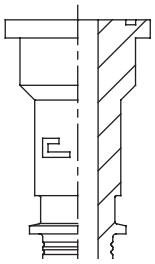
TIGHTENING TORQUES

24° CONE FITTINGS ISO 8434-1 (DIN 2353)



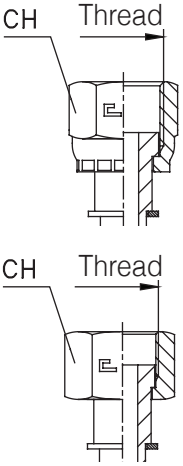
Light series "L"				Heavy series "S"			
Metric Cylindrical Thread	Ø Pipe	Key (CH)	Torque [Nm] $^{+10\%}_{0}$	Metric Cylindrical Thread	Ø Pipe	Key (CH)	Torque [Nm] $^{+10\%}_{0}$
M12x1.5	6	14	20	M14x1.5	6	17	38
M14x1.5	8	17	38	M16x1.5	8	19	45
M16x1.5	10	19	45	M18x1.5	10	22	51
M18x1.5	12	22	51	M20x1.5	12	24	58
M22x1.5	15	27	74	M22x1.5	14	27	74
M26x1.5	18	32	105	M24x1.5	16	30	74
M30x2	22	36	135	M30x2	20	36	135
M36x2	28	41	166	M36x2	25	41	166
M45x2	35	50	290	M42x2	30	50	240
M52x2	42	60	330	M52x2	38	60	330

FULL FLANGE - ISO 6162-1/-2, SAE J518



Series 3000					Series 6000				
Ø Flange	Metric Thread Screw		UNC Thread Screw		Ø Flange	Metric Thread Screw		UNC Thread Screw	
	Thread	Torque [Nm] $^{+10\%}_{0}$	Thread	Torque [Nm] $^{+10\%}_{0}$		Thread	Torque [Nm] $^{+10\%}_{0}$	Thread	Torque [Nm] $^{+10\%}_{0}$
1/2	M8	24	5/16-18	24	1/2	M8	20	5/16-18	24
3/4	M10	50	3/8-16	43	3/4	M10	50	3/8-16	43
1"	M10	50	3/8-16	43	1"	M12	92	7/16-14	70
1.1/4	M10	50	7/16-14	70	1.1/4	M12	92	1/2-13	105
1.1/2	M12	92	1/2-13	105	1.1/2	M16	210	5/8-11	210
2"	M12	92	1/2-13	105	2"	M20	400	3/4-10	360

ORFS FITTINGS - ISO 8434-3 / (SAE J1453)

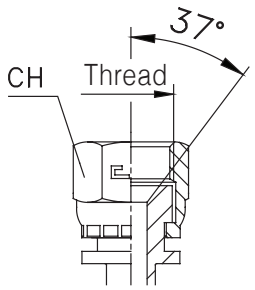
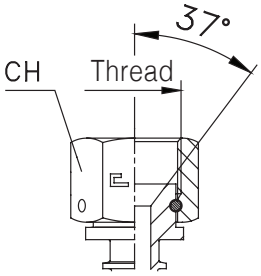
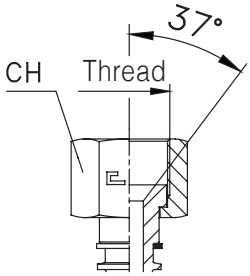


Thread UNF/UNS/UN-2A	Key [CH]	Free Nut	Clinched Nut
		Torque [Nm] $^{+10\%}_{0}$	Torque [Nm] $^{+10\%}_{0}$
9/16-18	17	25	25
11/16-16	22	40	40
13/16-16	24	55	55
1-14	30	60	60
1.3/16-12	36	90	90
1.7/16-12	41	125	125
1.11/16-12	50	170	170
2-12	60	200	200

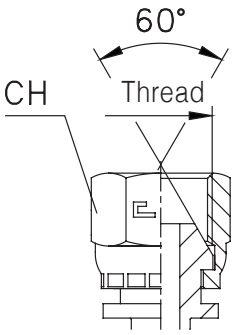
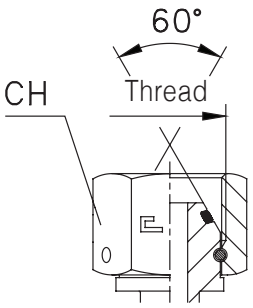
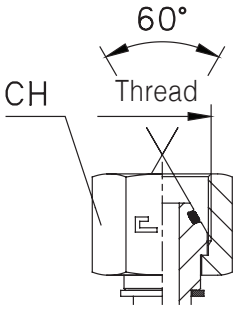
Note: I valori riportati nelle tabelle di serraggio sono dati indicativi, ricavati da prove pratiche eseguite nel laboratorio Cast, che possono variare in funzione dei materiali e delle tolleranze dei componenti impiegati.

TIGHTENING TORQUES

JIC 37°FITTINGS - ISO 8434-2 (SAE J514)

		Clinched Nut	Barbed Nut	Free Nut
				
Thread UNF-UN	**Key (CH)**	**Torque [Nm] $^{+10\%}_{0}$**	**Torque [Nm] $^{+10\%}_{0}$**	**Torque [Nm] $^{+10\%}_{0}$**
7/16-20	14	15	20	20
1/2-20	17	20	25	25
9/16-18	19	30	35	35
3/4-16	24	50	60	60
7/8-14	27	69	85	85
1.1/16-12	32	98	140	140
1.3/16-12	36	118	-	-
1.5/16-12	41	140	230	230
1.5/8-12	50	-	380	380
1.7/8-12	60	-	460	460

CONE 60° FITTINGS - ISO 8434-6 (BS 5200)

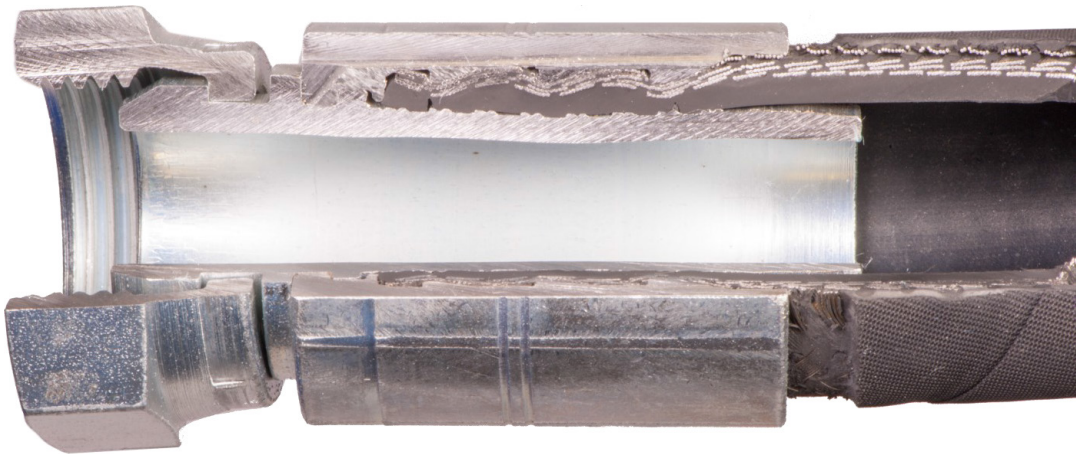
		Clinched Nut	Barbed Nut	Free Nut
				
Gas Thread/ Cylindrical Metric	**Key (CH)**	**Torque [Nm] $^{+10\%}_{0}$**	**Torque [Nm] $^{+10\%}_{0}$**	**Torque [Nm] $^{+10\%}_{0}$**
G 1/8	14	15	25	20
G1/4	19	20	65	30
G 3/8	22	34	85	75
G 1/2	27	60	150	130
G 5/8	30	69	200	170
G 3/4	32	115	260	220
G1 "	41	140	320	270
G 1.1/4	50	-	500	420
G 1.1/2	55	-	600	510
G 2"	70	-	700	600
M 12x1,5	17	15	35	30
M 14x1,5	19	20	45	38
M 16x1,5	22	35	55	48
M 18x1,5	24	48	70	60
M 20x1,5	27	60	80	70
M 22x1,5	27	60	100	85
M 26x1,5	32	115	170	150
M 30x1,5	36	-	250	210
M 38x1,5	46	-	310	280
M 45x1,5	55	-	380	320

Note: The values given in the tightening tables are approximate figures, derived from practical tests carried out in the Cast laboratory, which may vary depending on the materials and tolerances of the components used.

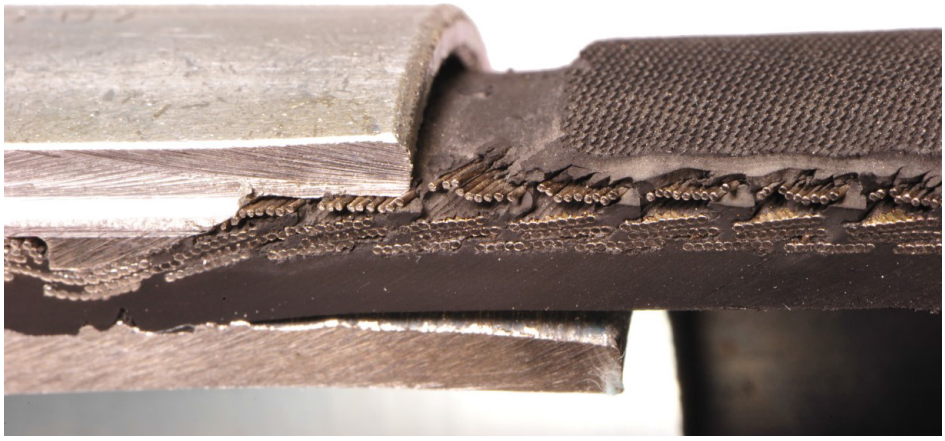
FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

EXCESSIVE PIPE-STRIPPING LENGTH

NON-COMPLIANT



NON-COMPLIANT



ASSEMBLY BEHAVIOUR:
Excessive stripping of the pipe cover leaves the metal reinforcement exposed after pressing the bushing.

