ATUSA

# MALLEABLE CAST IRON THREADED FITTINGS

T E C H N I C A L  M A N U A L

CHRYSSAFIDIS

CHRYSSAFIDIS S.A./ ATHENS: 3 AGRINIOU STR, TAVROS - (+30) 210 4836315-20 / THESSALONIKI: DA12A STR, OT32, BIPE SINDOU - (+30) 2310 754681-4 / www.chryssafidis.com / sales@chryssafidis.gr

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## CONTENTS



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# 1 GENERAL INFORMATION ABOUT THE PRODUCT

## 1.1. THREADED JOINTS

Threaded joints between elements of conduction (fittings, steel pipes, valves, brackets,…) is regulated, with the following being the type of threads used:

- **Joining or Leakage Threads:** these threads themselves must provide the sealing of the joint, this is attained through the pressure of metal on metal which is produced between the flanges of the exterior tapered thread and the interior cylindrical thread when tightened and using an adequate pairing (the use of an appropriate sealant helps with the sealing of the joint given that it fills the unavoidable differences which are produced in the manufacturing of the theoretical thread profile).

  This is carried out in accordance with the **EN 10226-1** standard, which is:
  - **Internal threads:** parallel or cylindrical (called **Rp**).
  - **External threads:** tapered (called **R**).

- **Fastening or tightening threads** : these threads themselves do not provide sealing of the union. They act as a simple fastening or tightening mechanical element. The sealing is achieved with the help of flat joints placed between flat metal faces (flat joints) or through metal surfaces conveniently assembled together jouned (tapered joints).

They are manufactured in accordance with the **EN ISO 228-1** standard under denomination **G**.

Special consideration must be given to the combination between a **type Rp** internal parallel threaded joint according to the EN 10226-1 standard and a **type G** (tolerance class A or B) external parallel fastening thread according to the EN ISO 228-1 standard.Such an occurrence must be specified and the fact that sealing may not necessarily be achieved has to kept in mind.

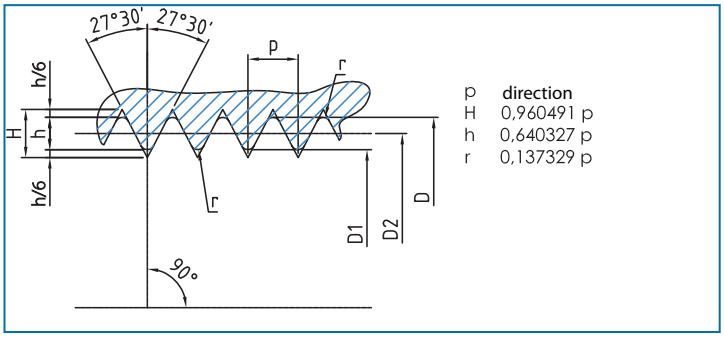
### PROFILE OF THE THREADED JOINT

The dimensions, tolerances and labelling of tapered external threads and internal cylindrical threads in sealing joints meet all the requirements of the EN 10226-1 standard.

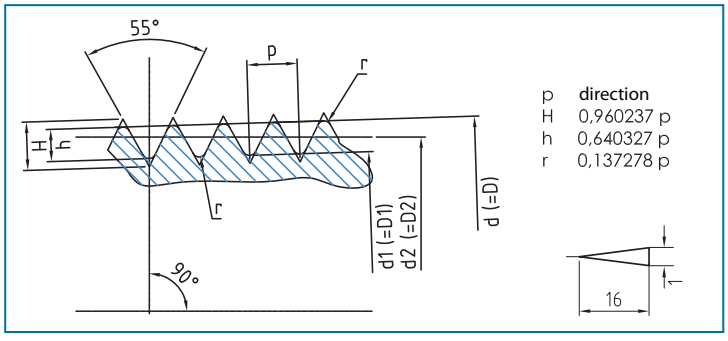
From a mechanical point of view, all tensile, compression and bending stresses on the threaded joints are absorbed by the metal on metal contact between the flanges and the threads of the joint.

The profiles of the internal and external threads are shown in the following diagrams:

**Internal Thread**
**Cross section of cylindrical thread (EN 10226-1)**




**External Thread**
**Cross section of conical thread (EN 10226-1)**



In order to obtain a reliable thread the following factors have to be taken into account:

**In the internal threads** it is important to note that the useful thread must be of such a length that it allows the external thread to be introduced even when this has reached its maximum value.

**In the external threads:**

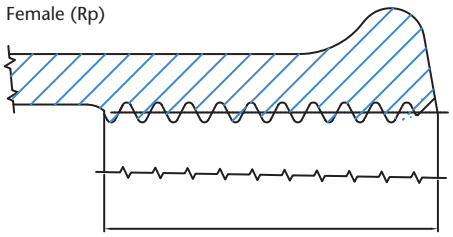
- The dimension "A" (calibre length) should be designed in such a way that even with the lowest internal thread diameter, the external thread should be able to be introduced and the sealing material can be applied. This length can be identified when manually tightening.

- The length of the thread (totally formed in the roots and in the majority of the crests) behind the gauge plane is the required length to withstand the pressure of the tool even with internal threads with maximum diameter. This length "b" is the length of the installation, and it is important to obtain a perfect tight joint on contact with the tool (always equal to or greater than 2 ¾ turns).

- The length "c", which starts after the end of "b", is known as the thread end (it is not completely formed in the roots) and must remain visible after contact with the tool. If this is tightened to the limit in such a way that the threads in the area can't be seen, there will be a serious risk of leakage and it indicates that the threaded joint is incorrect.

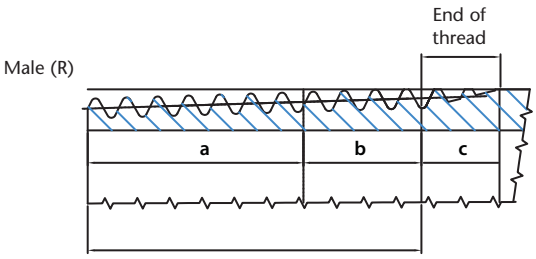
A graphical explanation of the aforementioned procedure :

### Internal Thread



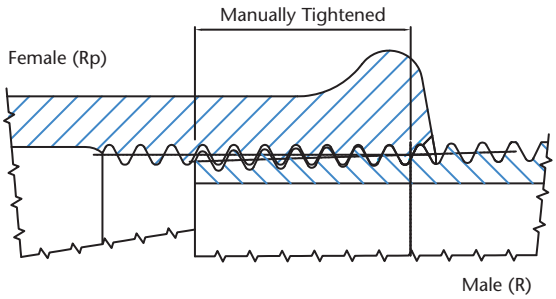

USEFUL THREAD LENGTH

### External Thread

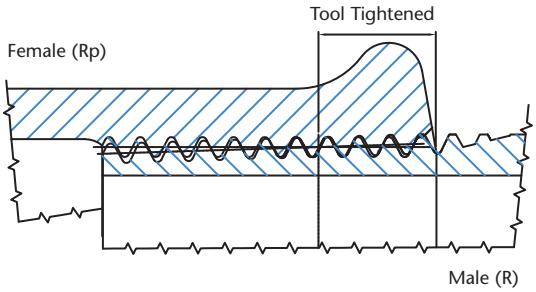



USEFUL THREAD LENGTH

### Manually Tightened




### Tool Tightened




In the diagram a manually tightened joint is shown (one can notice that there is still enough room in the external thread to apply tool pressure). Next, the final tightening with the tool can be seen, and the free end threads can be appreciated.

So, the tapered-cylindrical compression effect in the length ("a" +"b") obtains a perfect tight joint to which a small amount of sealant material must be added to cover the theoretical profile differences.

In the following table we present the dimensions and tolerances for the threaded joints and the basic threaded steel pipe dimensions of the medium and heavy weight range in accordance with the EN 10255 (old DIN 2440) standard.

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## Thread Size

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Thread Size | Number of threads in 25,4 mm | Pitch | Height of thread | Diameters at gauge plane | | | Guage length (external thread) | | | | | Assembly lenght | | Lenght of useful external thread not less than | | | Tolerance on position of gauge plane on internal thread | | |
| | | P | h | Major (gaude diameter) d=D | Pitch $d_2=D_2$ | Minor $d_1=D_1$ | Nomi-nal | Tolerance $T_1/2$ | | max. | min. | | Turns of thread | for nominal gauge length | for maxi-mum gauge length | for mi-nimum gauge length | Tolerance $T_2/2$ | | Equivalent diametral tolerance [a] on parallel internal threads |
| | | mm | mm | mm | mm | mm | mm | mm[b] | Turns of thread | mm | mm | mm[b] | | mm | mm | mm | mm[b] | Turns of thread | mm[b] |
| 1/16 | 28 | 0,907 | 0,581 | 7,723 | 7,142 | 6,561 | 4 | ± 0,9 | ± 1 | 4,9 | 3,1 | 2,5 | 2 3/4 | 6,5 | 7,4 | 5,6 | ± 1,1 | ± 1 1/4 | ± 0,071 |
| 1/8 | 28 | 0,907 | 0,581 | 9,728 | 9,147 | 8,566 | 4 | ± 0,9 | ± 1 | 4,9 | 3,1 | 2,5 | 2 3/4 | 6,5 | 7,4 | 5,6 | ± 1,1 | ± 1 1/4 | ± 0,071 |
| 1/4 | 19 | 1,337 | 0,856 | 13,157 | 12,301 | 11,445 | 6 | ± 1,3 | ± 1 | 7,3 | 4,7 | 3,7 | 2 3/4 | 9,7 | 11 | 8,4 | ± 1,7 | ± 1 1/4 | ± 0,104 |
| 3/8 | 19 | 1,337 | 0,856 | 16,662 | 15,806 | 14,950 | 6,4 | ± 1,3 | ± 1 | 7,7 | 5,1 | 3,7 | 2 3/4 | 10,1 | 11,4 | 8,8 | ± 1,7 | ± 1 1/4 | ± 0,104 |
| 1/2 | 14 | 1,814 | 1,162 | 20,955 | 19,793 | 18,631 | 8,2 | ± 1,8 | ± 1 | 10,0 | 6,4 | 5,0 | 2 3/4 | 13,2 | 15 | 11,4 | ± 2,3 | ± 1 1/4 | ± 0,142 |
| 3/4 | 14 | 1,814 | 1,162 | 26,441 | 25,279 | 24,117 | 9,5 | ± 1,8 | ± 1 | 11,3 | 7,7 | 5,0 | 2 3/4 | 14,5 | 16,3 | 12,7 | ± 2,3 | ± 1 1/4 | ± 0,142 |
| 1 | 11 | 2,309 | 1,479 | 33,249 | 31,770 | 30,291 | 10,4 | ± 2,3 | ± 1 | 12,7 | 8,1 | 6,4 | 2 3/4 | 16,8 | 19,1 | 14,5 | ± 2,9 | ± 1 1/4 | ± 0,180 |
| 1 1/4 | 11 | 2,309 | 1,479 | 41,910 | 40,431 | 38,952 | 12,7 | ± 2,3 | ± 1 | 15,0 | 10,4 | 6,4 | 2 3/4 | 19,1 | 21,4 | 16,8 | ± 2,9 | ± 1 1/4 | ± 0,180 |
| 1 1/2 | 11 | 2,309 | 1,479 | 47,803 | 46,324 | 44,845 | 12,7 | ± 2,3 | ± 1 | 15,0 | 10,4 | 6,4 | 2 3/4 | 19,1 | 21,4 | 16,8 | ± 2,9 | ± 1 1/4 | ± 0,180 |
| 2 | 11 | 2,309 | 1,479 | 59,614 | 58,135 | 56,656 | 15,9 | ± 2,3 | ± 1 | 18,2 | 13,6 | 7,5 | 3 1/4 | 23,4 | 25,7 | 21,1 | ± 2,9 | ± 1 1/4 | ± 0,180 |
| 2 1/2 | 11 | 2,309 | 1,479 | 75,184 | 73,705 | 72,226 | 17,5 | ± 3,5 | ± 1 1/2 | 21,0 | 14,0 | 9,2 | 4 | 26,7 | 30,2 | 23,2 | ± 3,5 | ± 1 1/2 | ± 0,216 |
| 3 | 11 | 2,309 | 1,479 | 87,884 | 86,405 | 84,926 | 20,6 | ± 3,5 | ± 1 1/2 | 24,1 | 17,1 | 9,2 | 4 | 29,8 | 33,3 | 26,3 | ± 3,5 | ± 1 1/2 | ± 0,216 |
| 4 | 11 | 2,309 | 1,479 | 113,030 | 111,551 | 110,072 | 25,4 | ± 3,5 | ± 1 1/2 | 28,9 | 21,9 | 10,4 | 4 1/2 | 35,8 | 39,3 | 32,3 | ± 3,5 | ± 1 1/2 | ± 0,216 |
| 5 | 11 | 2,309 | 1,479 | 138,430 | 136,951 | 135,472 | 28,6 | ± 3,5 | ± 1 1/2 | 32,1 | 25,1 | 11,5 | 5 | 40,1 | 43,6 | 36,6 | ± 3,5 | ± 1 1/2 | ± 0,216 |
| 6 | 11 | 2,309 | 1,479 | 163,830 | 162,351 | 160,872 | 28,6 | ± 3,5 | ± 1 1/2 | 32,1 | 25,1 | 11,5 | 5 | 40,1 | 43,6 | 36,6 | ± 3,5 | ± 1 1/2 | ± 0,216 |

**Note:** The main dimensions were converted into millimetres on the basis of 1 inch= 25,4 mm, beginning with the number of threads per inch, which determines the picth P, the formula h (the height of thread) = 0,640 327 P and the major diameter at the gauge plane. Pitch diameter and minor diameter were then compiled by subtracting once or twice respectively the height of thread h from the major diameter. The nominal gauge length, the tolerances and the assembly length were directly computed. The remaining lenghts given in table 1 were obtained by subtracting or adding the tolerances or assembly lenght respectively to the nominal gauge lenght. Tolerances and assembly lenghts are expressed in milimetres and in number of turns of thread.

