



# B4

NEW SIX-SEALS CUTTING RING.  
INTERNATIONAL INDUSTRIAL PATENT Nr. 864061 of the 10/03/99  
FLANKS AND DOES NOT REPLACE THE STANDARD RING CURRENTLY IN USE

AVAILABLE IN CARBON AND STAINLESS STEEL

## THEORY OF OPERATION

The "B4" is a highly innovative, deformable, double clinching, double edge ring with double elastomer seal that is assembled according to well-known techniques and is perfectly interchangeable with all types of rings used on 24° cone fittings complying with the ISO 8434-1/DIN 2353 standards.

The ring helps fast assembly of removable tubes, avoids welding, tapping and flaring, thus assuring maximum simplicity of complex oleo-dynamic systems.

During tightening by the nut, the ring deforms according to the bore of the 24° cone of the fitting and bites into the steel tube, producing two deep cuts the first of which is visible due to lifting of an outer edge on the diameter of the tube, allows the water tightness and anti-unthreading of the ring. The second groove (invisible) balances the forces on the whole ring, prevents vibrations to reach the first groove and stops the stapling of the tube at a predetermined value.

### COUPLING SYSTEM DIN 2353

#### Traceability decoding

**CAST** =  
Manufacturer

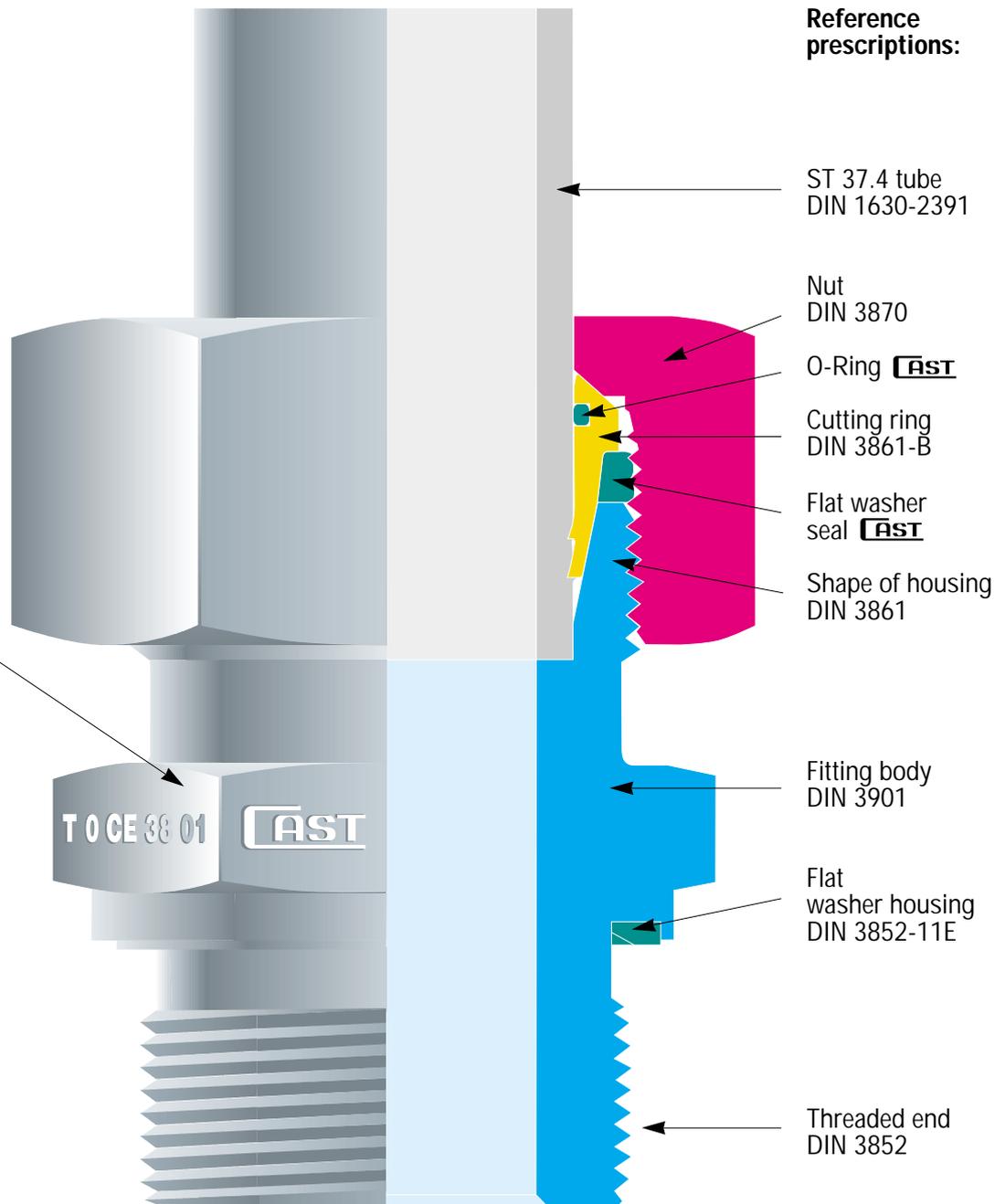
• T =  
Production plant

• 0 =  
Year manufactured

• CE =  
Made in EEC

• 38 =  
Type of steel used

• 01 =  
Heat number of the steel used



### Reference prescriptions:

ST 37.4 tube  
DIN 1630-2391

Nut  
DIN 3870

O-Ring **CAST**