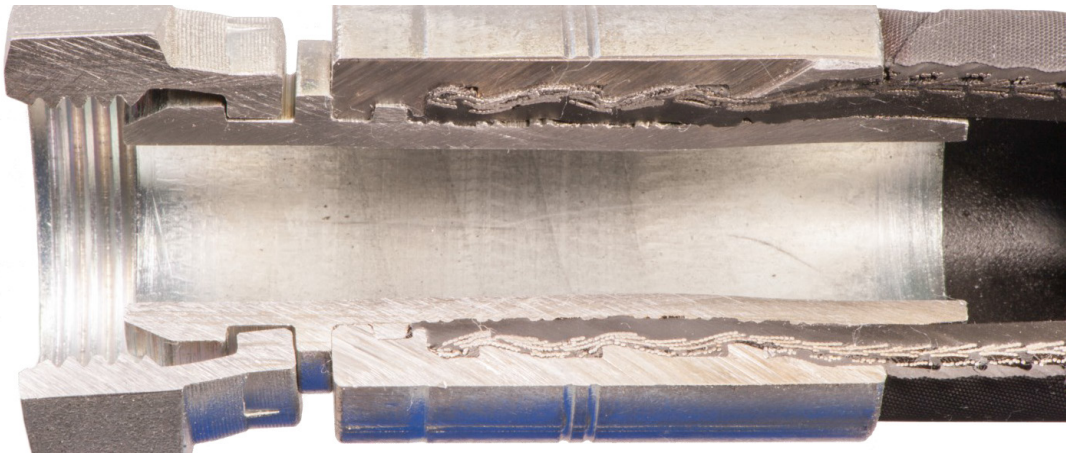
CONSEQUENCES:
Corrosion of the metal reinforcement and loss of the pipe's ability to withstand the pressure with unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe according to the stripping length specifications in the pressing table.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

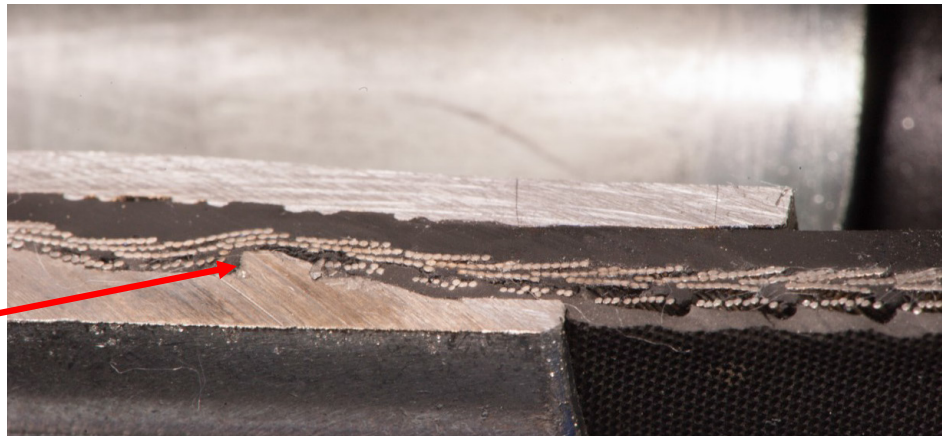
INSUFFICIENT PIPE-STRIPPING LENGTH

NON-COMPLIANT



NON-COMPLIANT

Rubber under the teeth



ASSEMBLY BEHAVIOUR:
Insufficient stripping of the pipe cover creates tension between the various layers of the pipe after pressing the bushing. The presence of rubber between the teeth of the bushing and the metal part of the pipe prevents proper clinching.

CONSEQUENCES:
Detachment of the metal reinforcement from the rubber layers, loss of the pipe's ability to withstand the pressure, with unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe according to the stripping length specifications in the pressing table.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

EXCESSIVE BUSHING PRESSING DIAMETER

NON-COMPLIANT

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
Excessive pressing of the bushing reduces the internal passage section of the pipe and causes damage to the rubber underlayer with possible breakage of the metal reinforcement.

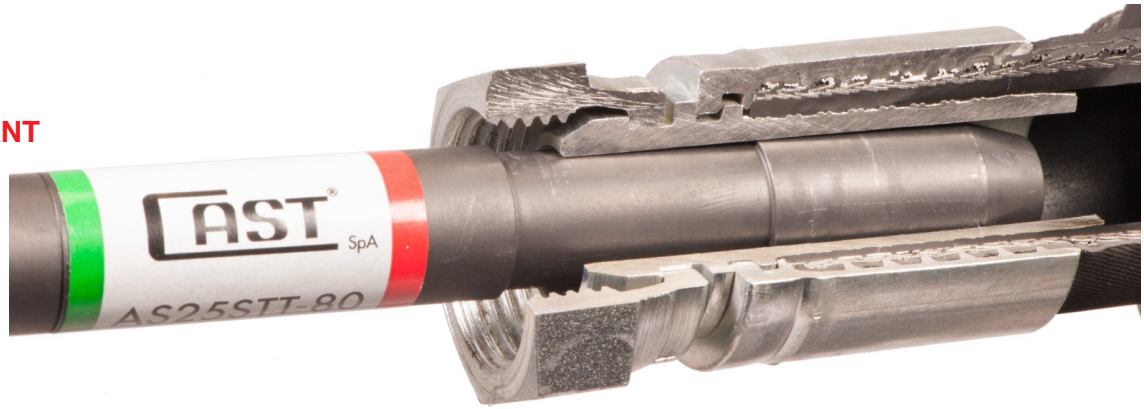
CONSEQUENCES:
Loss of fluid and unthreading of the fitting from the pipe with the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe in accordance with the bushing clinching value given in the pressing table. Check the correct collapse of the fitting hole with the appropriate test pin.

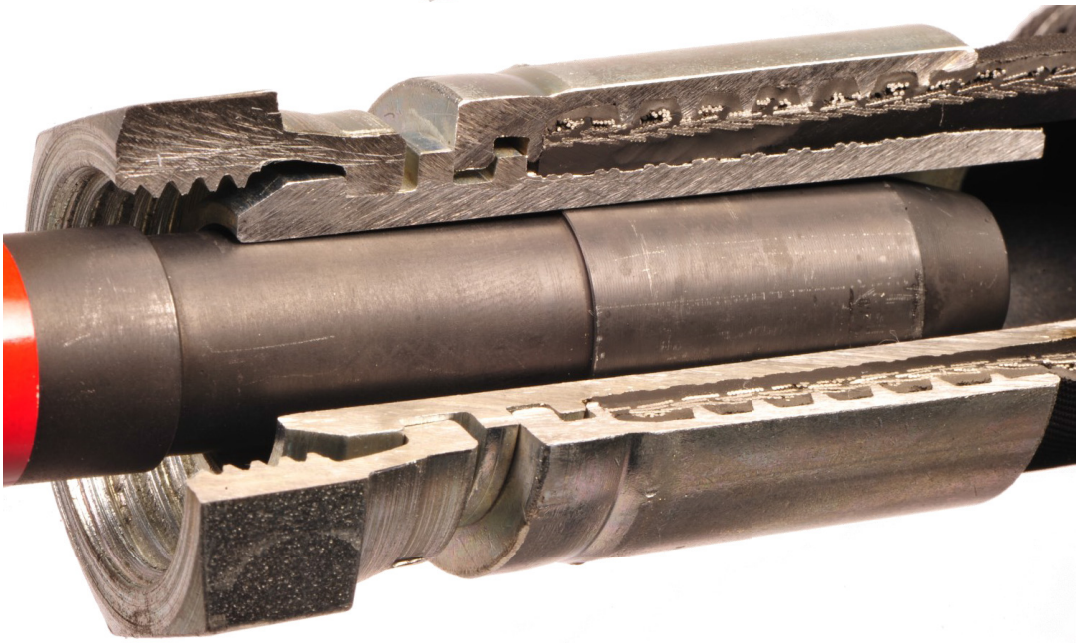
FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

INSUFFICIENT BUSHING PRESSING DIAMETER

NON-COMPLIANT



NON-COMPLIANT



ASSEMBLY BEHAVIOUR:
Insufficient pressing of the bushing reduces the cohesive force between the bushing and the pipe, thus promoting fluid leakage between the fitting and the pipe.

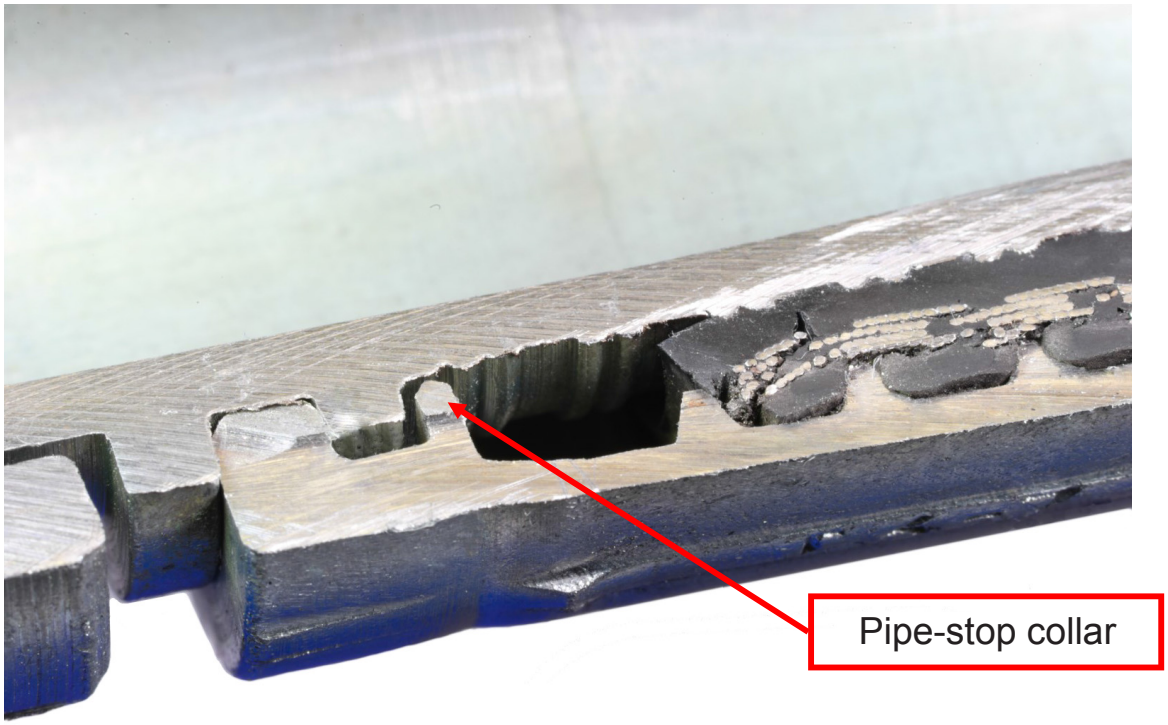
CONSEQUENCES:
Loss of fluid from the assembly, unthreading of the fitting from the pipe, loss of fluid with the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe in accordance with the bushing clinching value given in the pressing table. Check the correct collapse of the fitting hole with the appropriate test pin.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

NON-FLUSH INSERTION OF THE PIPE INTO THE BUSHING

NON-COMPLIANT



ASSEMBLY BEHAVIOUR:
Not all the teeth of the bushing provide the correct grip on the pipe.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe using a method that ensures correct assembly, such as marking the outside surface of the pipe to indicate the correct position of the bushing. The correctly assembled pipe must stop at the “pipe-stop collar”.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

PIPE-CUTTING RESIDUES (RUBBER/METAL) INSIDE THE FLEXIBLE PIPE

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
Machining residues inside the pipe can create problems with fluid pollution, resulting in blockage of expensive system components and damage to the sublayer caused by the abrasion of micro metal parts.