1 For paralalllel internally threaded parts the diametral tolerances are derived from the tolerances in column 19 by multiplying with the corresponding pitch in column 3 and with 1/16, the amount of taper.

2 Informative tolerances, in milimetres, are obteined from the mandatory values in turns by multiplaying with the corresponding pitch in column 3 and rounding to the nearest 0,1mm.

### Medium weight steel tubing (EN 10255) Standard which does not conform to the following norms:

UNE 19-040 Normal weight | UNE 19-047, UNE 19-051, UNE 36-864 ↔ DIN 2440 and ISO 65 Medium weight

| Thread size | Nominal diameter DN (1) | Inferior diameter mm | Exterior diameter | | | Espesor de pared | Masa kg/m | |
|---|---|---|---|---|---|---|---|---|
| | | | Theoretical | Maximum | Minimum | Theoretical | Black tube | Galvanized tube |
| 3/8 | DN 10 | 12,6 | 17,2 | 17,5 | 16,7 | 2,3 | 0,84 | 0,88 |
| 1/2 | DN 15 | 16,1 | 21,3 | 21,8 | 21,0 | 2,6 | 1,21 | 1,25 |
| 3/4 | DN 20 | 21,7 | 26,9 | 27,3 | 26,5 | 2,6 | 1,56 | 1,6 |
| 1 | DN 25 | 27,3 | 33,7 | 34,2 | 33,3 | 3,2 | 2,41 | 2,48 |
| 1 1/4 | DN 32 | 36,0 | 42,4 | 42,9 | 42,0 | 3,2 | 3,10 | 3,19 |
| 1 1/2 | DN 40 | 41,9 | 48,3 | 48,8 | 47,9 | 3,2 | 3,56 | 3,70 |
| 2 | DN 50 | 53,1 | 60,3 | 60,8 | 59,7 | 3,6 | 5,03 | 5,18 |
| 2 1/2 | DN 65 | 68,9 | 76,1 | 76,6 | 75,3 | 3,6 | 6,42 | 6,62 |
| 3 | DN 80 | 80,9 | 88,9 | 89,5 | 88,0 | 4,0 | 8,36 | 8,59 |
| 4 | DN 100 | 105,3 | 114,3 | 115,0 | 113,1 | 4,5 | 12,20 | 12,50 |
| 5 | DN 125 | 129,7 | 139,7 | 140,8 | 138,5 | 5,0 | 16,60 | 16,90 |
| 6 | DN 150 | 155,1 | 165,1 | 166,5 | 166,5 | 5,0 | 19,80 | 20,10 |

### Heavy weight steel tubing (EN 10255) Standard which does not conform to the following norms:

UNE 19-041 Stolen weightened ↔ DIN 2441 e ISO 65 Stolen weightened

| Thread size | Nominal diameter DN (1) | Inferior diameter mm | Exterior diameter | | | Espesor de pared | Masa kg/m | |
|---|---|---|---|---|---|---|---|---|
| | | | Theoretical | Maximum | Minimum | Theoretical | Black tube | Galvanized tube |
| 3/8 | DN 10 | 11,4 | 17,2 | 17,5 | 16,7 | 2,9 | 1,02 | 1,07 |
| 1/2 | DN 15 | 14,9 | 21,3 | 21,8 | 21,0 | 3,2 | 1,44 | 1,49 |
| 3/4 | DN 20 | 20,5 | 26,9 | 27,3 | 26,5 | 3,2 | 1,87 | 1,94 |
| 1 | DN 25 | 25,7 | 33,7 | 34,2 | 33,3 | 4,0 | 2,93 | 3,02 |
| 1 1/4 | DN 32 | 34,4 | 42,4 | 42,9 | 42,0 | 4,0 | 3,79 | 3,90 |
| 1 1/2 | DN 40 | 40,3 | 48,3 | 48,8 | 47,9 | 4,0 | 4,37 | 4,54 |
| 2 | DN 50 | 51,3 | 60,3 | 60,8 | 59,7 | 4,5 | 6,19 | 6,37 |
| 2 1/2 | DN 65 | 67,1 | 76,1 | 76,6 | 75,3 | 4,5 | 7,93 | 8,18 |
| 3 | DN 80 | 78,9 | 88,9 | 89,5 | 88,0 | 5,0 | 10,30 | 10,58 |
| 4 | DN 100 | 103,5 | 114,3 | 115,0 | 113,1 | 5,4 | 14,50 | 14,86 |
| 5 | DN 125 | 128,9 | 139,7 | 140,8 | 138,5 | 5,4 | 17,90 | 18,22 |
| 6 | DN 150 | 154,3 | 165,1 | 166,5 | 163,9 | 5,4 | 21,30 | 21,62 |



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## 1.2. BASIC TECHNICAL CHARACTERISTICS

### STANDARD OF THE PRODUCT

Malleable Cast iron grooved fittings meet the requirements of the European product standard EN 10242 and international standard ISO 49.

The EN 10242 standard has been adopted by many European countries as a national standard (UNE EN 10242, DIN EN 10242, UNI EN 10242…) and has substituted the old national standard UNE 19491,DIN 2950…

### BASE MATERIAL

Malleable cast iron is basically an alloy of iron and carbon in which free graphite appears during solidification and in the cooling process. In this way, the properties of cast iron are obtained designated in terms of resistance to traction and percentage elongation. The material in question withstands impacts well, can flex well without breaking (ductility) at low temperatures as well having interesting soldering properties.

The initial cast iron (**white heart malleable cast iron** with a graphite free structure) is very hard, which makes its mechanisation very difficult. Because of this, and in order to obtain a final structure with good mechanization, good ductility and appropriate mechanical properties, a thermal annealing or malleablizing treatment is performed, through which two different types of malleable cast iron can be produced:

- **White heart malleable cast iron**: obtained by decarburizing the white heart at high temperatures (approx. 1060ºC) in an oxidizing atmosphere for long time cycles. The resulting material will be greatly reduced in carbon, even in thin pieces, obtaining a ferrite structure which is totally free of graphite. On the other hand, in very thick pieces graphite may exist in the central zones. Any remaining graphite will be in the form of “temper carbon”.

- **Black heart malleable cast iron**: obtained by annealing in an inert atmosphere (vacuum, inert gas,…) in several phases at temperatures of 750º - 950ºC for time cycles inferior than those of white heart. The resulting material presents a uniform microstructure with graphite nodes in the form of “temper carbon”.

As a consequence of the different thermal treatment undergone, the white heart malleable cast iron has major advantages over that of black heart such as:

- Better galvanization (Fe-Zn alloy) given that the microstructure of the white heart is more ferrite on the surface (presence of pure iron).

- Better mechanical properties (better resistance to traction for similar elongations).

- The possibility to obtain, after additional thermal treatments, a material that can be soldered.

ATUSA mainly manufactures EN-GJMW-400-05 in accordance with the EN-GJMW-400-05 standard. This means that a test bar with a diameter of 12mm presents the following properties:

- Minimum Tensile Strength (Rm) : 400 MPa

- Minimum Elongation Percentage ($A_{3,4}$ ) : 5%

- Elastic Limit ($Rp_{0,2}$) : 220 MPa

- Maximum Brinell Hardness : 220 HB

The malleability obtained for our fittings guarantees that no cracks will appear after the flattening of cylindrical sections. Thus, after the flattening of a:

- Fitting of up to 2”: a diameter distortion of 10% without the appearance of cracks is guaranteed.

- Fitting over 2”: a diameter distortion of 5% without the appearance of cracks is guaranteed

**Note**: some fittings may be supplied in steel, providing the same properties as those of malleable cast iron.

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## SURFACE COATING

The fittings can be provided with two types of finish:

- **Black coating**: the fittings are finished without surface treatment after being annealed or malleablized.

- **Galvanized coating**: after thermal treatment, the fittings undergo hot dip galvanization in a zinc bath, obtaining a continuous surface, without any chips, burr or metallic residue.

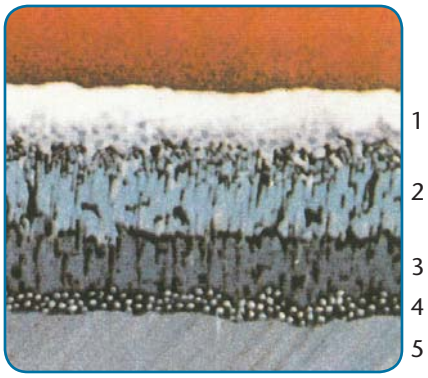
Nevertheless, after mechanisation and unitary leakage control, and in order to remove shavings, cutting oils and other dirt, the fittings are subjected to a grease removal process which provides them with a temporary layer of antioxidant protection. This ensures that the final surface is free of polycyclic aromatic hydrocarbons (PAHs).

**Note:** steel fittings, which can be finished in black or electro zinc, are an exception.

## GALVANIZATION

Galvanization of the fittings is carried out through a process of hot dip immersion in accordance with the specifications of the EN 10242 standard.

The metal base of the white heart fittings forms an alloy (Fe-Zn), with the zinc in layers as shown in the diagram:




Micrograph (cross section of a hot dip galvanized white heart fitting)

**LAYER 1**: (eta) pure zinc, exterior surface
**LAYER 2:** (zeta) Fe-Zn (5.8% - 6.8% Fe content)
**LAYER 3:** (delta) Fe-Zn (7% - 12% Fe content)
**LAYER 4:** (gamma) Fe-Zn (21% - 28% Fe content)
**(5) NUCLEUS:** base material, interior

In this way, and without just being a "simple layer or exterior coating", galvanization applied to the surface of the fittings is an intimate union which always forms part of the material. Hence, it provides very high protection against corrosion and makes the product especially recommended for use in drinking water installations.

The mass of the alloy is over 500gr/m2 and has a minimum thickness of 70 micros, which is very high when compared with other protection methods (electro zinc).

The alloy is even harder than steel, which, with its zinc exterior (softer), makes the joint form a "cushioning" system which is able to withstand blows and abrasion.

## DESIGN

The "Design Symbol" of the design of the fittings allows identification according to the selection of the material and the type of thread chosen. Consequently; **ATUSA** manufactures its fittings mainly in accordance with design type A, which means:

- Tapered exterior threads.
- Parallel or cylindrical interior threads.
- EN-GJMW-400-05 standard material (white heart malleable cast iron).

| Design symbol | Type oh thread | | Material degree |
|---|---|---|---|
| | Tapered external | Parallel internal | |
| A | R | Rp | EN-GJMW-400-5 |

## SEALANTS

The role of the sealing material used in the (tapered-cylindrical) threaded joint is to fill the unavoidable differences which are produced in the manufacturing of the theoretical thread profile.

The product to use should be chosen on the basis of the conduction material, of the fluid to be conducted, and of the pressure and temperature conditions. Attention should also be given to the instructions of the manufacturer. Thus, the EN 751 standard (***sealing materials for metallic threaded joints*** in contact with 1st, 2nd and 3rd family gases and hot water) specifies the characteristics of the sealing materials for threaded joints in contact with gases and hot water (moreover, there are other materials on the market which are adapted to cater for different fluids such as air, combustible liquids, oils, etc.)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## 1.3. CERTIFICATION

Amongst others, ATUSA holds the following certificates:

Quality Management Certification in accordance with standard UNE-EN ISO 9001:2008, issued by AENOR.

Implementation and maintenance of Quality Management for the manufacturing of Malleable Cast Iron Fittings.

Certification for the manufacturing of Malleable Cast Iron Threaded Fittings in accordance with the UNE-EN ISO 10242 Standard (Design symbol "A") in the Salvatierra factory (Spain), issued by AENOR.

Certification for Malleable Cast Iron Threaded Fittings in accordance with the DIN-EN 10242 Standard (Design symbol "A") for their use in the supply of gases, issued by DVGW.

Certification for Malleable Cast Iron Threaded Fittings in accordance with the DIN-EN 10242 Standard (Design symbol "A") for their use in the supply of gases, issued by SVGW.

Certification for Malleable Cast Iron Threaded Fittings in accordance with the FM Approvals Standard 1920 for their use in fire prevention installations.