Cutting ring  
DIN 3861-B

Flat washer seal  
**CAST**

Shape of housing  
DIN 3861

Fitting body  
DIN 3901

Flat washer housing  
DIN 3852-11E

Threaded end  
DIN 3852

## TECHNICAL CHARACTERISTICS

The "B4" ring assures perfect tightness of the circuit regardless of the fluid used provided that corrosive fluids are avoided and the nominal pressures of the fittings are complied with. The fittings on which the "B4" rings are mounted are manufactured in two series that are used according to the operating conditions.

"L" light duty series for applications characterized by medium high pressures, maximum 315 bar.

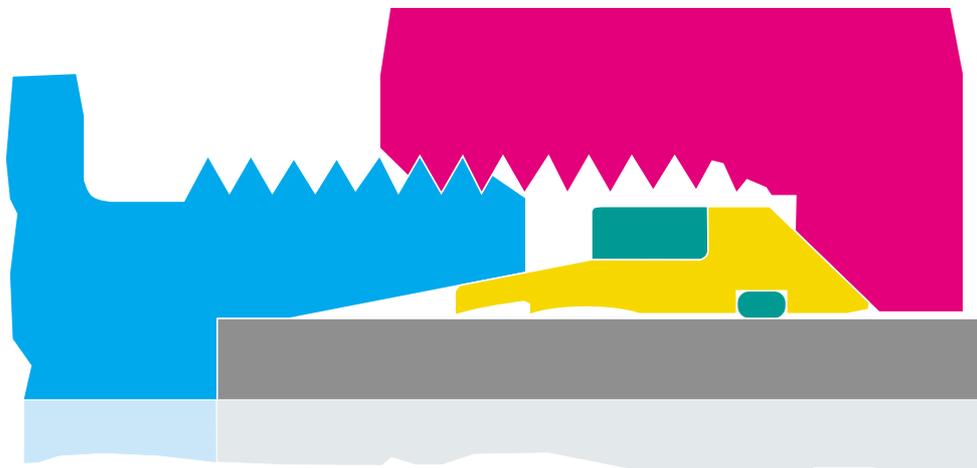
"S" heavy duty series for harsh applications characterized by high temperatures and a maximum pressure of 630 bar.

"B4" performance is not affected by vibrations within normal limits and the product maintains its optimal characteristics, as an absolutely safe ring, even at maximum values.

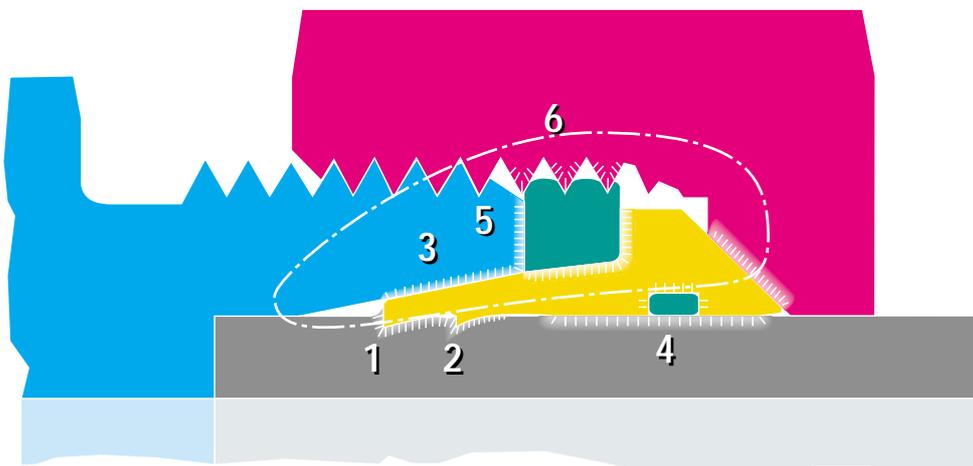
When the fitting, ring, nut, tube system is assembled, the flat seal is compressed between the head of the cutting ring and the front of the fitting body. The mechanical pressure applied to the flat seal causes flexure towards the outside, with a consequent increase in diameter. The deformation causes the compressed material of the seal to fill the turns of the thread of the nut free from the closing coupling with the fitting body, assuring locking of the nut and preventing any vibration-induced loosening of this.