CONSEQUENCES:
The pipe loses its ability to withstand pressure, rupture of the sublayer and leakage of fluid into the environment, causing serious damage to people and property.

MEASURES TO BE APPLIED:
Thoroughly clean processing residues from the inside of the pipe before assembly.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

BUSHING PRESSED OUTSIDE OF THE CLAMPS

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
The bushing was not fully contained by the press clamps during the pressing process and the bushing coupling tooth was not positioned in the respective groove of the fitting.

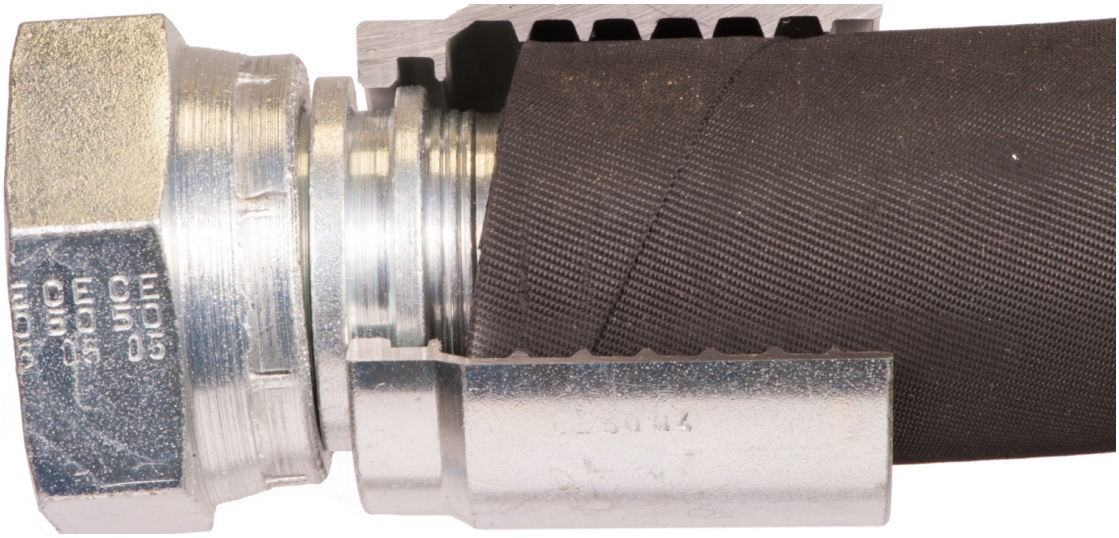
CONSEQUENCES:
Pipe loses its ability to withstand the pressure, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the flexible pipe, ensuring that the bushing pressing phase is fully contained by the press clamps when pressing.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

PIPE CUT IS OUT OF SQUARE

NON-COMPLIANT



ASSEMBLY BEHAVIOUR:
Not all the teeth of the bushing provide the correct grip on the pipe.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe, ensuring that it is cut perpendicular to its axis.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

METAL REINFORCEMENT BREAKS DURING FLEXIBLE PIPE STRIPPPING PHASE

NON-COMPLIANT

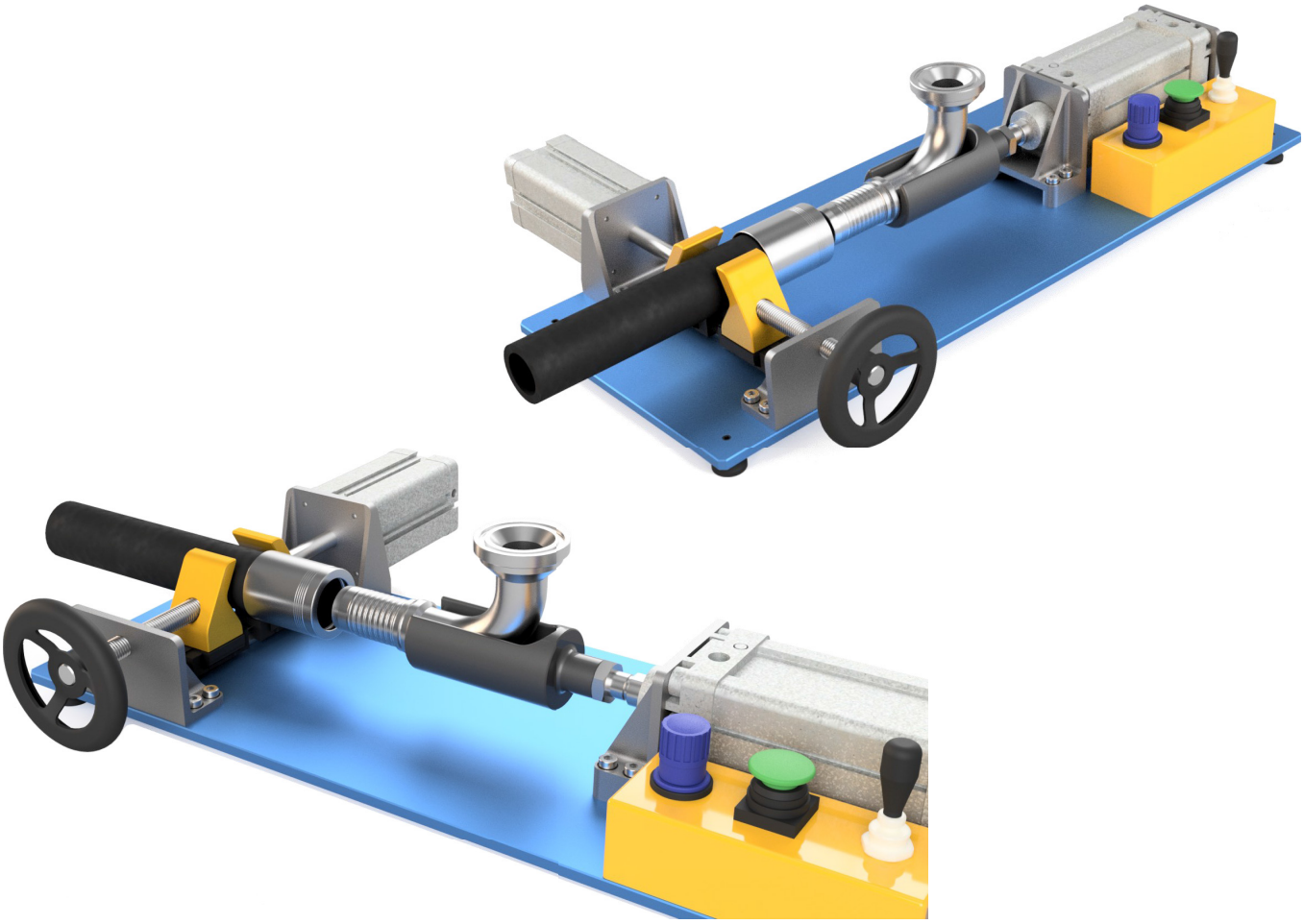
ASSEMBLY BEHAVIOUR:
Incorrect adjustment of the machine tool damages the metal reinforcement when stripping the pipe, causing it to be non-compliant.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, unthreading of the fitting from the pipe and the possibility of causing serious damage to people and property

MEASURES TO BE APPLIED:
Reassemble the pipe ensuring that the machine tool is adjusted so that it only removes the rubber cover of the pipe without damaging the metal reinforcement.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

OVERLY FORCED INSERTION OF BARB INTO THE PIPE



ASSEMBLY BEHAVIOUR:
The lack of play between the interior of the pipe and the barb may cause damage to the sublayer if perfect alignment between the two elements is not ensured during insertion and adequate lubrication is not provided.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, loss of fluid from the connection, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Use specific equipment (see example above) to insert the barbs into the pipe to ensure perfect alignment between the two elements and no damage to the sublayer. Check the correct collapse of the barb hole with the test pin.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

INSERTION OF BARB WITH TOO MUCH PLAY IN THE PIPE

NON-COMPLIANT

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
Reduced or inexistent fit between the inside of the pipe and the barb may create problems with the correct positioning of the two elements during bushing pressing.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, loss of fluid from the connection, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
When pressing, make sure that the fitting and bushing are in the correct position on the pipe and that the pressing is carried out in accordance with the specified dimensions. Check the correct collapse of the barb hole with the test pin.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

USE OF INCORRECT, UNDERSIZED CLAMPS IN THE PRESSING PHASE

NON-COMPLIANT

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
Pressing the bushing with incorrect, undersized clamps causes excessive collapse of the barb hole with reduction of the fluid passage section, damage to the sublayer and breakage of the metal reinforcement.

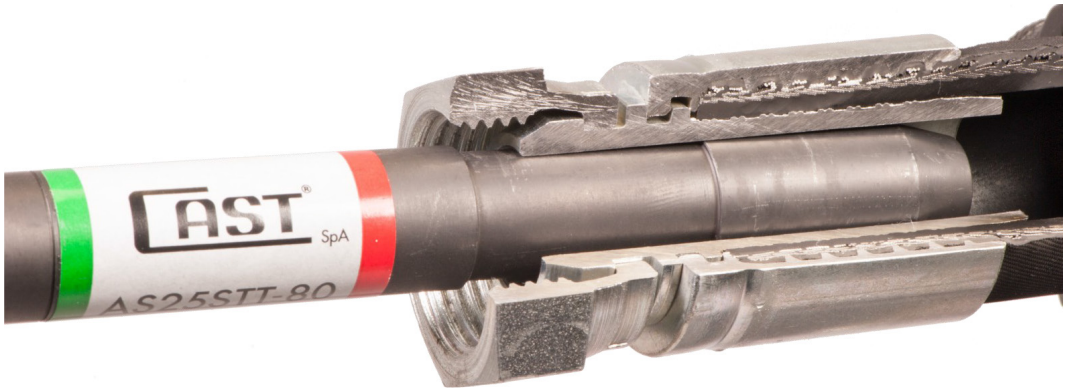
CONSEQUENCES:
Pipe loses its ability to withstand the pressure, loss of fluid from the connection, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe making sure that the clamps chosen for pressing the bushing correspond to the indications given by the press or the pressing table. Check the correct collapse of the barb hole with the test pin.