Certification of Conformity of Production of Galvanized Malleable Cast Iron Fittings products in accordance with UNE-EN 10242 (EO brand) for their use in the supply of fluids and gases in agreement with that required by the Royal Decree 2531/1985 and the 13.01.1999 Ministerial Order issued by the Ministry of Industry.

Sanitary Registration for Malleable Cast Iron Threaded Products in agreement with Annex IX of the Royal Decree 140/2003 issued by the Ministry of Health.

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# 2 PRODUCT RANGE


1


1A


2


2A


3


40


92


92R


94

95

96

97


131


132


133


134


135


165


241

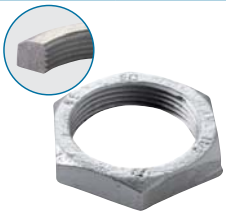

245


246


270


271


280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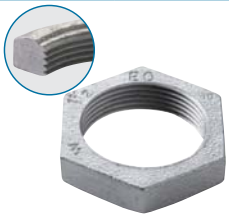
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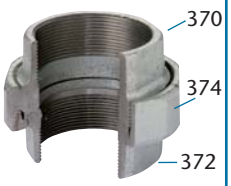
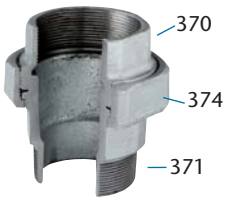
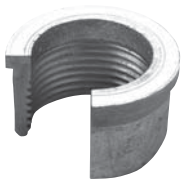
321



330



331


372


374


380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383


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41


60


85


90


90R

98


120


121


130


130R


180


220


221


223


240


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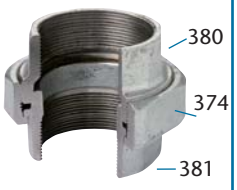
291

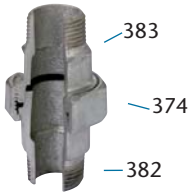

294


300



340

341



344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471


526


529A


531


596



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# 3 DIMENSIONS

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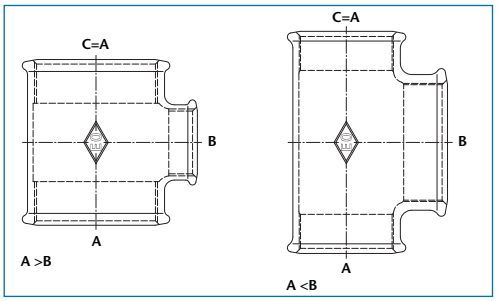
## NAMING THE FIGURES

**The designation of the size of the fittings is carried out in the following way:**

- Position/place the mouth of the water flow with the greatest diameter on a flat surface (ground)
- The mouth of the branch/ shunt (increasing or reducing) is placed facing the right.

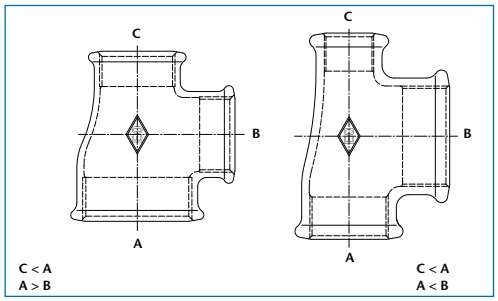
The denomination will start with the "ground" mouth and continue anticlockwise.

Reducing / Increasing branch




(without reduction in the flow A=C)

Reducing / Increasing branch




(with reduction in the flow A>C)

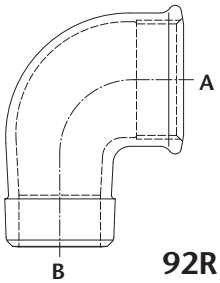
**1. Fittings with equal sized mouths**
Regardless of the number of mouths, the designation will be unique.
The denomination will be: **A"**

**2. Fittings with two different sized mouths (reductions)**
The denomination will be : **A"- B"**, where A is always bigger than B.

**3. Fittings with more than two mouths, not all the same size, with no reduction in the flow.**
In this case, the two mouths of the water flow are the same. It will be designated indicating the size of the two similar mouths (flow) followed by the size of the branch (regardless of whether this is bigger or smaller).
The denomination will be: **A"- B"- A"**, where A may be bigger or smaller than B ( in practice this is usually designated A"- B")

**4. Fittings with more than two mouths, not all the same size, with reduction in the flow.**
In this situation, the two mouths of the flow are different. It will be designated indicating the size of the mouths beginning with the flow of water mouth with the biggest diameter and following an anticlockwise direction.
The denomination will be: **A"- B"- C"**, where A may be bigger than C ( B may be greater of smaller than A).

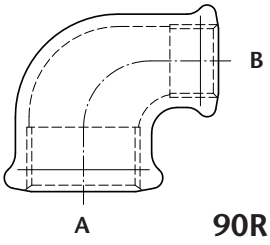
**5. Special Cases: (Fig 92R, reducing elbow and Fig 90R , reducing elbow)**




**92R**

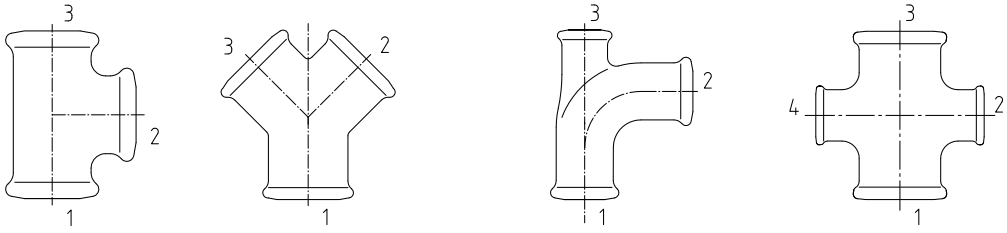
Reduction in male mouth (A>B)
- Designation: 92R - A" - B" (A= female; B= male)

Reduction in female mouth (B>A)
- Designation: 92R - A" - B" (A= female; B=male)




**90R**

Anyway, always remember that the denomination will always follow an anticlockwise direction.



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## MARKINGS

Generally, all our fittings are marked during the modelling process with:

- Logotype EO
- Dimensions (in inches)
- Model number (identifiable from its position in the tools)
- W: (White) identifying that it is a white heart fitting

## DIMENSIONS AND TOLERANCES

The fittings have the appropriate dimensions according to the EN 10242 standard and these are shown in the accompanying dimension tables.

**Longitude tolerances**: when the maximum and minimum dimensions are not specified, these can be found in the following table:

| Dimension mm. | | Tolerance |
|---|---|---|
| 0 | ≤ 30 | ± 1,5 |
| > 30 | ≤ 50 | ± 2,0 |
| > 50 | ≤ 75 | ± 2,5 |
| > 75 | ≤ 100 | ± 3,0 |
| > 100 | ≤ 150 | ± 3,5 |
| > 150 | ≤ 200 | ± 4,0 |
| > 200 | | ± 5,0 |

**Note:**

- For straight fittings, the tolerance refers to the distance between faces.
- For curved fittings, the tolerance refers to the distance between the face and the centre.
- For joints, the tolerance refers to the individual components, not to the assembled joint.

**Angular Tolerances** (thread alignment): the axes of the threads will have a maximum deviation of between +/- 0.5º with regard to the specified angle.

**Storage For The Tightening Tool**: the dimensions of the flat surfaces for the storage of the key depend on the design and are not regulated. However, the minimum width for the storage of the tightening key, measured in the corners, will be specified in the following table:

| Nominal Diameter DN | 6 | 8 | 10 | 15 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Designation of size of thread | 1/8" | 1/4" | 3/8" | 1/2" | 3/4" | 1" | 1 1/4" | 1 1/2" | 2" | 2 1/2" | 3" | 4" | 5" | 6" |
| Length of coupling in mm. | 7 | 10 | 10 | 13 | 15 | 17 | 19 | 19 | 24 | 27 | 30 | 36 | 40 | 40 |



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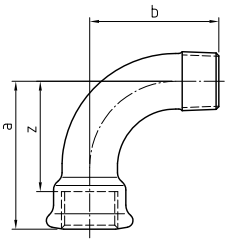
# 3 DIMENSIONS

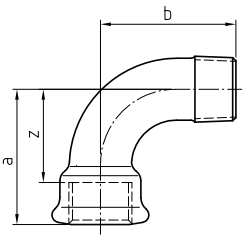
## 1 (G4) LONG SWEED BEND M/F




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/8″ | 01001/5000 | 35 | 32 | 28 | 28 |
| 1/4″ | 01001/5001 | 40 | 36 | 30 | 56 |
| 3/8″ | 01001/5002 | 48 | 42 | 38 | 68 |
| 1/2″ | 01001/5003 | 55 | 48 | 42 | 145 |
| 3/4″ | 01001/5004 | 69 | 60 | 54 | 215 |
| 1″ | 01001/5005 | 85 | 75 | 68 | 382 |
| 1 1/4″ | 01001/5006 | 105 | 95 | 86 | 650 |
| 1 1/2″ | 01001/5007 | 116 | 105 | 97 | 785 |
| 2″ | 01001/5008 | 140 | 130 | 116 | 1351 |
| 2 1/2″ | 01001/5009 | 176 | 165 | 149 | 2241 |
| 3″ | 01001/500A | 205 | 190 | 175 | 3635 |
| 4″ | 01001/500C | 260 | 245 | 224 | 4886 |

1/5 - 1= Black - 5= Galvanized

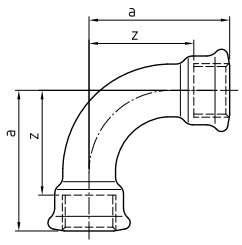
## 1A (D4) SHORT BEND M/F




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/4″ | 01A01/5001 | 30 | 30 | 20 | 67 |
| 3/8″ | 01A01/5002 | 36 | 36 | 26 | 81 |
| 1/2″ | 01A01/5003 | 45 | 45 | 32 | 98 |
| 3/4″ | 01A01/5004 | 50 | 50 | 35 | 164 |
| 1″ | 01A01/5005 | 63 | 63 | 46 | 254 |
| 1 1/4″ | 01A01/5006 | 76 | 76 | 57 | 438 |
| 1 1/2″ | 01A01/5007 | 85 | 85 | 66 | 572 |
| 2″ | 01A01/5008 | 102 | 102 | 78 | 988 |
| 2 1/2″ | 01A01/5009 | 115 | 115 | 88 | 1610 |
| 3″ | 01A01/500A | 127 | 127 | 97 | 2585 |
| 4″ | 01A01/500C | 165 | 165 | 129 | 4350 |

1/5 - 1= Black - 5= Galvanized

## 2 (G1) LONG SWEEP BEND F/F




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 1/4″ | 02001/5001 | 40 | 30 | 72 |
| 3/8″ | 02001/5002 | 48 | 38 | 80 |
| 1/2″ | 02001/5003 | 55 | 42 | 168 |
| 3/4″ | 02001/5004 | 69 | 54 | 262 |
| 1″ | 02001/5005 | 85 | 68 | 450 |
| 1 1/4″ | 02001/5006 | 105 | 86 | 710 |
| 1 1/2″ | 02001/5007 | 116 | 97 | 855 |
| 2″ | 02001/5008 | 140 | 116 | 1545 |
| 2 1/2″ | 02001/5009 | 176 | 149 | 2513 |
| 3″ | 02001/500A | 205 | 175 | 3807 |
| 4″ | 02001/500C | 260 | 224 | 5066 |

1/5 - 1= Black - 5= Galvanized



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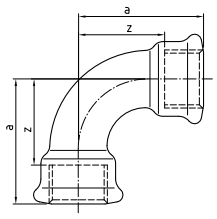
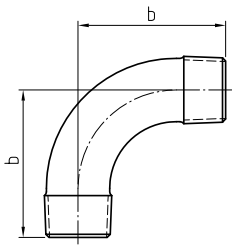
## 2A (D1) SHORT BEND F/F




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 3/8" | 02A01/5002 | 36 | 26 | 122 |
| 1/2" | 02A01/5003 | 45 | 32 | 124 |
| 3/4" | 02A01/5004 | 50 | 35 | 195 |
| 1" | 02A01/5005 | 63 | 46 | 270 |
| 1 1/4" | 02A01/5006 | 76 | 57 | 462 |
| 1 1/2" | 02A01/5007 | 85 | 66 | 599 |
| 2" | 02A01/5008 | 102 | 78 | 1560 |
| 2 1/2" | 02A01/5009 | 115 | 88 | 2100 |
| 3" | 02A01/500A | 127 | 97 | 2630 |
| 4" | 02A01/500C | 165 | 129 | 6290 |