When the fitting is disassembled the flat seal goes back to its original shape, without any damage, freeing the nut threads.

*Before assembly on the metal tube*



*After assembly on the metal tube*



Field of force after assembly  
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Pressure surfaces after assembly  
|||||

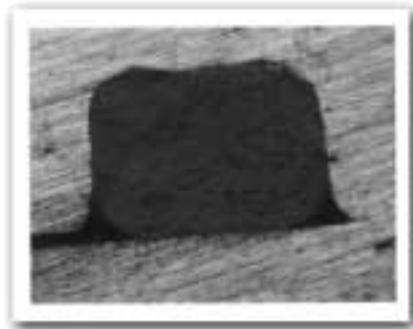
Sealing points  
1 - 2 - 3 - 4 - 5 - 6

**109. DETAIL OF B4 CUTTING RING SEALING POINTS**

Cutting ring: 100110.4  
 Tube: Ø22x1,5  
 Cutting ring assembly: one full turn on fitting body as per DIN 3859-2 norm  
 Magnifying: Microscope x5  
 Detail scale: 0,5



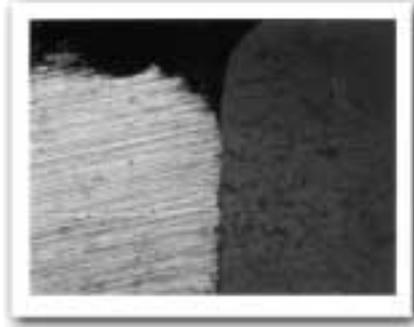
SEALING POINT 1  
FIRST CUTTING EDGE



SEALING POINT 4  
O-RING



SEALING POINT 2  
SECOND CUTTING EDGE



SEALING POINT 5  
FLAT WASHER SEAL ON FITTING BODY



SEALING POINT 3  
24° CONE



SEALING POINT 6  
FLAT WASHER SEAL IN NUT THREADS

## TECHNICAL INNOVATION

For many years now, there has been an increasing imperative market demand for fluid system components able to guarantee three main factors: safety, easy assembly, leakage-free tightness.

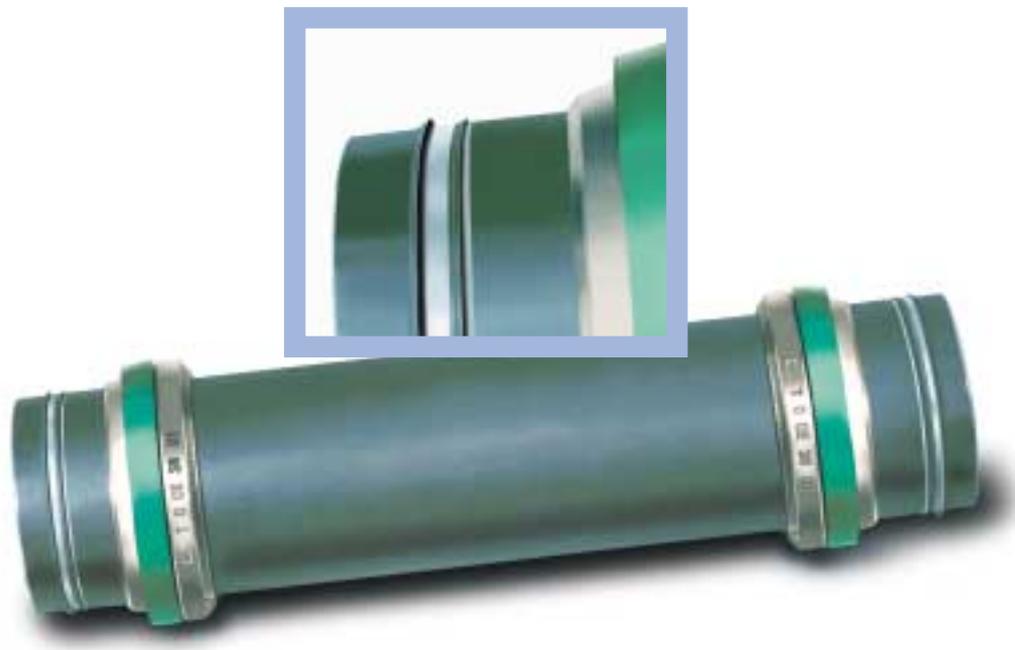
These elements, now considered essential for safety of the working environment (Law 626/94), product liability (Presidential Decree 224-EEC 85/374) and for the entire environmental protection system have promoted the development of the new "B4" ring as an effective response to all the above-mentioned problems.