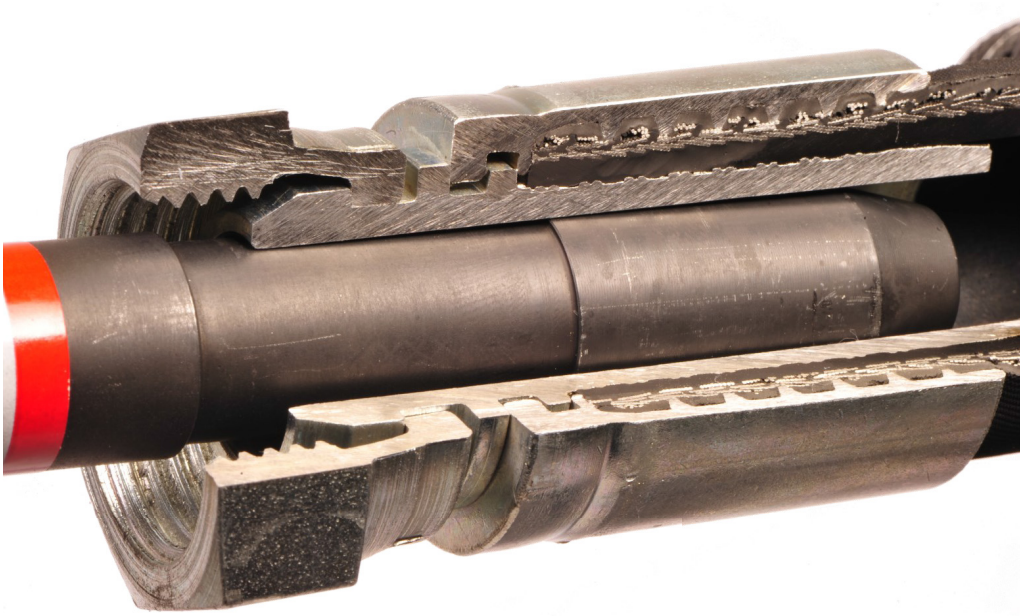
FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

USE OF INCORRECT, OVERSIZED CLAMPS IN THE PRESSING PHASE

NON-COMPLIANT



NON-COMPLIANT



ASSEMBLY BEHAVIOUR:
Pressing the bushing with oversized clamps causes the barb hole not to collapse with reduced cohesion force between the bushing and the pipe.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, loss of fluid from the connection, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Make sure that the clamps chosen for pressing the bushing correspond to the indications given by the press or the pressing table. Check the correct collapse of the barb hole with the test pin.

FLEXIBLE PIPES ASSEMBLED WITH FITTINGS FOR FLEXIBLE PIPES

BUSHING PRESSED OUTSIDE OF THE COUPLING GROOVE OF THE FITTING

NON-COMPLIANT

NON-COMPLIANT

ASSEMBLY BEHAVIOUR:
After pressing, the bushing coupling is not contained within the groove of the fitting, which results in the assembly not being mechanically sealed.

CONSEQUENCES:
Pipe loses its ability to withstand the pressure, unthreading of the fitting from the pipe, causing loss of fluid and the possibility of causing serious damage to people and property.

MEASURES TO BE APPLIED:
Reassemble the pipe, making sure that the pipe and bushing are in the correct position and fully engaged in the bushing-barb pressing.

CAUSES OF DAMAGE TO THE PIPE DURING OPERATION

- **HARD, CRACKED PIPE**

Premature deterioration of the pipe is caused by constantly exceeding the temperature limits of the fluid conducted. The causes are often attributed to system malfunction, or to the oil level in the tank being too low to allow an adequate heat exchange.

NON-COMPLIANT

- **TUBO CON CURVATURA ECCESSIVA**

Ogni tipo di tubo ha un suo minimo raggio di curvatura ammesso. Scendere al di sotto le trecce metalliche sono sollecitate a trazione nella parte esterna della curvatura e a compressione all'interno. L'aumento del diametro in pressione tende a strapparle o scollarle dalla gomma causando in breve tempo la rottura del tubo.

NON-COMPLIANT

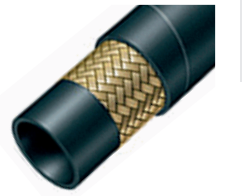
- **BURST PIPE**

High pressure peaks are the cause of this type of failure.

NON-COMPLIANT

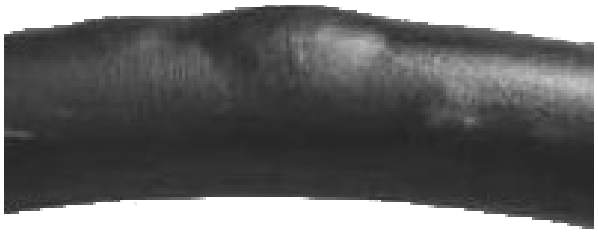
BURST PIPE UP TO THE NUT WITH BRAIDS OF RUSTY METAL
Excessive stripping leaves the metal braid exposed which provokes premature corrosion and the pressure finishes the job, thus causing the pipe to burst.

NON-COMPLIANT



• **PIPE HAS NUMEROUS BULGES, COATING DETACHED FROM THE SUPPORT IN SEVERAL PLACES**

The pipe was twisted during mounting. The pressure has loosened the metal braids causing the pipe to distort and the coating to detach.



NON-COMPLIANT

NON-COMPLIANT

• **PIPE EJECTED FROM THE BUSHING**

Possible causes: use of an unsuitable bushing for the pipe being used; improper pressing; failure to check with Pass—No Pass test pins.

NON-COMPLIANT

- **PIPE NOT PROTECTED EXTERNALLY**

The pipe has been installed without adequate protection against external agents, whether chemical (aggressive substances in contact with the pipe), mechanical (contact with other components of the system) or atmospheric. These cause deterioration of the outer cover leading to premature ageing of the pipe and decay in performance with possible bursting causing damage to people and property.

NON-COMPLIANT

NON-COMPLIANT

- **USE OF FLUIDS THAT ARE NOT COMPATIBLE WITH THE PIPE SUBSTRATE**

The use of fluids that are not compatible with the chemical composition of the chosen pipe will cause corrosion of the sub-layer, leading, for example, to the pipe itself breaking or the fitting slipping off with possible damage to people and property.

OPINIONS ON IMPORTANT TOPICS REGARDING HYDRAULIC PIPES: LOW QUALITY? NO THANKS

In view of the growing mass of low-quality products placed on the market with no origins, dubious origins or under purely fictitious names, which are sold or used as quality products, we believe that the time has come to lay down some firm rules to "give to Caesar what is Caesar's" and to denounce with absolute clarity the offences perpetrated.

We will develop our analysis over five points, in order to express our company's thoughts on a malpractice that must absolutely be curbed given the dangerous nature of the subject matter, documenting our position and making ourselves available for any technical discussions.

Today, there is an undeniable need to contain industrial costs, and Cast S.p.A. is well aware of this, since this problem affects all companies in the sector, whether they are manufacturers of components or involved in the construction of complex hydraulic systems.

But there is also a duty that goes beyond any legitimate economic demands, and that is "Safety", which cannot be renounced for any reason. We must therefore rationalise costs but without ever compromising safety parameters, standardised or not, as they stand alone in guaranteeing the proper operation of system installations without exposing people, the environment or property to risks other than those that are intrinsic to the system. Here is a follow-up to our point of view.

1. TECHNICAL: minimum performance, tests and trials:

The flexible hydraulic pipe, used in hydraulic circuits for the transmission of power at high working pressures, is a typical product which, for the type with braided steel reinforcement, is subject to international standards such as: EN 853 (single/two-braid hydraulic pipes) and EN 857 (single/two-braid compact hydraulic pipes).

The fundamental constituent elements of the hydraulic pipe are:
Rubber inner sublayer - Steel reinforcement - Rubber coating.

These three components contribute, with their very different mechanical and physical characteristics, to the final aesthetic and technical features of the flexible hydraulic pipe.

As with all composite products, it is essential that the various components integrate to form a single body (both chemically and mechanically), in order to guarantee the compactness of the finished product and its inherent operational qualities.

The hydraulic pipe is now a consolidated industrial product, from a strictly design point of view, whose production, performance and qualitative evolution is fundamentally linked to the improvement of manufacturing technologies and the quality of the raw materials used.

The aforementioned international standards set out the minimum technical requirements to ensure that the product guarantees the required performance and safety coefficients.

The main components of the hydraulic pipe fulfil different functions, such as:

- *Rubber underlayer: to ensure compatibility with fluids used in hydraulic circuits.*
- *Metal reinforcement: to guarantee hydrostatic performance according to standardised parameters.*

- *Rubber coating: to protect the pipe from atmospheric agents (especially the metal reinforcement) and from contact/friction wear and tear.*

Basically, these components, assembled to form the hydraulic pipe, contribute to guaranteeing its final technical characteristics, in accordance with international reference standards, both in terms of absolute value and variability within the same production batch, in particular:

A. Dimensional requirements:

• *Internal diameter of the pipe:*

DN (mm)	Normal and compact braided pipe	Internal diameter (mm)	
		min.	max.
05	1SN-2SN	4,6	5,4
06	1SN-2SN / 1SC-2SC	6,2	7,0
08	1SN-2SN / 1SC-2SC	7,7	8,5
10	1SN-2SN / 1SC-2SC	9,3	10,1
12	1SN-2SN / 1SC-2SC	12,3	13,5
16	1SN-2SN / 1SC-2SC	15,5	16,7
19	1SN-2SN / 1SC-2SC	18,6	19,8
25	1SN-2SN / 1SC-2SC	25,0	26,4
31	1SN-2SN	31,4	33,0
38	1SN-2SN	37,7	39,3
51	1SN-2SN	50,4	52,0

• *Internal diameter of the pipe:*

DN (mm)	PIPE TYPE 1SN EN853			PIPE TYPE 2SN EN853			PIPE TYPE 1SC EN857			PIPE TYPE 2SC EN857		
	Pipe	External diameter (mm)		Pipe	External diameter (mm)		Pipe	External diameter (mm)		Pipe	External diameter (mm)	
		min.	max.		min.	max.		min.	max.		min.	max.
05	1SN	10,6	12,5	2SN	12,2	14,1	-	-	-	-	-	-
06	1SN	12,2	14,1	2SN	13,7	15,7	1SC		13,5	2SC		14,2
08	1SN	13,7	15,7	2SN	15,3	17,3	1SC		14,5	2SC		16,0
10	1SN	16,1	18,1	2SN	17,7	19,7	1SC		16,9	2SC		18,3
12	1SN	19,1	21,4	2SN	20,6	23,0	1SC		20,4	2SC		21,5
16	1SN	22,2	24,5	2SN	23,8	26,2	1SC		23,0	2SC		24,7
19	1SN	26,2	28,5	2SN	27,8	30,1	1SC		26,7	2SC		28,6
25	1SN	34,1	36,6	2SN	36,1	38,9	1SC		34,9	2SC		36,6
31	1SN	41,3	44,8	2SN	45,3	49,5	-	-	-	-	-	-
38	1SN	48,6	52,1	2SN	52,2	55,9	-	-	-	-	-	-
51	1SN	61,7	65,5	2SN	64,9	68,6	-	-	-	-	-	-

B. Hydrostatic requirements (process):

Pipe	DN	Pipe type 1SN 1SC Pressure sec. EN 853-EN857 (bar)		
	mm	Esercizio	Collaudo	Scoppio
1SN	05	250	500	1.000
1SN-1SC	06	225	450	900
1SN-1SC	08	215	430	860
1SN-1SC	10	180	360	720
1SN-1SC	12	160	320	640
1SN-1SC	16	130	260	520
1SN-1SC	19	105	210	420
1SN-1SC	25	88	175	352
1SN	31	63	125	252
1SN	38	50	100	200
1SN	51	40	80	160

Pipe	DN	Pipe type 2SN – 2SC Pressure sec. EN 853-EN857 (bar)		
	mm	Esercizio	Collaudo	Scoppio
2SN	05	415	830	1.660
2SN-2SC	06	400	800	1.600
2SN-2SC	08	350	700	1.400
2SN-2SC	10	330	660	1.320
2SN-2SC	12	275	550	1.100
2SN-2SC	16	250	500	1.000
2SN-2SC	19	215	430	860
2SN-2SC	25	165	325	660
2SN	31	125	250	500
2SN	38	90	180	360
2SN	51	80	160	320

The operating pressure must guarantee a safety factor of 4:1, with respect to the bursting pressure, which is binding. To increase the 4:1 coefficient, the operating pressure must be reduced.