1/5 - 1= Black - 5= Galvanized

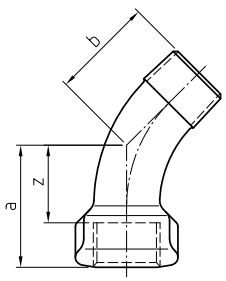
## 3 (G8) LONG SWEEP BEND M/M




| SIZE | CODE | DIMENSIONS (mm) | Weight (gr) |
|---|---|---|---|
| | | b | |
| 1/4" | 03001/5001 | 36 | 30 |
| 3/8" | 03001/5002 | 42 | 60 |
| 1/2" | 03001/5003 | 48 | 88 |
| 3/4" | 03001/5004 | 60 | 162 |
| 1" | 03001/5005 | 75 | 36 |
| 1 1/4" | 03001/5006 | 95 | 488 |
| 1 1/2" | 03001/5007 | 105 | 632 |
| 2" | 03001/5008 | 130 | 1074 |
| 2 1/2" | 03001/5009 | 165 | 1846 |
| 3" | 03001/500A | 190 | 1962 |
| 4" | 03001/500C | 245 | 5995 |

1/5 - 1= Black - 5= Galvanized

## 40 (G4/45°) LONG SWEEP BEND M/F 45°




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/4" | 04001/5001 | 26 | 21 | 16 | 37 |
| 3/8" | 04001/5002 | 30 | 24 | 20 | 66 |
| 1/2" | 04001/5003 | 36 | 30 | 23 | 106 |
| 3/4" | 04001/5004 | 43 | 36 | 28 | 156 |
| 1" | 04001/5005 | 51 | 42 | 34 | 235 |
| 1 1/4" | 04001/5006 | 64 | 54 | 45 | 478 |
| 1 1/2" | 04001/5007 | 68 | 58 | 49 | 524 |
| 2" | 04001/5008 | 81 | 70 | 57 | 819 |
| 2 1/2" | 04001/5009 | 99 | 86 | 72 | 1295 |
| 3" | 04001/500A | 113 | 100 | 83 | 1980 |
| 4" | 04001/500C | 142 | 126 | 106 | 3750 |

1/5 - 1= Black - 5= Galvanized



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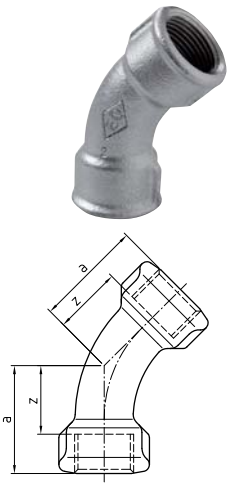
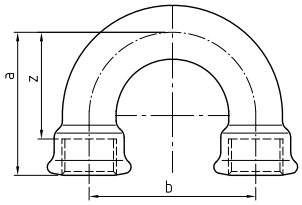
## 41 (G1/45º) LONG SWEEP BEND F/F 45º




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 1/4" | 04101/5001 | 26 | 16 | 52 |
| 3/8" | 04101/5002 | 30 | 20 | 88 |
| 1/2" | 04101/5003 | 36 | 23 | 141 |
| 3/4" | 04101/5004 | 43 | 28 | 194 |
| 1" | 04101/5005 | 51 | 34 | 293 |
| 1 1/4" | 04101/5006 | 64 | 45 | 550 |
| 1 1/2" | 04101/5007 | 68 | 49 | 601 |
| 2" | 04101/5008 | 81 | 57 | 931 |
| 2 1/2" | 04101/5009 | 99 | 72 | 1456 |
| 3" | 04101/500A | 113 | 83 | 2160 |
| 4" | 04101/500C | 142 | 106 | 4254 |

1/5 - 1= Black - 5= Galvanized

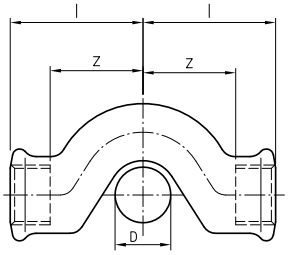
## 60 RETURN BEND




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/2" | 06001/5003 | 45 | 38 | 32 | 187 |
| 3/4" | 06001/5004 | 52 | 50 | 37 | 382 |
| 1" | 06001/5005 | 64 | 64 | 47 | 566 |
| 1 1/4" | 06001/5006 | 73 | 76 | 54 | 705 |
| 1 1/2" | 06001/5007 | 80 | 89 | 61 | 970 |
| 2" | 06001/5008 | 90 | 102 | 66 | 1395 |

1/5 - 1= Black - 5= Galvanized

## 85 CROSSOVER




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | l | D | z | |
| 3/8" | 08501/5002 | 38 | 3/8 | 28 | 118 |
| 1/2" | 08501/5003 | 46 | 1/2 | 33 | 150 |
| 3/4" | 08501/5004 | 56 | 3/4 | 41 | 362 |
| 1" | 08501/5005 | 70 | 1 | 53 | 523 |
| 1 1/4" | 08501/5006 | 85 | 1 1/4 | 66 | 862 |

1/5 - 1= Black - 5= Galvanized

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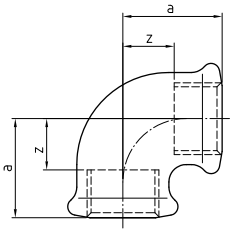
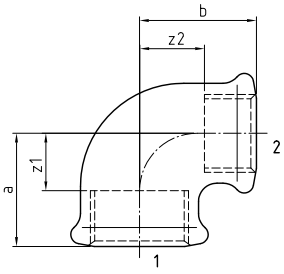
## 90 (A1) ELBOW F/F 90°




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) | |
|---|---|---|---|---|---|
| | | a | z | | |
| 1/8″ | 09001/5000 | 19 | 12 | 32 | |
| 1/4″ | 09001/5001 | 21 | 11 | 43 | |
| 3/8″ | 09001/5002 | 25 | 15 | 69 | |
| 1/2″ | 09001/5003 | 28 | 15 | 110 | |
| 3/4″ | 09001/5004 | 33 | 18 | 129 | |
| 1″ | 09001/5005 | 38 | 21 | 177 | |
| 1 1/4″ | 09001/5006 | 45 | 26 | 354 | |
| 1 1/2″ | 09001/5007 | 50 | 31 | 394 | |
| 2″ | 09001/5008 | 58 | 34 | 603 | |
| 2 1/2″ | 09001/5009 | 69 | 42 | 1064 | |
| 3″ | 09001/500A | 78 | 48 | 1413 | |
| 4″ | 09001/500C | 96 | 60 | 2387 | |
| 5″ | 09001/500D | 115 | 75 | 4197 | |
| 6″ | 09001/500E | 131 | 91 | 6000 | |

1/5 - 1= Black - 5= Galvanized

## 90R (A1) REDUCING ELBOW F/F 90°




| SIZE | CODE | DIMENSIONS (mm) | | | | Weight (gr) | |
|---|---|---|---|---|---|---|---|
| | | a | b | z1 | z2 | | |
| 3/8″ - 1/4″ | 09001/5021 | 23 | 23 | 13 | 13 | 48 | |
| 1/2″ - 1/4″ | 09001/5031 | 24 | 24 | 11 | 14 | 68 | |
| 1/2″ - 3/8″ | 09001/5032 | 26 | 26 | 13 | 16 | 64 | |
| 3/4″ - 3/8″ | 09001/5042 | 28 | 28 | 13 | 18 | 87 | |
| 3/4″ - 1/2″ | 09001/5043 | 30 | 31 | 15 | 18 | 98 | |
| 1″ - 1/2″ | 09001/5053 | 32 | 34 | 15 | 21 | 120 | |
| 1″ - 3/4″ | 09001/5054 | 35 | 36 | 18 | 21 | 149 | |
| 1 1/4″ - 1/2″ | 09001/5063 | 35 | 38 | 16 | 25 | 177 | |
| 1 1/4″ - 3/4″ | 09001/5064 | 36 | 41 | 17 | 26 | 254 | |
| 1 1/4″ - 1″ | 09001/5065 | 40 | 42 | 21 | 25 | 310 | |
| 1 1/2″ - 3/4″ | 09001/5074 | 38 | 44 | 19 | 29 | 262 | |
| 1 1/2″ - 1″ | 09001/5075 | 42 | 46 | 23 | 29 | 282 | |
| 1 1/2″ - 1 1/4″ | 09001/5076 | 46 | 48 | 27 | 29 | 414 | |
| 2″ - 1″ | 09001/5085 | 44 | 52 | 20 | 35 | 380 | |
| 2 ″- 1 1/4″ | 09001/5086 | 48 | 53 | 24 | 34 | 456 | |
| 2″ - 1 1/2″ | 09001/5087 | 52 | 55 | 28 | 36 | 494 | |
| 2 1/2″ - 2″ | 09001/5098 | 61 | 66 | 34 | 42 | 910 | |

1/5 - 1= Black - 5= Galvanized

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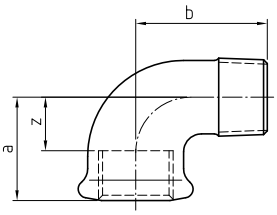
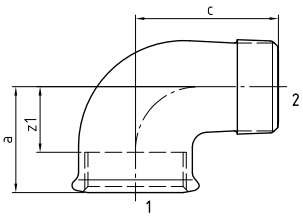
## 92 (A4) ELBOW M/F 90°




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/8″ | 09201/5000 | 19 | 25 | 12 | 23 |
| 1/4″ | 09201/5001 | 21 | 28 | 11 | 37 |
| 3/8″ | 09201/5002 | 25 | 32 | 15 | 61 |
| 1/2″ | 09201/5003 | 28 | 37 | 15 | 96 |
| 3/4″ | 09201/5004 | 33 | 43 | 18 | 126 |
| 1″ | 09201/5005 | 38 | 52 | 21 | 200 |
| 1 1/4″ | 09201/5006 | 45 | 60 | 26 | 390 |
| 1 1/2″ | 09201/5007 | 50 | 65 | 31 | 408 |
| 2″ | 09201/5008 | 58 | 74 | 34 | 616 |
| 2 1/2″ | 09201/5009 | 69 | 88 | 42 | 1178 |
| 3″ | 09201/500A | 78 | 98 | 48 | 1619 |
| 4″ | 09201/500C | 96 | 118 | 60 | 2300 |

1/5 - 1= Black - 5= Galvanized

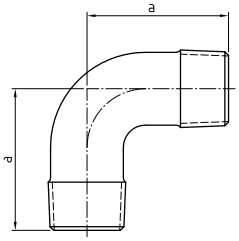
## 92R (A4) REDUCING ELBOW M/F 90°




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | c | z1 | |
| 1/2″ - 3/8″ | 09201/5032 | 26 | 33 | 13 | 56 |
| 3/4″ - 1/2″ | 09201/5043 | 30 | 40 | 15 | 96 |
| 1″ - 3/4″ | 09201/5054 | 35 | 46 | 18 | 180 |
| 1 1/4″ - 1″ | 09201/5065 | 40 | 56 | 21 | 255 |
| 1 1/2″ - 1″ | 09201/5075 | 47 | 62 | 28 | 361 |
| 1 1/2″ - 1 /1/4″ | 09201/5076 | 52 | 64 | 33 | 345 |
| 3/8″ - 1/2″ | 09201/5023 | 28 | 37 | 18 | 99 |
| 1/2″ - 3/4″ | 09201/5034 | 34 | 42 | 21 | 150 |
| 3/4″ - 1″ | 09201/5045 | 39 | 50 | 24 | 234 |
| 1″ - 1 1/4″ | 09201/5056 | 44 | 59 | 27 | 351 |

1/5 - 1= Black - 5= Galvanized

## 94 ELBOW M/F 90°




| SIZE | CODE | DIMENSIONS (mm) | Weight (gr) |
|---|---|---|---|
| | | a | |
| 3/8″ | 09401/5002 | 29 | 37 |
| 1/2″ | 09401/5003 | 37 | 65 |
| 3/4″ | 09401/5004 | 40 | 106 |
| 1″ | 09401/5005 | 47 | 185 |
| 1 1/4″ | 09401/5006 | 56 | 295 |
| 1 1/2″ | 09401/5007 | 59 | 341 |
| 2″ | 09401/5008 | 68 | 564 |

1/5 - 1= Black - 5= Galvanized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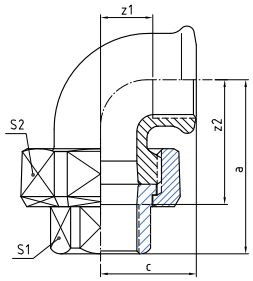
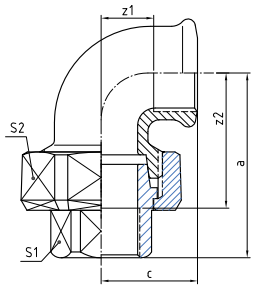
## 95 (UA1) UNION ELBOW FLAT SEAT F/F


| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | a | c | z1 | z2 | s1 | s2 | s2 máx | (gr) |
| 3/8" | 3/4" | 09501/5002 | 52 | 25 | 15 | 42 | 12 | 32 | 36 | 143 |
| 1/2" | 1 1/8" | 09501/5003 | 58 | 28 | 15 | 45 | 26 | 44 | 44 | 281 |
| 3/4" | 1 1/4" | 09501/5004 | 62 | 33 | 18 | 47 | 32 | 48 | 50 | 359 |
| 1" | 1 1/2" | 09501/5005 | 72 | 38 | 21 | 55 | 38 | 54 | 55 | 507 |
| 1 1/4" | 2" | 09501/5006 | 82 | 45 | 26 | 63 | 48 | 68 | 70 | 826 |
| 1 1/2" | 2 1/4" | 09501/5007 | 90 | 50 | 31 | 71 | 54 | 74 | 75 | 931 |
| 2" | 2 3/4" | 09501/5008 | 100 | 58 | 34 | 76 | 66 | 89 | 90 | 1404 |