## PRODUCT CONCEPT

The most original aspect of the product is that the structure of the existing ring has been used, inserting an O-Ring in the inside part to obtain another seal on the tube used and a flat seal on the outer diameter to obtain two additional seals.

The main idea behind the development of the "B4" was to design a new cutting ring able to go one step beyond the known techniques and to solve the problem of minor losses of tightness, leaks, sweating and loosening of the system fastening nut.

With this new ring, the double clinching of the steel tube is still possible and as well as, for obvious reasons of safety, the visual inspection of correct coupling between the ring and the steel tube, maintaining the current, perfectly functional system of assembly that is widely known to product users.



## SEALING

"B4" solves the problem of absolute tightness in the following way:

- On the outer diameter of the steel tube, with the double cutting edges and with an O-Ring placed inside the ring that provides a first seal with an elastomeric material that didn't exist before.
- In the 24° cone of the fitting body, with an increase in the metal-on-metal contact area and with a flat seal, placed statically on the outer diameter of the cutting ring which, when compressed between the head of the ring and the front of the fitting body, provides a second seal with an elastomeric material that didn't exist before.
- In the thread of the system fastening nut, with the flat seal. When this is compressed between the head of the ring and the front of the fitting body, it fills the threads of the nut that are not engaged in clinching of the coupling system, thus providing a third seal with an elastomeric material that didn't exist before.
- Basically, the "B4" provides six points of seal of which three metal to metal and three by means of two soft elastomeric seals (the flat seal assures two sealing points) thus obtaining a product able to assure complete tightness without any possibility of leakage even in particularly harsh operating conditions.

## GENERAL INSTRUCTIONS FOR B3 AND B4 RINGS

- Before starting the preassembly make sure that the pierce of the machine and the hardened blocks are in perfect working order. Further inspections are necessary during the preassembly (every 30-50 tightenings). For this purpose we advise to use a control buffer 1000... pierce and replace any block out of tolerance.
- Over the whole tightening phase the tube must be in touch with the inner part of the body of the fitting. If this does not happen, the ring will advance with the tube without indenting it, so the coupling would not be functional and it would be necessary to do the operation again. The tube must not turn with the nut during the tightening phase; the capability of the ring to rotate, once the pre-assembly is done, is not a deficiency but is a consequence of the right elasticity of the ring. Always check that the tube be correctly indented. If the indentation does not cover 80% of the ring front side then the assembly is not functional and must be done again. Indicated pressures are for steel tubes only.
- In case thin wall tubes are used, specially mild tubes, or tubes in Rilsan or similar, the assembling is possible, but a suitable reinforcement must be inserted into the end of the tube that is going to be tightened. Without the reinforcement it is not possible to operate with the above mentioned materials.
- Before assembling the preassembled tube to the equipment it is necessary to check that the tube and the fitting are aligned. Fitting should never be used to correct a wrong alignment or to be a support for the tube. Extremely long tubes or tubes undergoing high stress have absolutely to be fixed by using some support to avoid excessive vibrations that could cause damage to the system.
- The proper lubrication of components involved in the tightening is basic for good working. We advise to use mineral oils for carbon steel fittings and anti-seizing compound (Nickel basis) for Stainless steel fittings.
- The fittings and the valves in this technical catalogue may be used for fluideo-dynamic connections only.
- Is not allowed to mix carbon and stainless steel components.