C. Impulse test requirements:

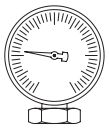
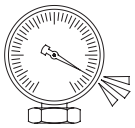
Pipe	DN	Pipe type 1SN – 1SC Pressure sec. EN 853-EN857 (bar)		
	mm	Esercizio	Prova	N° cicli
1SN	05	250	312,5	150.000
1SN-1SC	06	225	281,5	150.000
1SN-1SC	08	215	269	150.000
1SN-1SC	10	180	225	150.000
1SN-1SC	12	160	200	150.000
1SN-1SC	16	130	162,5	150.000
1SN-1SC	19	105	131,5	150.000
1SN-1SC	25	88	110	150.000
1SN	31	63	63	150.000
1SN	38	50	50	150.000
1SN	51	40	40	150.000

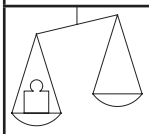
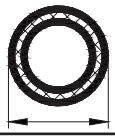
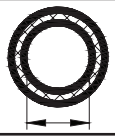
Pipe	DN	Pipe type 2SN – 2SC Pressure sec. EN 853-EN857 (bar)		
	mm	Esercizio	Prova	N° cicli
2SN	05	415	552	200.000
2SN-2SC	06	400	532	200.000
2SN-2SC	08	350	465,5	200.000
2SN-2SC	10	330	439	200.000
2SN-2SC	12	275	366	200.000
2SN-2SC	16	250	332,5	200.000
2SN-2SC	19	215	286	200.000
2SN-2SC	25	165	219,5	200.000
2SN	31	125	166,5	200.000
2SN	38	90	120	200.000
2SN	51	80	106,5	200.000

Impulse tests must be performed in accordance with ISO 6803. The test temperature must be 100°C.

D. Guaranteed minimum adhesion between the main components, metal reinforcement and rubber compounds.
E. Resistance of the rubber underlayer to fluids intended for hydraulic circuits.
F. Resistance of the rubber coating to atmospheric agents (e.g. ozone) and wear.
G. Cyclic fatigue resistance, at least according to standard specifications.

KEY

SYMBOL	DESCRIPTION
	**Minimum bending radius**
	**Maximum operating pressure**
	**Bursting pressure**

SYMBOL	DESCRIPTION
	**Pipe unit linear weight**
	**Average external diameter of the flexible pipe**
	**Average internal diameter of the flexible pipe**

As already pointed out, all the characteristics listed above are strictly established by international standards, both in terms of absolute value and range of variability.

The variability of these technical characteristics and their containment within a narrow oscillation band are the basis for the production of a quality product. Essentially, producing pipes that not only guarantee but also maintain the necessary requirements and safety standards over time, the main factors to take into account are:

a) RUBBER COMPUNDS

The quality of the various components of the compounds, both polymeric and chemical, is directly reflected in the characteristics of the compounds themselves in terms of:

- *Compatibility of the rubber underlayer with the various fluids used in hydraulic circuits.*
- *Resistance of the rubber coating to atmospheric agents (ozone) and wear.*
- *Ensuring that elasticity is maintained over time, which is essential in products that need to remain excellent flexibility during use.*

The use, for economic reasons, of second-rate polymers, the excessive addition of inert fillers such as kaolin and the lack or absence of costly additives that regulate the vulcanization of the compound or protection from external agents, have a decisive, qualitative influence, on the (in-operational) behaviour of the hydraulic pipe, causing significant critical consequences such as a rapid decline in performance.

It is common, especially in the agricultural equipment sector, where low-quality pipes are often used, to note rapid cracking of the rubber coating thus exposing the metal reinforcement, as well as an accelerated hardening of the rubber, with a consequent reduction in the elasticity and flexibility of the pipe.

b) STEEL REINFORCEMENT

The steel wire that makes up the metal braid reinforcing the hydraulic pipe, in addition to guaranteeing its mechanical characteristics, must, thanks to a surface brass-plating treatment, develop a chemical bond with the compounds during the vulcanization phase, so as to make these components mutually supportive even during operation, when the pipe works with rapid pressure excursions.

The process of brass-plating steel wire is not only expensive, but also involves sophisticated equipment that is subject to very careful monitoring. For these reasons, there are relatively few reliable plants in the world and, it seems, none in the Far East, with the exception of Japan, which has suitable technology.

2. PROCESS MONITORING

It must therefore be reiterated that quality products must be manufactured by plants where process quality control is a fundamental rule in setting up and managing the processing cycles. In particular, with regard to the industrial production of flexible hydraulic pipes, process monitoring during the following phases is essential from the point of view of the qualitative result:

• Calibration of the inner diameter, the size and variability of which depend on calibrated polypropylene supports upon which the sublayer compound is extruded. These polypropylene sublayers undergo natural degradation during their lifecycle in the production process and must be constantly checked with size gauges to avoid excessive variability and non-compliance due to being out-of-tolerance.

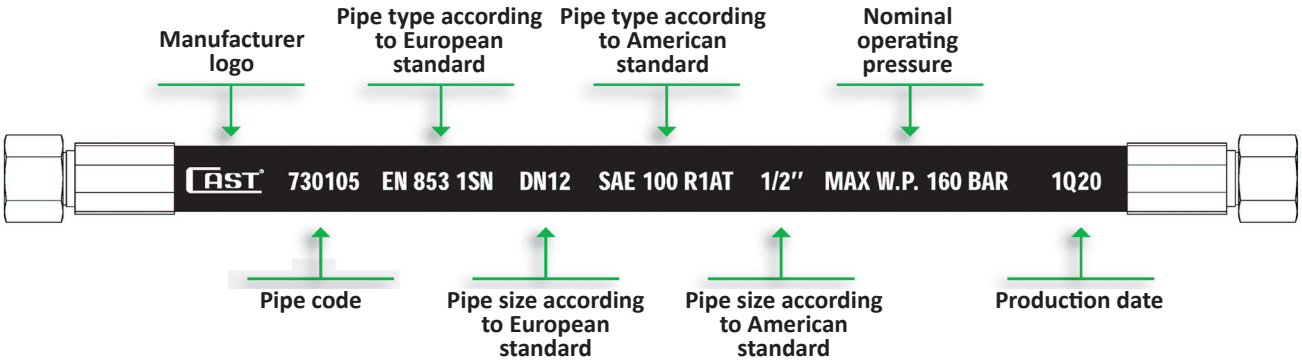
• Calibration of the outer diameter and the thickness of the covering, therefore requiring continuous monitoring which, in addition to taking measurements, must also implement adjustment of the extruder in order to maintain the dimensional constancy of the covering itself.

• Winding of the brass-plated steel wire to form the metal braid that makes up the reinforcement.
Inadequate process monitoring control on systems operating at very high production speeds, is the cause of wiring overlaps, which contribute to structural weak spots and hence potential leakage of the pipe during operation.

• Controlling the vulcanization phase, in which the transformation of the rubber compounds from plastic to elastic material takes place and activates the chemical adhesion process between the metal wire and the rubber compounds. The use of poor-quality/outdated materials and inadequate control of the vulcanization cycle can lead to a failure in product stabilisation, which may result in the various components becoming unstuck or loose during operation, with inevitable collapse of its structure.

• 100% hydrostatic testing as an integral part of the production cycle.
Process monitoring control during these production phases is decisive above all for one of the product's fundamental characteristics, namely fatigue resistance (a.k.a. service life), a parameter which is obviously linked not only to the design, but also, and above all, to the quality features of the components and careful control of the production process.
Regarding this feature (resistance to fatigue), the user can only verify the quality of the product after the event, having to suffer the consequences of former decisions to use products made with obsolete equipment and inferior raw materials.

PIPE MARKINGS



Although we are fully aware of the technical problems that these low-cost and even more so, low-quality, flexible hydraulic pipes have created and continue to create for users, we have undertaken, at our testing room in Casalgrasso (CN), certain tests on various pipes of this type on the market; pipes of dubious origin, with an unbearable smell, which our company considers harmful and dangerous for people, things and the environment. The results are as follows :

Test number	DN in mm	Type of pipe	Pipe with dubious origins	Type of test	Operating pressure (bar)	Test pressure (bar)	Test result	Note
1	06	1SN	on the market	cyclical 150.000	225	281,5	Non-compliant	braid breaking at 72.837 cycles
2	10	1SN	on the market	cyclical 150.000	180	225	Non-compliant	braid breaking at 3.272 cycles
3	12	1SN	on the market	cyclical 150.000	160	200	Non-compliant	braid breaking at 49.305 cycles
4	19	1SN	on the market	cyclical 150.000	105	131,5	Non-compliant	pipe punctured at 35.420 cycles
5	25	1SN	on the market	cyclical 150.000	88	110	Non-compliant	pipe punctured at 66.842 cycles

Test number	DN in mm	Type of pipe	Pipe with dubious origins	Type of test	Operating pressure (bar)	Test pressure (bar)	Test result	Note
6	06	2SN	on the market	cyclical 200.000	400	532	Non-compliant	pipe punctured at 3.064 cycles
7	10	2SN	on the market	cyclical 200.000	330	439	Non-compliant	pipe punctured at 12.966 cycles
8	12	2SN	on the market	cyclical 200.000	275	366	Non-compliant	braid breaking at 26.574 cycles
9	19	2SN	on the market	cyclical 200.000	215	286	Non-compliant	pipe unthreaded due to broken underlayer at 12.042 cycles
10	25	2SN	on the market	cyclical 200.000	165	219,5	Non-compliant	pipe unthreaded due to broken underlayer at 6.863 cycles

As can easily be seen from the results of the tests, our most pessimistic predictions have consistently been verified. Having established the truth of the facts, everyone is free to make their own choices and use the pipes they prefer, assuming full responsibility thereof.