1/5 - 1= Black - 5= Galvanized

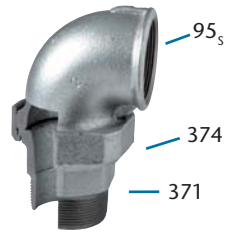
## 96 (UA11) UNION ELBOW, TAPER SEAT F/F

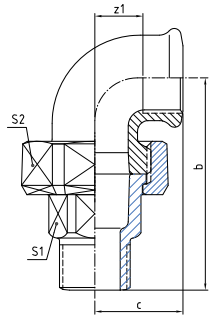




| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | a | c | z1 | z2 | s1 | s2 | s2 máx | (gr) |
| 1/4" | 5/8" | 09601/5001 | 48 | 21 | 11 | 38 | 18 | 31 | 32 | 116 |
| 3/8" | 7/8" | 09601/5002 | 52 | 25 | 15 | 42 | 22 | 35 | 36 | 176 |
| 1/2" | 1 1/8" | 09601/5003 | 58 | 28 | 15 | 45 | 26 | 44 | 44 | 291 |
| 3/4" | 1 1/4" | 09601/5004 | 62 | 33 | 18 | 47 | 32 | 48 | 50 | 373 |
| 1" | 1 1/2" | 09601/5005 | 72 | 38 | 21 | 55 | 38 | 54 | 55 | 491 |
| 1 1/4" | 2" | 09601/5006 | 82 | 45 | 26 | 63 | 48 | 68 | 70 | 881 |
| 1 1/2" | 2 1/4" | 09601/5007 | 90 | 50 | 31 | 71 | 54 | 74 | 75 | 973 |
| 2" | 2 3/4" | 09601/5008 | 100 | 58 | 34 | 76 | 66 | 89 | 90 | 1515 |
| 2 1/2" | 3 1/2" | 09601/5009 | 112 | 70 | 43 | 85 | 86 | 110 | 110 | 2407 |
| 3" | 4" | 09601/500A | 135 | 78 | 48 | 105 | 98 | 130 | 130 | 3389 |

1/5 - 1= Black - 5= Galvanized

## 97 (UA2) UNION ELBOW, FLAT SEAT M/F

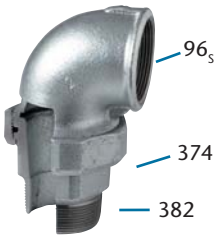


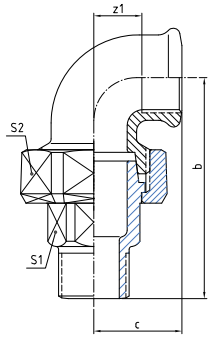




| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | b | c | z1 | s1 | s2 | s2 máx | (gr) | |
| 3/8" | 3/4" | 09701/5002 | 65 | 25 | 15 | 19 | 32 | 36 | 146 | |
| 1/2" | 1 1/8" | 09701/5003 | 76 | 28 | 15 | 25 | 44 | 44 | 303 | |
| 3/4" | 1 1/4" | 09701/5004 | 82 | 33 | 18 | 32 | 48 | 50 | 400 | |
| 1" | 1 1/2" | 09701/5005 | 94 | 38 | 21 | 38 | 54 | 55 | 582 | |
| 1 1/4" | 2" | 09701/5006 | 107 | 45 | 26 | 48 | 68 | 70 | 930 | |
| 1 1/2" | 2 1/4" | 09701/5007 | 115 | 50 | 31 | 54 | 74 | 75 | 1091 | |
| 2" | 2 3/4" | 09701/5008 | 128 | 58 | 34 | 66 | 89 | 90 | 1670 | |

1/5 - 1= Black - 5= Galvanized

## 98 (UA12) UNION ELBOW, TAPER SEAT M/F

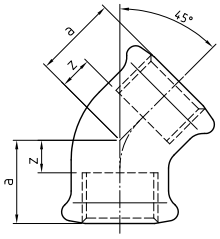



| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | b | c | z1 | s1 | s2 | s2 máx | |
| 1/4″ | 5/8″ | 09801/5001 | 61 | 21 | 11 | 15 | 28 | 32 | 132 |
| 3/8″ | 7/8″ | 09801/5002 | 65 | 25 | 15 | 22 | 35 | 36 | 186 |
| 1/2″ | 1 1/8″ | 09801/5003 | 76 | 28 | 15 | 26 | 44 | 44 | 311 |
| 3/4″ | 1 1/4″ | 09801/5004 | 82 | 33 | 18 | 32 | 48 | 50 | 412 |
| 1″ | 1 1/2″ | 09801/5005 | 94 | 38 | 21 | 38 | 54 | 55 | 576 |
| 1 1/4″ | 2″ | 09801/5006 | 107 | 45 | 26 | 48 | 68 | 70 | 959 |
| 1 1/2″ | 2 1/4″ | 09801/5007 | 115 | 50 | 31 | 54 | 74 | 75 | 1135 |
| 2″ | 2 3/4″ | 09801/5008 | 128 | 58 | 34 | 66 | 89 | 90 | 1737 |
| 2 1/2″ | 3 1/2″ | 09801/5009 | 145 | 70 | 43 | 86 | 110 | 110 | 2560 |
| 3″ | 4″ | 09801/500A | 160 | 78 | 48 | 98 | 130 | 130 | 3882 |

1/5 - 1= Black - 5= Galvanized

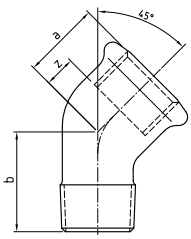
## 120 (A1/45º) ELBOW F/F 45º




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 3/8″ | 12001/5002 | 20 | 10 | 50 |
| 1/2″ | 12001/5003 | 22 | 9 | 98 |
| 3/4″ | 12001/5004 | 25 | 10 | 122 |
| 1″ | 12001/5005 | 28 | 11 | 165 |
| 1 1/4″ | 12001/5006 | 33 | 14 | 258 |
| 1 1/2″ | 12001/5007 | 36 | 17 | 366 |
| 2″ | 12001/5008 | 43 | 19 | 564 |
| 2 1/2″ | 12001/5009 | 48 | 21 | 840 |
| 3″ | 12001/500A | 54 | 24 | 1190 |

1/5 - 1= Black - 5= Galvanized

## 121 (A4/45º) ELBOW M/F 45º




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 3/8″ | 12101/5002 | 20 | 25 | 10 | 44 |
| 1/2″ | 12101/5003 | 22 | 28 | 9 | 82 |
| 3/4″ | 12101/5004 | 25 | 32 | 10 | 114 |
| 1″ | 12101/5005 | 28 | 37 | 11 | 164 |
| 1 1/4″ | 12101/5006 | 33 | 43 | 14 | 265 |
| 1 1/2″ | 12101/5007 | 36 | 46 | 17 | 330 |
| 2″ | 12101/5008 | 43 | 55 | 19 | 570 |
| 2 1/2″ | 12101/5009 | 46 | 54 | 19 | 770 |
| 3″ | 12101/500A | 52 | 61 | 22 | 1100 |

1/5 - 1= Black - 5= Galvanized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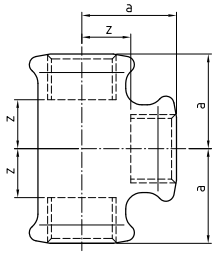
## 130 (B1) TEE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) | |
|---|---|---|---|---|---|
| | | a | z | | |
| 1/8″ | 13001/5000 | 19 | 12 | 40 | |
| 1/4″ | 13001/5001 | 21 | 11 | 55 | |
| 3/8″ | 13001/5002 | 25 | 15 | 87 | |
| 1/2″ | 13001/5003 | 28 | 15 | 150 | |
| 3/4″ | 13001/5004 | 33 | 18 | 191 | |
| 1″ | 13001/5005 | 38 | 21 | 267 | |
| 1 1/4″ | 13001/5006 | 45 | 26 | 433 | |
| 1 1/2″ | 13001/5007 | 50 | 31 | 554 | |
| 2″ | 13001/5008 | 58 | 34 | 840 | |
| 2 1/2″ | 13001/5009 | 69 | 42 | 1409 | |
| 3″ | 13001/500A | 78 | 48 | 1807 | |
| 4″ | 13001/500C | 96 | 60 | 3491 | |
| 5″ | 13001/500D | 115 | 75 | 5625 | |
| 6″ | 13001/500E | 131 | 91 | 8000 | |

1/5 - 1= Black - 5= Galvanized

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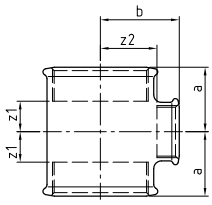
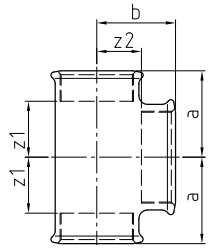
I: Tes iguales en paso y reducidas en bifurcación
II: Tes iguales en paso y aumentadas en bifurcación (A= C<B)
III: Tes reducidas en paso y en bifurcación ( A>B y A>C; B= C ó B>C ó B<C)
IV: Tes reducidas en paso e iguales en bifurcación (A= B>C)
V: Tes reducidas en paso y aumentadas en bifurcación (A>C ; B>A; B>C)

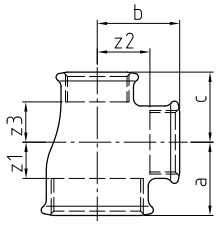
# 130R (B1) REDUCING TEE (A x B x C)