## UTILIZATION STANDARDS FOR B3 AND B4 CUTTING RINGS

### CARBON STEEL FITTINGS

- High quality tubes must be employed to assure correct use and related technical performance of carbon steel fitting. Use of tubes without the aforementioned characteristics may seriously impair the efficiency of the fitting. We recommend use of the following tubes only: ST 37.4 steel seamless tubes complying with DIN 1630, inner and outer diameter tolerances as per DIN 2391, maximum permissible hardness, measured on the outer diameter of the tube is 75 HRB.
- All carbon steel tubes with a diameter of more than 10 mm must be pre-assembled using the specific preassembly machine. If this is not available, hardened blocks, to be clamped in vice for manual preassembly, must be used. Remember to oil the thread, nut and ring. If hardened pre-assembly blocks are not available, normal straight fittings can be used. The fitting used once must be replaced at each tightening. During preassembly, pay particular attention to parts such as reducing standpipes and nipples as these are made of raw materials characterized, therefore, by higher resistance compared with the cuts made on annealed tubes. These parts must always be pre-assembled on hardened 24° cones (for all diameters).

### STAINLESS STEEL FITTINGS

- High quality tubes must be employed to assure correct use and related technical performance of stainless steel fitting. Use of tubes without the aforementioned characteristics may seriously impair the efficiency of the fitting. We recommend use of the following tubes only: cold drawn seamless tube 1.4571 as per DIN 17458 or ASTM A 269, maximum permitted hardness, measured on the outer diameter of the tube, measured on the outer diameter of the tube is 85 HRB. Electrically welded tubes may be used provided they comply with the mechanical tolerances of the aforementioned standards and related hardness values.
- All stainless steel tubes must be pre-assembled using the specific preassembly machine. If this is not available, hardened blocks must be used for manual preassembly. In this case, make sure that the bench and vice in which the block is clamped are firmly fastened to prevent any possibility of movement caused by the twisting moment applied to the nut during the preassembly phase. Assembly or preassembly operations directly on the fitting are not allowed.

## QUALITY ASSURANCE ACCORDING TO UNI EN ISO 9001

The Quality Assurance System complies with UNI EN ISO 9001, certificate (N°90/94) issued by the RINA certification authority recognized by IQNET at European level.

CAST S.p.A. has also obtained the DVGW product omologation for stainless steel fittings, and DNV product omologation for carbon and stainless steel fittings with B3 and B4 cutting rings.

At the customer's request, our Quality Service will issue certificates of origin for the materials used to manufacture the products delivered.

Our Quality Experts are always ready to provide customers with advice, to guide them around our facilities as to provide documentation of the traceability system applied.

## COMPONENT TESTING

In addition to the normal dimensional checks carried out during machining, percentage inspections of the finished product, practical tightness and fatigue tests, coupling tests between the various parts are also carried out on CAST fittings. At the customer's request, our Product Test and Inspection Service issues the certificate of the tests carried out: dimensional and geometrical tests, checking of static seal at low and high pressure, dynamic seal at high pressure (maximum operating pressure + 33%) as per ISO 8434-5.

If required by the customer, tests can be carried out by various Third Party Authorities including: RINA – DVGW – Lloyd's Register of Shipping – Det Norske Veritas – Germanischer Lloyd – American Bureau of Shipping (to be specified on the order).

## SAFETY FACTORS

- B3 and B4 rings provide the right answer to safety problems so that absolute functional reliability between the ring, the steel tube and the fitting body is guaranteed by the double clinching and automatic locking of the cuts on the steel tube (assured by the particular shape of the ring).
- CAST's product range fully complies with the construction parameters of reference standards.
- The nominal operating pressures (bar) given in the catalogue indicate the maximum permissible pressures (including pressure peaks). For higher pressure the items must be tested in accordance with the manufacturer for specific applications.
- The safety factor is 4:1 and is intended with static load and with the temperature at the values indicated as per DIN 3861 (24° cone) for tube connection. The same safety factor 4:1 is intended for parallel threaded end fittings with elastomeric seal. For stud couplings with taper or parallel threaded end fittings with metal to metal seal safety factor is 2,5:1.
- Is understood that the product is guaranteed only if the full connection is made entirely with CAST S.p.A. products and components.



*Destructive testing with 28x2 carbon steel tube  
The tube burst at 650 bar without any leakages or sweating from the sealing points*