Cast S.p.A. hydraulic pipes, as well as those produced by numerous well-qualified Italian and foreign companies, easily pass the above-mentioned standard tests.

4. LIABILITY

Presidential Decree 224 - EEC 85/347 states: "...liability shall be charged to the party found to have been negligent.... ".

In concrete terms, the manufacturer shall only be held legally liable for negligence and wilful misconduct if the item is effectively found to be defective in design or execution/ production.

On the other hand, the Distributor making the sale must have made provisions to ensure that its customer is fully aware of all the technical issues relating to the product itself, such as assembly instructions, and that it is used in the correct applications and in complete safety for the environment, persons and property.

Similarly, the End-User shall be held liable if, through negligence, carelessness or wilful misconduct, it has not scrupulously followed the Manufacturer's written stipulations (Technical Sales Catalogue) that must be provided as technical support by whoever sold it the product.

The user who, purely for economic interest, knowingly ignores the duty to ensure that the products used or marketed are compliant, safe and not harmful, shall, in the event of an accident, to persons, the environment or property, be jointly and severally liable in the appropriate (civil and criminal) courts. This is because buying, selling or using products that do not have the standard characteristics and relative functional and safety performance, prefigures an objective "Responsibility" to be classified as "Deliberate and Voluntary", given that such a choice is aimed at obtaining illicit gain to the detriment of safety, good faith and environmental protection.

The sleeves of the fitted flexible hydraulic pipes are life-limited parts.
This must be taken into account in preventive and planned maintenance operations.

It is not permitted to mix and use components from different hydraulic fitting manufacturers. Company and traceability marks on the product are key.

Pressurised fluids can cause serious personal injury and property damage, so always exercise the utmost caution, respecting all standard stipulations and adopt the precautionary principle of prudence for yourself and others in order to avoid any accident.

The sleeves of connected hydraulic pipes must always be protected by casings or bound by a safety cable, so as to protect people and prevent them from hitting surrounding personnel in the event of their be coming detached.

The use of products of different makes on the same connection will invalidate the warranties on functionality and automatically transfer "liability" to the person who has adopted this choice, which is not recommended by any manufacturers of hydraulic components.

5. CONCLUSION

The guarantee offered by a product manufactured using the best technology, with good raw materials, controlled industrial processes and in full compliance with the laws in force on worker safety and the environment, is undoubtedly of greater value from both an industrial and an ethical point of view than the illusory savings obtained through the use of cheap, low-quality products with unreliable performance, dangerous applications and harmful to the environment.

Whoever markets or uses this type of low-quality product is knowingly complicit in illegal behaviour, since the product is not what it appears to be, almost always has a dubious origin and does not comply with the technical characteristics of the reference standard, either in terms of performance or safety parameters.

For all the above reasons, Cast S.p.A. says a definitive NO to the use of low-quality products and strongly advises all users to use only good quality products.

Hydraulic pipes, manufactured by companies that comply with the standards and operate in full compliance with the current applicable legislation on manufacturing and safety.

The name and nationality of the company chosen as a supplier are irrelevant, but it is imperative to ensure that it operates in a proper ethical, regulatory and legal context.

Those who fail to do so bear the full responsibility for acting against the principles of fair competition with regard to those who respect the law, and they will not be able to complain if at some point these considerations take the form of a complaint addressed to the investigating magistracy, the Arpa, Inail, Inps control bodies and the national and international press, not least to have their voice heard on a problem that concerns all the countries of the world and all the people living therein.

The aim of this article is to shed some light on at least one of the many topics that loom large in the world of high-pressure hydraulic fittings. No controversial vein, no promotional intent, but simply the truth of the facts as we see them. We are available for further in-depth information upon request.

FLEXIBLE PIPE STORE

The properties of the rubber deteriorate during storage and also use of the pipe. DIN 20066 (Power systems - assembled flexible pipes - measurements - requirements) and ISO 8331 specify the shelf- and service-life of the assembled pipe:

- The storage period for loose pipes should not exceed 4 years from the date of manufacture.
- The storage period of assembled pipes should not exceed 2 years from the date of manufacture.
- The service life of assembled pipes, including any storage period, must not exceed 6 years.

CORRECT STORAGE PROCEDURE

- **ALWAYS IMPLEMENT THE STOCK ROTATION SYSTEM (FIFO);**
- Always store the rolls of pipe in their original suppliers' packaging;
- Store the rolls in closed areas in order to protect them from unfavourable climatic factors;
- Avoid contact with oil and grease;
- Do not store them near high-power transformers, motors or generators that induce;
- current to the metal reinforcement of the pipe;
- Avoid contact with insects/rodents;

FLUID COMPATIBILITY TABLE

The following table indicates, according to the different compatibility with the fluid used, the best possible choice as a combination of type of fitting material (carbon steel or stainless steel) and type of elastomer seal material (NBR or FKM).

The data is purely indicative as it may be subject to variations due to pressure, operating temperature, ambient temperature and conditions of use.

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Ethyl acetate	C	A	D	D	D	D	E
Acetylene	C	B	A	A	D	D	A
Vinegar	C	A	A	A	D	D	E
Acetone	A	A	D	D	D	D	B
Acetic acid 5%	D	A	A	A	D	D	A
Boric acid	D	A	A	A	A	A	A
Carbonic acid	D	C	A	A	C	C	E
Citric acid	D	C	A	A	B	B	B
Hydrochloric acid	D	D	D	A	D	D	E
Hydrofluoric acid	D	D	C	C	D	D	E
Formic acid	D	D	D	D	D	D	E
Phosphoric acid	D	C	D	A	D	D	C
Lactic acid	D	A	A	A	D	D	E
Nitric acid	D	C	D	A	D	D	D
Sulphuric acid	C	C	D	A	C	C	D
Tannic acid	D	D	A	A	A	B	C
Water	C	A	A	A	A	A	A
Water-glycol	A	A	A	A	A	A	A
Deionised water	C	A	A	A	A	A	A
Distilled water	C	A	A	A	A	A	A
Seawater	D	C	A	A	C	C	E
Oxygenated water	D	A	B	A	E	E	E
Mineral turpentine	A	A	B	A	C	C	C
Turpentine	C	A	B	A	C	C	C
Drain water	C	C	A	A	C	C	C
Addinol Okoplus HETG 32-68	A	A	E	E	B	B	E
Addinol Okosynth HEES 46	A	A	E	E	C	C	E
RTV adhesives and silicone glues	A	A	E	E	D	D	E
AeroShell Fluid 41	E	E	E	E	A	A	A
AeroShell Turbine Oil 500	A	A	A	A	C	C	E
Agip Arnica Extra Plus	E	E	E	E	B	B	B
Agip Arnica Plus	E	E	E	E	A	A	A
Agip Arnica 22, 32, 46, 68	A	A	B	B	B	B	A
Agip ATF IID	E	E	E	E	D	B	D
Agip Oso 32	E	E	E	E	A	A	A
Agip Sint 2000	E	E	E	E	A	B	A
Amyl alcohol	D	A	A	A	D	D	E
Butyl alcohol (Butanol)	C	A	A	A	C	C	E
Ethyl alcohol (Ethanol)	C	A	A	C	B	B	B
Isopropyl alcohol	C	A	C	A	C	C	E
Methyl alcohol (Methanol)	C	A	B	D	C	C	B
Ammonia gas (cold)	A	A	A	D	A	B	A
Ammonia liquid	C	A	A	D	B	B	A
Anderol 497	E	E	E	E	B	C	B
Carbon dioxide	A	A	A	A	C	C	B
Aniline	A	A	D	C	D	D	C
Aral Vitam DE 46, 68	A	A	A	A	A	A	B
Aral Vitam GF 68	E	E	E	E	A	A	A

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Argon	D	A	A	A	E	E	E
Air	A	A	A	A	A	A	A
Dry air	A	A	A	A	B	B	A
Compressed air	A	A	A	A	A	A	A
Aromatics 100,150	A	A	E	E	C	C	E
Asphalt	D	A	A	A	C	C	E
Avia Sintofluid N32	A	A	E	E	A	B	A
Avia Sintofluid N46	A	A	E	E	A	A	A
Nitrogen	A	A	A	A	B	B	B
Benzene, Benzol	A	A	D	A	D	D	C
Petrol	A	A	A	A	D	D	B
Petrol (Isoctane)	A	A	A	A	A	B	A
Petrol (70% isoctane, 30% toluene)	A	A	D	C	B	C	A
Petrol (50% isoctane, 50% toluene)	A	A	D	C	C	D	B
Unleaded petrol	A	A	A	A	D	D	E
Sodium bicarbonate	A	B	A	A	A	A	A
Binol Hyd 46	E	E	E	E	B	A	B
Sulphur dioxide	D	A	D	A	D	D	D
Sodium bisulphate	C	C	A	A	D	D	E
Carbon disulphide	A	A	D	A	E	E	E
Borax	C	A	A	A	C	C	E
BP Energol HLP-HM 68	A	A	E	E	A	A	E
BP Biohyd 46	A	A	B	B	B	B	A
BP Vanellus C5	E	E	E	E	B	C	C
Brine	D	C	E	E	C	C	E
Butane	A	A	A	A	C	C	A
Castrol 5000	A	A	E	E	C	C	E
Castrol Aero HF 585 B	A	A	A	A	A	B	A
Castrol Brayco 717	B	B	B	B	B	B	B
Castrol Brayco Micronic 882	A	A	E	E	A	B	E
Castrol Brayco Micronic 889	A	A	E	E	C	C	E
Castrol Bio Tec Alpin 22	A	A	E	E	A	A	A
Castrol Hyspin HDH 7000	E	E	E	E	A	A	A
Castrol Icematic SW 100	E	E	E	E	B	B	C
Castrol Aerial Lift Fluid	E	E	E	E	A	A	A
Tar	D	A	A	A	D	D	E
Celluguard	A	A	A	A	A	A	E
Kerosene	A	A	A	A	A	B	E
Chevron Clarity Hydraulic Oil AW 32, 46, 68	A	A	E	E	A	A	E
Chevron FLO-COOL 180	A	A	E	E	C	C	E
Chevron HyJet IV	A	A	E	E	D	D	E
Chevron Hydraulic Oil AW MV 15, 32, 46, 68, 100	A	A	E	E	A	A	E
Potassium chlorate	D	C	E	E	A	A	A
Chlorine	D	A	D	A	C	C	C
Ammonium chloride	D	D	A	E	A	A	E
Calcium chloride	C	D	A	A	A	A	A
Ethyl chloride	C	C	A	A	D	D	E
Magnesium chloride	D	D	A	A	A	A	E
Methyl chloride	A	A	D	A	D	D	E
Copper chloride	D	D	A	A	A	B	E
Sodium chloride	D	A	A	A	B	B	B
Zinc chloride	D	C	A	A	A	A	A
Sulphur chloride	C	C	D	A	D	D	E