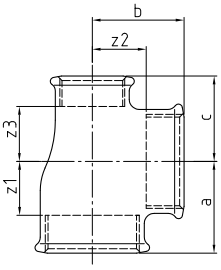

I



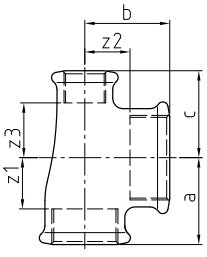

II




III




IV




V

| SIZE | TYPE | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | a | b | c | z1 | z2 | z3 | |
| 3/8" - 1/4" - 3/8" | I | 13001/5212 | 23 | 23 | - | 13 | 13 | - | 109 |
| 3/8" - 1/2" - 3/8" | II | 13001/5232 | 26 | 26 | - | 16 | 13 | - | 80 |
| 3/8" - 3/4" - 3/8" | II | 13001/5242 | 28 | 24 | - | 18 | 9 | - | 109 |
| 1/2" - 1/4" - 1/2" | I | 13001/5313 | 24 | 24 | - | 11 | 14 | - | 82 |
| 1/2" - 3/8" - 3/8" | III | 13001/5322 | 26 | 26 | 25 | 13 | 16 | 15 | 99 |
| 1/2" - 3/8" - 1/2" | I | 13001/5323 | 26 | 26 | - | 13 | 16 | - | 106 |
| 1/2" - 1/2" - 3/8" | IV | 13001/5332 | 28 | 28 | 26 | 15 | 15 | 16 | 108 |
| 1/2" -3/4" - 3/8" | V | 13001/5342 | 29 | 30 | 30 | 17 | 15 | 20 | 118 |
| 1/2" -3/4" - 1/2" | II | 13001/5343 | 31 | 30 | - | 18 | 15 | - | 159 |
| 1/2" - 1" - 1/2" | II | 13001/5353 | 34 | 32 | - | 21 | 15 | - | 182 |
| 3/4" - 1/4" - 3/4" | I | 13001/5414 | 26 | 27 | - | 11 | 17 | - | 130 |
| 3/4" - 3/8" - 1/2" | III | 13001/5423 | 28 | 28 | 26 | 13 | 18 | 13 | 114 |
| 3/4" - 3/8" - 3/4" | I | 13001/5424 | 28 | 28 | - | 13 | 18 | - | 139 |
| 3/4" - 1/2" - 3/8" | III | 13001/5432 | 30 | 31 | 26 | 15 | 18 | 16 | 117 |
| 3/4" - 1/2" - 1/2" | III | 13001/5433 | 30 | 31 | 28 | 15 | 18 | 15 | 122 |
| 3/4" - 1/2" - 3/4" | I | 13001/5434 | 30 | 31 | - | 15 | 18 | - | 148 |
| 3/4" - 3/4" - 3/8" | IV | 13001/5442 | 33 | 33 | 28 | 18 | 18 | 18 | 144 |
| 3/4" - 3/4" - 1/2" | IV | 13001/5443 | 33 | 33 | 31 | 18 | 18 | 18 | 188 |
| 3/4" - 1" - 1/2" | V | 13001/5453 | 36 | 35 | 34 | 21 | 18 | 21 | 201 |
| 3/4" - 1" - 3/4" | II | 13001/5454 | 36 | 35 | - | 21 | 18 | - | 225 |
| 3/4" - 1 1/4" - 3/4" | II | 13001/5464 | 41 | 36 | - | 26 | 17 | - | 251 |
| 1" - 1/4" - 1" | I | 13001/5515 | 28 | 31 | - | 11 | 21 | - | 172 |
| 1" - 3/8" - 3/4" | III | 13001/5524 | 30 | 32 | 28 | 13 | 22 | 13 | 181 |
| 1" - 3/8" - 1" | I | 13001/5525 | 30 | 32 | - | 13 | 22 | - | 182 |
| 1" - 1/2 "- 1/2" | III | 13001/5533 | 32 | 34 | 28 | 15 | 21 | 15 | 221 |
| 1" - 1/2" - 3/4" | III | 13001/5534 | 32 | 34 | 30 | 15 | 21 | 15 | 197 |
| 1" - 1/2" - 1" | I | 13001/5535 | 32 | 34 | - | 15 | 21 | - | 196 |
| 1" - 3/4" - 1/2" | III | 13001/5543 | 35 | 36 | 31 | 18 | 21 | 18 | 213 |
| 1" - 3/4" - 3/4" | III | 13001/5544 | 35 | 36 | 33 | 18 | 21 | 18 | 184 |
| 1" - 3/4" - 1" | I | 13001/5545 | 35 | 36 | - | 18 | 21 | - | 232 |
| 1" - 1" - 3/8" | IV | 13001/5552 | 38 | 38 | 32 | 21 | 21 | 22 | 198 |
| 1" - 1" - 1/2" | IV | 13001/5553 | 38 | 38 | 34 | 21 | 21 | 21 | 246 |
| 1" - 1" -3/4" | IV | 13001/5554 | 38 | 38 | 36 | 21 | 21 | 21 | 244 |
| 1" - 1 1/4" - 3/4" | V | 13001/5564 | 42 | 40 | 41 | 25 | 21 | 26 | 316 |
| 1" - 1 1/4" - 1" | II | 13001/5565 | 42 | 40 | - | 25 | 21 | - | 311 |
| 1" - 1 1/2" - 1" | II | 13001/5575 | 46 | 42 | - | 29 | 23 | - | 338 |
| 1 1/4" - 3/8" - 1 1/4" | I | 13001/5626 | 32 | 36 | - | 13 | 26 | - | 246 |
| 1 1/4" - 1/2" - 1" | III | 13001/5635 | 34 | 38 | 32 | 15 | 25 | 15 | 240 |
| 1 1/4" - 1/2" - 1 1/4" | I | 13001/5636 | 34 | 38 | - | 15 | 25 | - | 278 |
| 1 1/4" - 3/4" - 1/2" | III | 13001/5643 | 36 | 39 | 36 | 17 | 24 | 23 | 236 |
| 1 1/4" - 3/4" - 3/4" | III | 13001/5644 | 36 | 41 | 33 | 17 | 26 | 18 | 279 |
| 1 1/4" - 3/4" - 1" | III | 13001/5645 | 36 | 41 | 35 | 17 | 26 | 18 | 287 |
| 1 1/4" - 3/4" - 1 1/4" | I | 13001/5646 | 36 | 41 | - | 17 | 26 | - | 355 |
| 1 1/4" - 1" - 3/8" | III | 13001/5652 | 41 | 43 | 30 | 22 | 26 | 20 | 258 |
| 1 1/4" - 1" - 1/2" | III | 13001/5653 | 40 | 42 | 34 | 21 | 25 | 21 | 315 |
| 1 1/4" -1" - 3/4" | III | 13001/5654 | 40 | 42 | 36 | 21 | 25 | 21 | 300 |
| 1 1/4" - 1" - 1" | III | 13001/5655 | 40 | 42 | 38 | 21 | 25 | 21 | 330 |
| 1 1/4" - 1" - 1 1/4" | I | 13001/5656 | 40 | 42 | - | 21 | 25 | - | 405 |
| 1 1/4" - 1 1/4" - 1/2" | IV | 13001/5663 | 45 | 45 | 38 | 26 | 26 | 25 | 322 |
| 1 1/4" - 1 1/4" - 3/4" | IV | 13001/5664 | 45 | 45 | 41 | 26 | 26 | 26 | 380 |
| 1 1/4" - 1 1/4" - 1" | IV | 13001/5665 | 45 | 45 | 42 | 26 | 26 | 25 | 371 |
| 1 1/4" - 1 1/2" - 1" | V | 13001/5675 | 48 | 46 | 46 | 29 | 27 | 29 | 425 |
| 1 1/4" - 1 1/2" - 1 1/4" | II | 13001/5676 | 48 | 46 | - | 29 | 27 | - | 440 |
| 1 1/4" - 2" - 1 1/4" | II | 13001/5686 | 54 | 48 | - | 35 | 24 | - | 591 |
| 1 1/2" - 3/8" -1 1/2" | I | 13001/5727 | 35 | 40 | - | 16 | 30 | - | 339 |
| 1 1/2" - 1/2" - 1 1/4" | III | 13001/5736 | 36 | 42 | 34 | 17 | 29 | 15 | 314 |
| 1 1/2" - 1/2" - 1 1/2" | I | 13001/5737 | 36 | 42 | - | 17 | 29 | - | 362 |
| 1 1/2" - 3/4" - 1 1/4" | III | 13001/5746 | 38 | 44 | 36 | 19 | 29 | 17 | 338 |
| 1 1/2" - 3/4" - 1 1/2" | I | 13001/5747 | 38 | 44 | - | 19 | 29 | - | 419 |

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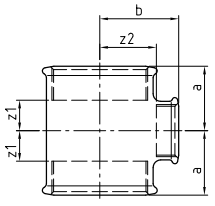
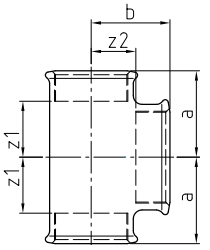
## 130R (B1) REDUCING TEE (A x B x C)


| SIZE | TIPE | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | a | b | c | z1 | z2 | z3 | |
| 1 1/2" - 1" - 1" | III | 13001/5755 | 42 | 46 | 38 | 23 | 29 | 21 | 360 |
| 1 1/2" - 1" - 1 1/4" | III | 13001/5756 | 42 | 46 | 40 | 23 | 29 | 21 | 390 |
| 1 1/2" - 1" - 1 1/2" | I | 13001/5757 | 42 | 46 | - | 23 | 29 | - | 472 |
| 1 1/2" - 1 1/4" - 1" | III | 13001/5765 | 46 | 48 | 42 | 27 | 29 | 25 | 454 |
| 1 1/2" - 1 1/4" - 1 1/4" | III | 13001/5766 | 46 | 48 | 45 | 27 | 29 | 26 | 490 |
| 1 1/2" - 1 1/4" - 1 1/2" | I | 13001/5767 | 46 | 48 | - | 27 | 29 | - | 514 |
| 1 1/2" - 1 1/2" - 1/2" | IV | 13001/5773 | 50 | 50 | 42 | 31 | 31 | 29 | 524 |
| 1 1/2" - 1 1/2" - 3/4" | IV | 13001/5774 | 50 | 50 | 44 | 31 | 31 | 29 | 504 |
| 1 1/2" - 1 1/2" - 1" | IV | 13001/5775 | 50 | 50 | 46 | 31 | 31 | 29 | 457 |
| 1 1/2" - 1 1/2" - 1 1/4" | IV | 13001/5776 | 50 | 50 | 48 | 31 | 31 | 29 | 525 |
| 1 1/2" - 2" - 1 1/4" | V | 13001/5786 | 56 | 54 | 56 | 37 | 30 | 37 | 621 |
| 1 1/2" - 2" - 1 1/2" | II | 13001/5787 | 55 | 52 | - | 36 | 28 | - | 617 |
| 2" - 1/2" - 1 1/2" | III | 13001/5837 | 38 | 48 | 38 | 14 | 35 | 19 | 519 |
| 2" - 1/2" - 2" | I | 13001/5838 | 38 | 48 | - | 14 | 35 | - | 480 |
| 2" - 3/4" - 1 1/2" | III | 13001/5847 | 40 | 50 | 38 | 16 | 35 | 19 | 504 |
| 2" - 3/4" - 2" | I | 13001/5848 | 40 | 50 | - | 16 | 35 | - | 592 |
| 2" - 1" -1 1/2" | III | 13001/5857 | 44 | 52 | 42 | 20 | 35 | 23 | 536 |
| 2" - 1" - 2" | I | 13001/5858 | 44 | 52 | - | 20 | 35 | - | 583 |
| 2" - 1 1/4" - 1" | III | 13001/5865 | 52 | 55 | 52 | 28 | 36 | 35 | 579 |
| 2" - 1 1/4" - 1 1/4" | III | 13001/5866 | 48 | 54 | 45 | 24 | 35 | 26 | 572 |
| 2" - 1 1/4" - 1 1/2" | III | 13001/5867 | 48 | 54 | 46 | 24 | 35 | 27 | 560 |
| 2" - 1 1/4" - 2" | I | 13001/5868 | 48 | 54 | - | 24 | 35 | - | 733 |
| 2" - 1 1/2" - 1" | III | 13001/5875 | 55 | 57 | 54 | 31 | 38 | 37 | 618 |
| 2" - 1 1/2" - 1 1/2" | III | 13001/5877 | 52 | 55 | 50 | 28 | 36 | 31 | 580 |
| 2" - 1 1/2" - 2" | I, | 13001/5878 | 52 | 55 | - | 28 | 36 | - | 809 |
| 2" - 2" - 1/2" | IV | 13001/5883 | 58 | 58 | 48 | 34 | 34 | 35 | 666 |
| 2" - 2" - 3/4" | IV | 13001/5884 | 58 | 58 | 50 | 34 | 34 | 35 | 748 |
| 2" - 2" - 1" | IV | 13001/5885 | 58 | 58 | 52 | 34 | 34 | 35 | 766 |
| 2" - 2" - 1 1/4" | IV | 13001/5886 | 58 | 58 | 54 | 34 | 34 | 35 | 824 |
| 2" - 2" - 1 1/2" | IV | 13001/5887 | 58 | 58 | 55 | 34 | 34 | 36 | 749 |
| 2" - 2 1/2" - 2" | II | 13001/5898 | 68 | 64 | - | 44 | 37 | - | 1189 |
| 2 1/2" - 1/2" - 2 1/2" | I | 13001/5939 | 43 | 56 | - | 16 | 43 | - | 815 |
| 2 1/2" - 3/4" - 2 1/2" | I | 13001/5949 | 45 | 58 | - | 18 | 43 | - | 770 |
| 2 1/2" - 1" - 2 1/2" | I | 13001/5959 | 47 | 60 | - | 20 | 43 | - | 869 |
| 2 1/2" - 1 1/4" - 2 1/2" | I | 13001/5969 | 52 | 62 | - | 25 | 43 | - | 951 |
| 2 1/2" - 1 1/2" - 2 1/2" | I | 13001/5979 | 55 | 63 | - | 28 | 44 | - | 968 |
| 2 1/2 "- 2" - 2" | III | 13001/5988 | 67 | 72 | 62 | 40 | 48 | 38 | 1165 |
| 2 1/2" - 2" - 2 1/2" | I | 13001/5989 | 61 | 66 | - | 34 | 42 | - | 1300 |
| 2 1/2 "- 2 1/2" - 1 1/2" | IV | 13001/5997 | 69 | 69 | 64 | 42 | 42 | 45 | 1500 |
| 2 1/2" - 2 1/2" - 2" | IV | 13001/5998 | 73 | 73 | 68 | 46 | 46 | 34 | 1435 |
| 3" - 1/2" - 3" | I | 13001/5A3A | 46 | 63 | - | 15 | 50 | - | 1108 |
| 3" - 3/4" - 3" | I | 13001/5A4A | 48 | 66 | - | 18 | 51 | - | 1225 |
| 3" - 1" - 3" | I | 13001/5A5A | 51 | 67 | - | 21 | 50 | - | 1152 |
| 3" - 1 1/4" - 3" | I | 13001/5A6A | 55 | 70 | - | 25 | 51 | - | 1556 |
| 3" - 1 1/2" - 3" | I | 13001/5A7A | 58 | 71 | - | 28 | 52 | - | 1312 |
| 3" - 2" - 2" | III | 13001/5A88 | 64 | 73 | 60 | 34 | 49 | 36 | 1480 |
| 3" - 2" - 3" | I | 13001/5A8A | 64 | 73 | - | 34 | 49 | - | 1687 |
| 3" - 2 1/2" - 3" | I | 13001/5A9A | 72 | 76 | - | 42 | 49 | - | 1738 |
| 3" - 3" - 2" | IV | 13001/5AA8 | 78 | 79 | 72 | 48 | 49 | 48 | 1950 |
| 4" - 1/2" - 4" | I | 13001/5C3C | 60 | 76 | - | 24 | 63 | - | 1865 |
| 4" - 3/4" - 4" | I | 13001/5C4C | 62 | 78 | - | 26 | 64 | - | 1755 |
| 4" - 1" - 4" | I | 13001/5C5C | 56 | 81 | - | 20 | 64 | - | 1734 |
| 4" - 1 1/2" - 4" | I | 13001/5C7C | 64 | 84 | - | 28 | 65 | - | 2300 |
| 4" - 2" - 4" | I | 13001/5C8C | 70 | 86 | - | 34 | 62 | - | 2258 |
| 4" - 2 1/2" - 4" | I | 13001/5C9C | 77 | 89 | - | 41 | 62 | - | 2393 |
| 4" - 3" - 4" | I | 13001/5CAC | 84 | 92 | - | 48 | 62 | - | 2589 |
| 5" - 4" - 5" | I | 13001/5DCD | 100 | 110 | - | 60 | 72 | - | 4560 |