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Glue	A	A	E	E	C	C	C
Coolanol 20, 25R, 35R, 45R, OS-59	A	A	A	A	A	A	A
DEA Econa E46	A	A	A	E	B	C	A
Dea Triton SE 55	E	E	E	E	B	B	B
Polyester	A	A	B	A	D	D	E
Sulphur dioxide	D	C	D	D	D	D	D
Dot 3	E	E	E	E	D	B	D
Dot 4	E	E	E	E	D	B	D
Dow Corning 200, 510, 550, C6-560	A	A	E	E	A	A	E
Dow HD50-4	C	A	E	E	C	C	E
Dowtherm A, E	A	A	D	A	D	D	E
Dowtherm G	A	A	E	E	D	D	E
Elf Hydrelf Bio 46	A	A	E	E	A	A	E
Helium gas	A	A	A	A	D	D	E
Emkarate RL 100S	E	E	E	E	C	B	C
Hexane	A	A	C	A	C	C	E
Esso Dexron III ATF	A	A	E	E	B	B	A
Esso Esstic 42,43	A	A	A	A	A	A	A
Esso Nuto H46, H68	A	A	E	E	A	A	E
Esso Hydraulicoel HE 46	A	A	E	E	B	B	A
Esso Teresstic	A	A	E	E	A	A	E
Esso Turbo Oil 2380	A	A	E	E	A	B	E
Esso Univis J26	A	A	E	E	A	A	E
Esso Univolt 60, N 61B	A	A	E	E	A	B	E
Polyol esters	A	A	E	E	D	D	E
Mixed phosphoric ester	A	A	E	E	D	D	E
Phosphoric esters	A	A	E	E	D	D	E
Silicate esters	A	A	A	A	B	B	E
Ethane	A	A	A	A	C	C	E
Ether	A	A	E	E	E	E	E
Petroleum ether	A	A	E	E	C	C	E
Ethyl-cellulose	D	C	E	E	C	C	E
Ethylene dichloride	D	D	E	E	D	D	E
Phenol (carbolic acid)	D	A	D	A	D	D	E
Fina Biohydran AW 46	E	E	E	E	B	B	B
Finke Aviaticon HY-HE 46	A	A	E	E	A	A	E
Formaldehyde	D	A	C	D	D	D	E
Ammonium phosphate	D	C	A	E	A	A	E
Fragol Hydraulic HE 46	A	A	E	E	C	C	E
Fragol Hydraulic TR 46	A	A	E	E	B	B	E
Freon 12	A	A	A	A	D	D	E
Freon 22	A	A	D	D	D	D	E
Freon 113, 114	A	A	A	A	D	D	E
Freon 502	A	A	A	A	D	D	E
Fuchs Planto Hytrac	E	E	E	E	A	A	B
Fuchs Plantohyd S46	E	E	E	E	A	A	E
Fuchs Plantosyn 3268	A	A	E	E	A	A	E
Fuchs Plantosyn 3268 Eco	A	A	E	E	C	C	E
Fuchs Renolin MR 320, 520	E	E	E	E	B	A	A
Fyre-Safe 120C, 126, 155, 1090E, 1150, 1120, 1300E	A	A	E	E	D	D	E
Fyre-Safe 200C, 211,225	A	A	E	E	A	B	E
Fyre-SafeW/O	A	A	E	E	A	A	E
Fyrguard 150, 150-M, 200	A	A	E	E	A	A	E

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Fyrquel 60, 90, 100, 150, 220, 300, 500, 550, 1000	A	A	E	E	D	D	E
Fyrquel EHC, GT, LT, VPF	A	A	E	E	D	D	E
Fyrtek MF, 215, 290, 295	A	A	E	E	D	D	E
Combustible gas	D	A	A	C	E	E	E
Liquid gas (GPL)	A	A	A	A	C	C	E
Natural gas	A	A	A	A	B	B	E
Untreated natural gas	A	A	A	A	B	B	E
Diesel	A	A	A	A	B	B	A
Glycerine	A	A	A	A	A	A	A
Glycol	A	A	A	A	A	A	A
Glycolethylene	A	A	A	A	A	B	E
Fat	A	A	A	A	A	A	E
Animal fat	C	A	A	A	C	C	E
Gulf FR fluids P37, P40, P43, P47	A	A	A	A	D	D	E
H-515 (Nato)	A	A	E	E	A	A	E
Houghto Safe from 271 to 640	A	A	A	A	A	B	B
Houghto Safe 419R	A	A	E	E	A	A	E
Houghto Safe 1010, 1055, 1110, 1115, 1120, 1130	A	A	D	A	D	D	E
Houghto Safe 5046, 5046W, 5047F	A	A	A	A	A	A	E
Houghton Cosmolubric HF-122, HF-130, HF-144	A	A	E	E	C	D	C
Hydrolubric 120B, 141	A	A	E	E	A	B	E
Hydro Safe Water Glycol 200	A	A	E	E	A	A	E
Hydrogen	A	A	A	A	D	D	E
Ammonium hydroxide	C	A	D	D	C	C	C
Calcium hydroxide	A	A	A	A	A	A	A
Magnesium hydroxide	C	C	A	A	B	B	B
Potassium hydroxide	C	A	A	D	B	B	B
Sodium hydroxide	A	A	A	A	C	B	C
Ammonia hydride	D	D	E	E	D	D	E
Iodine	D	A	C	A	E	E	E
Calcium hypochlorite	D	D	A	A	D	D	E
Sodium hypochlorite	D	D	A	A	C	C	C
Isocyanate	A	A	E	E	C	C	E
Isopar H	A	A	E	E	D	D	E
Isottano	A	A	A	A	C	C	E
JP3, JP4, JP5	A	A	C	C	B	B	B
Kaeser 150P, 175P, 325R, 687R	A	A	E	E	D	D	E
Lindol HF	A	A	D	A	D	D	E
Brake fluid	D	D	C	D	D	D	E
Mercaptan	E	E	D	A	D	D	E
Mercury	E	E	A	A	A	A	A
Methane	A	A	A	A	A	B	E
Methylethylketone	C	A	D	D	D	D	D
Methyl isopropyl ketone	C	A	D	D	D	D	E
Metlube 220	E	E	E	E	C	B	C
MIL-B-46176A	D	D	E	E	D	D	E
MIL-H-46170	A	A	E	E	C	C	E
MIL-H-5606	A	A	A	A	A	B	B
MIL-H-6083	A	A	A	A	A	B	E
MIL-H-7083	A	A	A	B	A	B	C
MIL-H-83282	A	A	E	E	A	B	E
MIL-L-2104, 2104B	A	A	A	A	A	B	E
MIL-L-23699	A	A	E	E	C	C	E

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
MIL-L-7808	B	A	B	A	A	B	C
Mobil Aero HFA	A	A	E	E	A	B	E
Mobil Aero HFE	A	A	E	E	A	B	B
Mobil ATF Fluid	E	E	E	E	C	A	B
Mobil Delvac 1300 (series)	E	E	A	A	A	B	A
Mobil DTE 11M, 13M, 15M, 16M, 18M, 19M	A	A	E	E	A	B	E
Mobil DTE 22, 24, 25, 26	A	A	A	A	A	B	C
Mobil EAL Artic 22	E	E	E	E	B	A	B
Mobil EAL 224H	A	A	E	E	A	B	A
Mobil Glygoyle 11,22, 30	A	A	E	E	A	A	A
Mobil Hydrofluid HFDU 68	E	E	E	E	A	A	A
Mobil Jet II	A	A	E	E	C	C	E
Mobil Nyvac 20, 30, 200D, FR	A	A	E	E	A	B	E
Mobil Pyrogard 42, 43, 51,53, 55	A	A	D	A	D	D	D
Mobil Pyrogard D	A	A	E	E	A	B	E
Mobil Rarus 826, 827, 829	A	A	E	E	D	D	E
Mobil SHC 524	E	E	E	E	C	B	C
Mobil Therm 600	E	E	A	A	B	B	B
Mobil Vactra	A	A	E	E	A	A	E
Mobilfluid 423	A	A	E	E	A	B	E
Mobilgear SHC 150, 220, 320, 460, 600, 680, 800	A	A	E	E	C	C	E
Mobilarma 525	A	A	E	E	A	A	E
Molub-Alloy Tribol 890	A	A	E	E	D	D	E
Moly Lube 902 HF	A	A	E	E	C	C	E
Monolec 6120	A	A	E	E	A	A	E
Carbon monoxide	A	A	A	A	C	C	E
Morpholine	D	A	E	E	D	D	E
Naphtha	A	A	A	A	B	B	A
Naphthalene	A	A	D	A	D	D	A
Neon	D	A	A	A	E	E	E
Neste Biohydrauli SE 46	E	E	E	E	A	A	A
Ammonium nitrate	C	A	A	E	A	A	B
Sodium nitrate	A	A	A	A	C	C	E
Nitrobenzene	D	C	D	A	D	D	E
Silicone oils	A	A	A	A	A	A	E
Petroleum-based oils	A	A	A	A	A	A	E
Oil ASTM n°1.5	A	A	A	A	A	A	A
Oil ASTM n°2. 4	A	A	A	A	A	B	A
Oil ASTM n°3	A	A	A	A	A	C	A
Heating oil	A	A	A	A	A	B	E
Cotton oil	A	A	A	A	A	B	E
Linseed oil	A	A	A	A	A	A	E
Petroleum oil	A	A	A	A	A	B	E
Castor oil	A	A	E	E	A	A	E
Soya oil	A	A	A	A	A	B	E
Mineral oil	A	A	A	A	A	A	E
Natural mineral oil	A	A	C	A	A	A	E
Oil for hydraulic controls	A	A	A	A	E	E	E
Braking system oil	A	A	D	D	E	E	E
Transmission oil (ATF)	A	A	A	A	A	A	E
Vegetable oil	A	A	A	A	E	E	E
Omv Biohyd MS 46	E	E	E	E	B	B	B
Carbon oxide	A	A	A	A	B	B	E