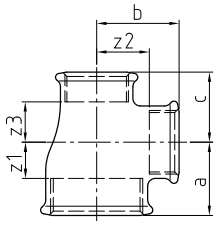
1/5 - 1= Black - 5= Galvanized



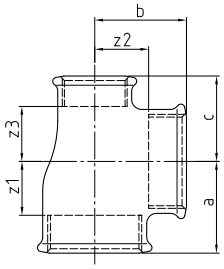
I



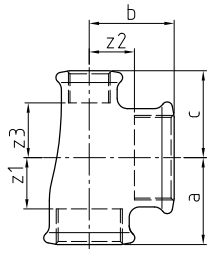
II



III

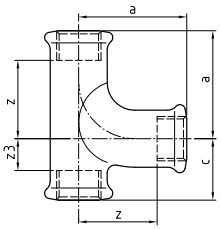


IV



V

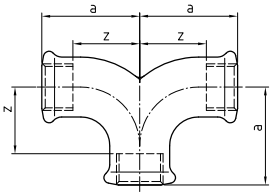
## 131 (E1) PITCHER TEE




| SIZE | CODE | DIMENSIONS (mm) | | | | Weight (gr) |
|---|---|---|---|---|---|---|
| | | a | c | z | z3 | |
| 1/2" | 13101/5003 | 45 | 24 | 32 | 11 | 241 |
| 3/4" | 13101/5004 | 50 | 28 | 35 | 13 | 332 |
| 1" | 13101/5005 | 63 | 33 | 46 | 16 | 457 |
| 1 1/4" | 13101/5006 | 76 | 40 | 57 | 21 | 685 |
| 1 1/2" | 13101/5007 | 85 | 43 | 66 | 24 | 1033 |
| 2" | 13101/5008 | 102 | 53 | 78 | 29 | 1400 |
| 2 1/2" | 13101/5009 | 115 | 62 | 88 | 35 | 2340 |
| 3" | 13101/500A | 127 | 70 | 97 | 40 | 3755 |
| 4" | 13101/500C | 165 | 87 | 129 | 51 | 6260 |

1/5 - 1= Black - 5= Galvanized

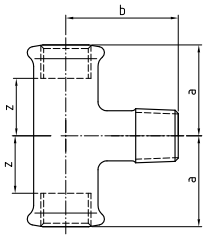
## 132 (E2) TWIN ELBOW




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 1/2" | 13201/5003 | 45 | 32 | 192 |
| 3/4" | 13201/5004 | 50 | 35 | 385 |
| 1" | 13201/5005 | 63 | 46 | 598 |
| 1 1/4" | 13201/5006 | 76 | 57 | 798 |
| 1 1/2" | 13201/5007 | 85 | 66 | 980 |
| 2" | 13201/5008 | 102 | 78 | 1920 |

1/5 - 1= Black - 5= Galvanized

## 133 TEE




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 3/8" | 13301/5002 | 22 | 31 | 12 | 83 |
| 1/2" | 13301/5003 | 25 | 38 | 12 | 101 |
| 3/4" | 13301/5004 | 33 | 45 | 18 | 190 |
| 1" | 13301/5005 | 39 | 53 | 22 | 325 |

1/5 - 1= Black - 5= Galvanized

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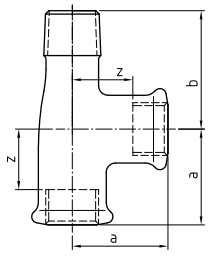
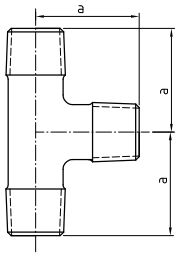
## 134 TEE




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | b | z | |
| 1/2″ | 13401/5003 | 27 | 37 | 14 | 106 |
| 3/4″ | 13401/5004 | 33 | 43 | 17 | 182 |
| 1″ | 13401/5005 | 37 | 50 | 20 | 298 |
| 1 1/4″ | 13401/5006 | 45 | 58 | 26 | 540 |
| 1 1/2″ | 13401/5007 | 50 | 65 | 31 | 587 |
| 2″ | 13401/5008 | 59 | 69 | 35 | 831 |

1/5 - 1= Black - 5= Galvanized

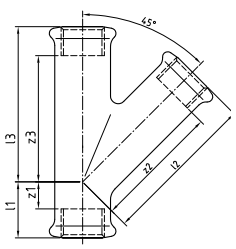
## 135 TEE




| SIZE | CODE | DIMENSIONS (mm) | Weight (gr) |
|---|---|---|---|
| | | a | |
| 1/2″ | 13501/5003 | 37 | 128 |
| 3/4″ | 13501/5004 | 43 | 221 |
| 1″ | 13501/5005 | 48 | 344 |

1/5 - 1= Black - 5= Galvanized

## 165 TEE 45°




| SIZE | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|
| | | l1 | l2 | l3 | z1 | z2 | z3 | |
| 1/2″ | 16501/5003 | 23 | 54 | 54 | 10 | 41 | 41 | 213 |
| 3/4″ | 16501/5004 | 24 | 64 | 64 | 9 | 49 | 49 | 307 |
| 1″ | 16501/5005 | 28 | 77 | 77 | 11 | 60 | 60 | 447 |
| 1 1/4″ | 16501/5006 | 34 | 91 | 91 | 14 | 72 | 72 | 555 |
| 1 1/2″ | 16501/5007 | 34 | 98 | 98 | 15 | 79 | 79 | 992 |
| 2″ | 16501/5008 | 40 | 106 | 106 | 16 | 82 | 82 | 1255 |

1/5 - 1= Black - 5= Galvanized

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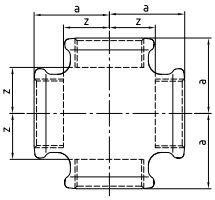
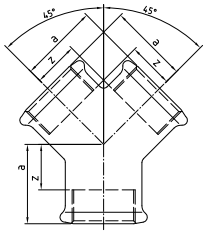
## 180 (C1) CROSS




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 1/4" | 18001/5001 | 21 | 11 | 59 |
| 3/8" | 18001/5002 | 25 | 15 | 111 |
| 1/2" | 18001/5003 | 28 | 15 | 167 |
| 3/4" | 18001/5004 | 33 | 18 | 241 |
| 1" | 18001/5005 | 38 | 21 | 372 |
| 1 1/4" | 18001/5006 | 45 | 26 | 557 |
| 1 1/2" | 18001/5007 | 50 | 31 | 793 |
| 2" | 18001/5008 | 58 | 34 | 935 |
| 2 1/2" | 18001/5009 | 69 | 42 | 1455 |
| 3" | 18001/500A | 78 | 48 | 2160 |
| 4" | 18001/500C | 96 | 60 | 3980 |

1/5 - 1= Black - 5= Galvanized

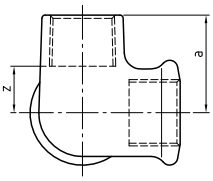
## 220 Y PIECE

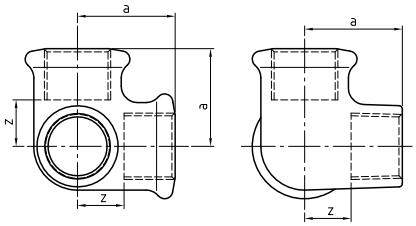



| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 3/8" | 22001/5002 | 24 | 14 | 100 |
| 1/2" | 22001/5003 | 27 | 14 | 124 |
| 3/4" | 22001/5004 | 33 | 18 | 189 |
| 1" | 22001/5005 | 40 | 23 | 290 |

1/5 - 1= Black - 5= Galvanized

## 221 (Za1) SIDE OUTLET ELBOW




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 3/8" | 22101/5002 | 25 | 15 | 102 |
| 1/2" | 22101/5003 | 28 | 15 | 92 |
| 3/4" | 22101/5004 | 33 | 18 | 158 |
| 1" | 22101/5005 | 38 | 21 | 228 |
| 1 1/4" | 22101/5006 | 45 | 26 | 485 |
| 1 1/2" | 22101/5007 | 50 | 31 | 575 |
| 2" | 22101/5008 | 58 | 34 | 826 |

1/5 - 1= Black - 5= Galvanized



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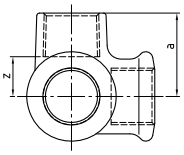
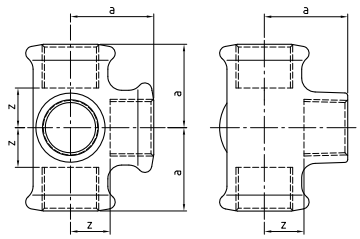
## 223 (Za2) SIDE OUTLET TEE

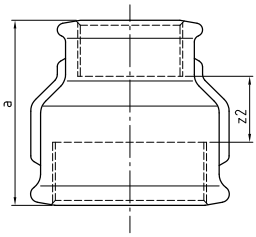



| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 1/2" | 22301/5003 | 28 | 15 | 164 |
| 3/4" | 22301/5004 | 33 | 18 | 185 |
| 1" | 22301/5005 | 38 | 21 | 430 |

1/5 - 1= Black - 5= Galvanized

## 240 (M2) REDUCING SOCKET




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z2 | |
| 1/4" - 1/8" | 24011/5010 | 27 | 10 | 38 |
| 3/8" - 1/8" | 24011/5020 | 30 | 13 | 36 |
| 3/8" - 1/4" | 24011/5021 | 30 | 10 | 38 |
| 1/2" - 1/4" | 24001/5031 | 36 | 13 | 50 |
| 1/2" - 3/8" | 24001/5032 | 36 | 13 | 70 |
| 3/4" - 1/4" | 24001/5041 | 39 | 14 | 73 |
| 3/4" - 3/8" | 24001/5042 | 39 | 14 | 100 |
| 3/4" - 1/2" | 24001/5043 | 39 | 11 | 97 |
| 1" - 3/8" | 24001/5052 | 45 | 18 | 150 |
| 1" - 1/2" | 24001/5053 | 45 | 15 | 144 |
| 1" - 3/4" | 24001/5054 | 45 | 13 | 146 |
| 1 1/4" - 3/8" | 24001/5062 | 50 | 21 | 150 |
| 1 1/4" - 1/2" | 24001/5063 | 50 | 18 | 180 |
| 1 1/4" - 3/4" | 24001/5064 | 50 | 16 | 200 |
| 1 1/4" - 1" | 24001/5065 | 50 | 14 | 234 |
| 1 1/2" - 1/2" | 24001/5073 | 55 | 23 | 208 |
| 1 1/2" - 3/4" | 24001/5074 | 55 | 21 | 226 |
| 1 1/2" - 1" | 24001/5075 | 55 | 19 | 252 |
| 1 1/2" - 1 1/4" | 24001/5076 | 55 | 17 | 256 |
| 2" - 1/2" | 24001/5083 | 65 | 28 | 398 |
| 2" - 3/4" | 24001/5084 | 65 | 26 | 362 |
| 2" - 1" | 24001/5085 | 65 | 24 | 372 |
| 2" - 1 1/4" | 24001/5086 | 65 | 22 | 395 |
| 2" - 1 1/2" | 24001/5087 | 65 | 22 | 368 |
| 2 1/2" - 1" | 24001/5095 | 74 | 30 | 610 |
| 2 1/2" - 1 1/4" | 24001/5096 | 74 | 28 | 611 |
| 2 1/2 "- 1 1/2" | 24001/5097 | 74 | 28 | 556 |
| 2 1/2" - 2" | 24001/5098 | 74 | 23 | 619 |
| 3" - 1 1/4" | 24001/50A6 | 80 | 31 | 1094 |
| 3" - 1 1/2" | 24001/50A7 | 80 | 31 | 736 |
| 3" - 2" | 24001/50A8 | 80 | 26 | 857 |
| 3" - 2 1/2" | 24001/50A9 | 80 | 23 | 860 |
| 4" - 2" | 24001/50C8 | 94 | 34 | 1311 |
| 4" - 2 1/2" | 24001/50C9 | 94 | 31 | 1385 |
| 4" - 3" | 24001/50CA | 94 | 28 | 1387 |