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Oxygen	D	A	D	D	D	D	E
Ozone	A	A	D	A	C	C	E
Panolin Gro Synth 46	E	E	E	E	B	B	E
Panolin HLP Synth 46	A	A	E	E	A	B	E
Paraffin	E	E	C	A	A	A	A
Pentane	E	A	A	A	A	C	A
Liquid pentane	E	A	A	A	A	C	A
Pentosin CHF 11 S	E	E	E	E	C	B	C
Perchloroethylene	C	A	A	A	D	D	C
Hydrogen peroxide	D	B	D	D	D	D	E
Sodium peroxide	D	A	A	A	D	D	E
Polyalkylene glycol (PAG)	A	A	E	E	C	B	E
Propane	A	A	A	A	D	D	E
Propylene glycol	C	C	A	A	A	B	E
Pydraul 60, 150, 625, F9	A	A	D	A	D	D	E
Pydraul 135, 230C, 312F, 540C	A	A	D	A	D	D	D
Pydraul A200	A	A	D	A	D	D	E
Q8 Handel 68	E	E	E	E	C	B	C
Quaker Quintolubric 888	C	A	B	A	A	A	A
Quaker Quintolubric 822 (series), 833	C	A	B	A	B	C	A
Quaker Quintolubric 957, 958	C	A	B	A	A	B	A
Raisio Biosafe HO 46 SE	E	E	E	E	B	B	B
Refrigerant HFC134	A	A	E	E	D	D	E
Revolt S.B.H.	E	E	E	E	A	A	B
Safety Kleen Hydraulic ISO VG 32, 46, 68	A	A	E	E	A	B	E
Santoflex 13	A	A	E	E	C	C	E
Santosafe 300	A	A	E	E	D	D	E
Santosafe W-G 15, 20, 30	A	A	E	E	A	A	E
Shell Cassida HF 46	E	E	E	E	B	B	B
Shell Clavus 32, 68	A	A	E	E	D	D	E
Shell Comptella	A	A	E	E	C	C	E
Shell Comptella S46, S68, SM	A	A	E	E	C	C	E
Shell Corena D	E	E	E	E	C	B	C
Shell Diala A, AX	A	A	A	A	A	B	A
Shell Naturelle HFE 15, 32, 46, 68	A	A	A	A	B	B	A
Shell Pella A	A	A	E	E	A	A	E
Shell Rimula X	E	E	E	E	B	A	B
Shell Tellus	A	A	A	A	A	A	A
Shell Tellus Arctic 32	E	E	E	E	A	B	A
Shell Thermia C	A	A	E	E	A	A	E
Shell Turbo	A	A	E	E	C	C	E
Shell V-Oil 1404	E	E	E	E	B	B	B
Sodium silicate	A	A	A	A	A	A	E
Silicone	A	A	A	A	E	E	E
Soda (sodium bicarbonate)	A	A	A	A	A	A	E
Ammonium sulphate	C	C	A	D	A	A	A
Magnesium sulphate	A	A	A	A	A	A	E
Copper sulphate	D	C	A	A	A	A	E
Sodium sulphate	A	A	A	A	A	A	A
Carbon sulphide	A	A	D	A	D	D	E
Hydrogen sulphide	D	C	E	E	D	D	E
Potassium sulphide	A	A	A	A	A	A	A
Zinc sulphide	D	A	E	E	A	A	A

FLUIDS	CARBON STEEL	INOX STEEL	RUBBER SEALS		FLEXIBLE PIPES		
			NBR	FKM	BRAIDED	COILED	THERMOPLASTICS
Solutia Skydrol 5, 500B-4, LD-4	A	A	D	B	D	D	A
Solutia Skydrol 500	E	E	D	D	D	D	D
Soap solutions	A	A	A	A	C	C	E
Stoddard solvent	A	A	A	A	C	C	E
Lacquer solvents	D	A	E	E	D	D	E
Ssr Ultra coolant	E	E	E	E	B	A	B
Styrene	E	A	D	A	E	E	E
Tamoil Green Hydro Safety 46	E	E	E	E	A	A	A
Teboil Hydraulic Eco 46	A	A	E	E	C	C	E
Teboil Hydraulic Oil Polar	E	E	E	E	A	B	A
Carbon tetrachloride	C	C	A	A	D	D	E
Texaco Hydra 46	E	E	E	E	A	B	A
Toluene	A	A	D	C	D	D	B
Turpentine	A	A	A	A	D	D	E
Trichloroethylene	D	A	C	A	D	D	C
Trichloroethylene	D	C	D	C	E	E	E
Trim-Sol	A	A	E	E	A	B	E
Sulphur trioxide	D	D	D	A	D	D	E
Ucon Hydrolube J-4	A	A	B	C	B	C	B
Urea	C	C	A	A	C	C	E
Urethane	A	A	E	E	A	A	E
Steam	C	A	C	C	D	D	E
Varsol fluids	A	A	E	E	C	C	E
Varnish	C	A	A	A	D	D	E
Enamel paint	D	A	C	C	D	D	E
Versilube F44, F50, F55	A	A	A	A	A	A	A
Xylene, Xylol	A	A	D	A	D	D	A
York 777	E	E	E	E	B	B	B
Zerol 150	A	A	E	E	A	A	E
Sulphur	D	C	D	A	B	B	B

KEYS

A = Excellent

B = Good

C = Sufficient

D = Not recommended

E = Insufficient data

In order to make an informed choice of the pipe to be used in a hydraulic system, you must first analyse the application, taking into account environmental conditions, installation space, operating conditions of the pipe, fluids to be used, type of machinery, etc.

Particular attention must be paid to the compatibility of the fluid with the pipes: it must not damage the sublayer, the outer coating, the reinforcement of the pipe or the fittings themselves.
In some cases, special piping may be required.

THANK YOU FOR YOUR ATTENTION

Globalisation has radically changed the exchange of goods and services. We must acknowledge this and commit ourselves to creating the conditions so that this now irreversible situation can be experienced as an opportunity and not as a source of major problems. There is an old saying: "Flowers can even bloom from landslides".

The correct information is therefore absolutely essential, and by means of this technical newsletter, our company has attempted to provide a technical overview of some of the most significant aspects of hydraulics and the components we produce and market.

The technical articles included in our newsletter are not intended to be dogmas, but rather our company's opinions on a number of topics that we consider important and worthy of further study with a view to safety and "Continuous Improvement". They are expressed in good faith and we have total belief in them.

Hydraulic technicians must have the proper training and it must be continuously updated. Only fully trained technicians who comply with the standards and instructions of the manufacturers of hydraulic components can guarantee the safety of these systems, which are intrinsically dangerous due to the high pressures involved.

In conclusion, the company's "Technical Committee" would like to thank the many people who have been involved, each according to their expertise, in the drafting of this working tool, which we hope will be appreciated by those in the hydraulics sector and used with common sense, for the safety of all. Special thanks are due to our Technical Office staff who have worked with skill and passion to make this important document a success.

Cast Spa

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Aree di Vendita • Sales Areas

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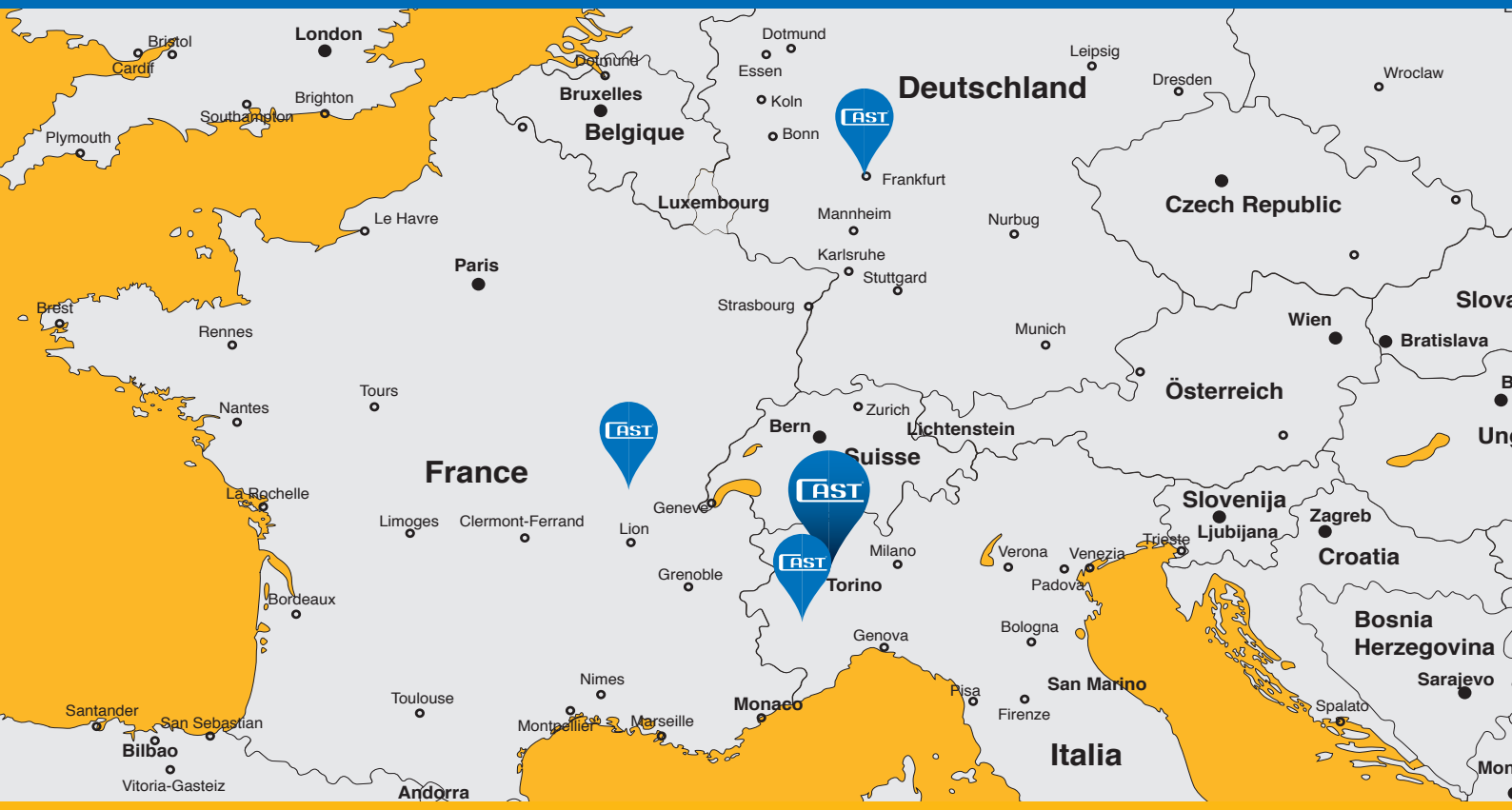
Note

Note



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