1/5 - 1= Black - 5= Galvanized



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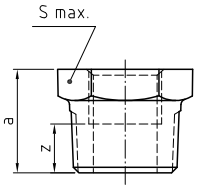
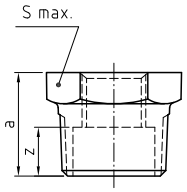
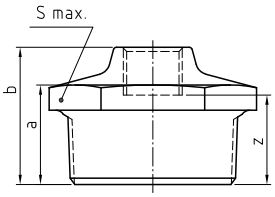
## 241 (N4) REDUCING BUSH




I




II




III

| SIZE | TIPO | CODE | DIMENSIONS (mm) | | | | Weight (gr) | |
|---|---|---|---|---|---|---|---|---|
| | | | a | b | z | S.máx. | | |
| 1/4″ - 1/8″ | I | 24111/5010 | 20 | - | 13 | 17 | 15 | |
| 3/8″ - 1/8″ | II | 24111/5020 | 20 | - | 13 | 19 | 22 | |
| 3/8″ - 1/4″ | I | 24111/5021 | 20 | - | 10 | 19 | 19 | |
| 1/2″ - 1/8″ | II | 24101/5030* | 24 | - | 17 | 23 | 46 | |
| 1/2″ - 1/4″ | II | 24101/5031 | 24 | - | 14 | 22 | 38 | |
| 1/2″ - 3/8″ | I | 24101/5032 | 24 | - | 14 | 22 | 31 | |
| 3/4″ - 1/4″ | II | 24101/5041 | 26 | - | 16 | 30 | 75 | |
| 3/4″ - 3/8″ | II | 24101/5042 | 26 | - | 18 | 30 | 65 | |
| 3/4″ - 1/2″ | I | 24101/5043 | 26 | - | 13 | 30 | 55 | |
| 1″ - 1/4″ | II | 24101/5051 | 29 | - | 19 | 36 | 116 | |
| 1″ - 3/8″ | II | 24101/5052 | 29 | - | 19 | 36 | 113 | |
| 1″ - 1/2″ | II | 24101/5053 | 29 | - | 16 | 36 | 105 | |
| 1″ - 3/4″ | I | 24101/5054 | 29 | - | 14 | 36 | 86 | |
| 1 1/4″ - 3/8″ | II | 24101/5062 | 31 | - | 21 | 46 | 209 | |
| 1 1/4″ - 1/2″ | II | 24101/5063 | 31 | - | 18 | 46 | 194 | |
| 1 1/4″ - 3/4″ | II | 24101/5064 | 31 | - | 16 | 46 | 174 | |
| 1 1/4″ - 1″ | I | 24101/5065 | 31 | - | 14 | 46 | 153 | |
| 1 1/2″ - 3/8″ | II | 24101/5072 | 31 | - | 21 | 50 | 244 | |
| 1 1/2″ - 1/2″ | II | 24101/5073 | 31 | - | 18 | 50 | 237 | |
| 1 1/2″ - 3/4″ | II | 24101/5074 | 31 | - | 16 | 50 | 224 | |
| 1 1/2″ - 1″ | II | 24101/5075 | 31 | - | 14 | 50 | 194 | |
| 1 1/2″ - 1 1/4″ | I | 24101/5076 | 31 | - | 12 | 50 | 136 | |
| 2″ - 1/2″ | III | 24101/5083 | 35 | 48 | 35 | 65 | 359 | |
| 2″ - 3/4″ | III | 24101/5084 | 35 | 48 | 33 | 65 | 318 | |
| 2″ - 1″ | II | 24101/5085 | 35 | - | 18 | 65 | 406 | |
| 2″ - 1 1/4″ | II | 24101/5086 | 35 | - | 16 | 65 | 346 | |
| 2″ - 1 1/2″ | II | 24101/5087 | 35 | - | 16 | 65 | 297 | |
| 2 1/2″ - 1″ | III | 24101/5095 | 40 | 54 | 37 | 80 | 654 | |
| 2 1/2″ - 1 1/4″ | III | 24101/5096 | 40 | 54 | 35 | 80 | 642 | |
| 2 1/2″ - 1 1/2″ | II | 24101/5097 | 40 | - | 21 | 80 | 602 | |
| 2 1/2″ - 2″ | II | 24101/5098 | 40 | - | 16 | 80 | 489 | |
| 3″ - 1″ | III | 24101/50A5 | 44 | 59 | 42 | 95 | 936 | |
| 3″ - 1 1/4″ | III | 24101/50A6 | 44 | 59 | 40 | 95 | 926 | |
| 3″ - 1 1/2″ | III | 24101/50A7 | 44 | 59 | 40 | 95 | 872 | |
| 3″ - 2″ | II | 24101/50A8 | 44 | - | 20 | 95 | 857 | |
| 3″ - 2 1/2″ | II | 24101/50A9 | 44 | - | 17 | 95 | 608 | |
| 4″ - 2″ | III | 24101/50C8 | 51 | 69 | 46 | 120 | 1639 | |
| 4″ - 2 1/2″ | III | 24101/50C9 | 51 | 69 | 42 | 120 | 1574 | |
| 4″ - 3″ | II | 24101/50CA | 51 | - | 21 | 120 | 1347 | |
| 5″ - 4″ | II | 24101/50DC | 57 | - | 28 | 147 | 1996 | |
| 6″ - 4″ | III | 24101/50EC | 44 | 86 | 50 | 175 | 3695 | |
| 6″ - 5″ | II | 24101/50ED | 64 | - | 31 | 175 | 2976 | |

1/5 - 1= Black - 5= Galvanized

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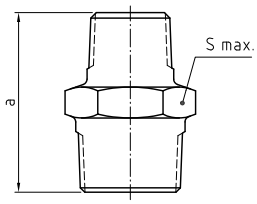
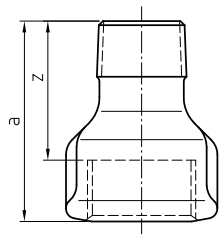
## 245 (N8) REDUCING HEXAGON NIPPLE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) | |
|---|---|---|---|---|---|
| | | a | S.máx | | |
| 1/4" - 1/8" | 24501/5010 | 35 | 17 | 27 | |
| 3/8" - 1/8" | 24511/5020 | 34 | 19 | 32 | |
| 3/8" - 1/4" | 24511/5021 | 38 | 19 | 36 | |
| 1/2" - 1/4" | 24511/5031 | 44 | 22 | 47 | |
| 1/2" - 3/8" | 24501/5032 | 44 | 22 | 52 | |
| 3/4" - 1/4" | 24501/5041 | 43 | 30 | 93 | |
| 3/4" - 3/8" | 24501/5042 | 47 | 30 | 83 | |
| 3/4" - 1/2" | 24501/5043 | 47 | 30 | 84 | |
| 1" - 1/2" | 24501/5053 | 53 | 36 | 138 | |
| 1" - 3/4" | 24501/5054 | 53 | 36 | 149 | |
| 1 1/4" - 1/2" | 24501/5063 | 57 | 46 | 213 | |
| 1 1/4" - 3/4" | 24501/5064 | 57 | 46 | 226 | |
| 1 1/4" - 1" | 24501/5065 | 57 | 46 | 222 | |
| 1 1/2" - 3/4" | 24501/5074 | 59 | 50 | 230 | |
| 1 1/2" - 1" | 24501/5075 | 59 | 50 | 264 | |
| 1 1/2" - 1 1/4" | 24501/5076 | 59 | 50 | 278 | |
| 2" - 1" | 24501/5085 | 68 | 65 | 447 | |
| 2" - 1 1/4" | 24501/5086 | 68 | 65 | 462 | |
| 2" - 1 1/2" | 24501/5087 | 68 | 65 | 529 | |
| 2 1/2" - 1 1/2" | 24501/5097 | 75 | 80 | 752 | |
| 2 1/2" - 2" | 24501/5098 | 75 | 80 | 646 | |
| 3" - 2" | 24501/50A8 | 83 | 95 | 1110 | |
| 3" - 2 1/2" | 24501/50A9 | 83 | 95 | 971 | |
| 4" - 3" | 24501/50CA | 93 | 120 | 1405 | |

1/5 - 1= Black - 5= Galvanized

## 246 (M4) REDUCING SOCKET M/F




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) | |
|---|---|---|---|---|---|
| | | a | z | | |
| 1/4" - 1/8" | 24611/5010 | 32 | 22 | 28 | |
| 3/8" - 1/4" | 24611/5021 | 35 | 25 | 46 | |
| 1/2" - 1/4" | 24601/5031 | 43 | 30 | 48 | |
| 1/2" - 3/8" | 24601/5032 | 43 | 30 | 71 | |
| 3/4" - 3/8" | 24601/5042 | 48 | 33 | 73 | |
| 3/4" - 1/2" | 24601/5043 | 48 | 33 | 100 | |
| 1" - 1/2" | 24601/5053 | 55 | 38 | 131 | |
| 1" - 3/4" | 24601/5054 | 55 | 38 | 123 | |
| 1 1/4" - 1/2" | 24601/5063 | 60 | 41 | 189 | |
| 1 1/4" - 3/4" | 24601/5064 | 60 | 41 | 188 | |
| 1 1/4" - 1" | 24601/5065 | 60 | 41 | 219 | |
| 1 1/2" - 3/4" | 24601/5074 | 60 | 41 | 233 | |
| 1 1/2" - 1" | 24601/5075 | 63 | 44 | 271 | |
| 1 1/2" - 1 1/4" | 24601/5076 | 63 | 44 | 276 | |
| 2" - 1" | 24601/5085 | 70 | 46 | 345 | |
| 2" - 1 1/4" | 24601/5086 | 70 | 46 | 406 | |
| 2" - 1 1/2" | 24601/5087 | 70 | 46 | 380 | |
| 2 1/2" - 1 1/2" | 24601/5097 | 83 | 56 | 790 | |
| 2 1/2" - 2" | 24601/5098 | 80 | 53 | 658 | |
| 3" - 2" | 24601/50A8 | 87 | 57 | 872 | |
| 3" - 2 1/2" | 24601/50A9 | 91 | 61 | 937 | |

1/5 - 1= Black - 5= Galvanized



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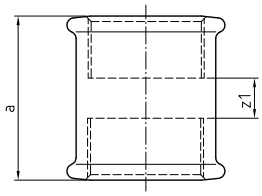
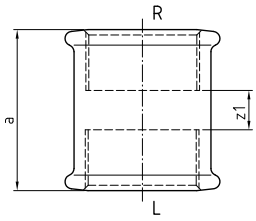
## 270 (M2) SOCKET




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z1 | |
| 1/8" | 27011/5000 | 25 | 11 | 24 |
| 1/4" | 27011/5001 | 27 | 7 | 32 |
| 3/8" | 27001/5002 | 30 | 10 | 49 |
| 1/2" | 27001/5003 | 36 | 10 | 83 |
| 3/4" | 27001/5004 | 39 | 9 | 96 |
| 1" | 27001/5005 | 45 | 11 | 147 |
| 1 1/4" | 27001/5006 | 50 | 12 | 250 |
| 1 1/2" | 27001/5007 | 55 | 17 | 303 |
| 2" | 27001/5008 | 65 | 17 | 472 |
| 2 1/2" | 27001/5009 | 74 | 20 | 739 |
| 3" | 27001/500A | 80 | 20 | 968 |
| 4" | 27001/500C | 94 | 22 | 1761 |
| 5" | 27001/500D | 109 | 29 | 2810 |
| 6" | 27001/500E | 120 | 40 | 3530 |

1/5 - 1= Black - 5= Galvanized

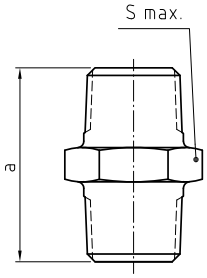
## 271 (M2 R-L) RIGHT (R) / LEFT (L) SOCKET




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z1 | |
| 3/8" | 27101/5002 | 30 | 10 | 51 |
| 1/2" | 27101/5003 | 36 | 10 | 72 |
| 3/4" | 27101/5004 | 39 | 9 | 100 |
| 1" | 27101/5005 | 45 | 11 | 146 |
| 1 1/4" | 27101/5006 | 50 | 12 | 254 |
| 1 1/2" | 27101/5007 | 55 | 17 | 332 |
| 2" | 27101/5008 | 65 | 17 | 472 |

1/5 - 1= Black - 5= Galvanized

## 280 (N8) HEXAGON NIPPLE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | S máx | |
| 1/8" | 28011/5000 | 29 | 13 | 13 |
| 1/4" | 28011/5001 | 36 | 17 | 26 |
| 3/8" | 28001/5002 | 38 | 22 | 52 |
| 1/2" | 28001/5003 | 44 | 27 | 59 |
| 3/4" | 28001/5004 | 47 | 32 | 104 |
| 1" | 28001/5005 | 53 | 41 | 172 |
| 1 1/4" | 28001/5006 | 57 | 50 | 255 |
| 1 1/2" | 28001/5007 | 59 | 55 | 318 |
| 2" | 28001/5008 | 68 | 70 | 525 |
| 2 1/2" | 28001/5009 | 75 | 85 | 730 |
| 3" | 28001/500A | 83 | 100 | 1053 |
| 4" | 28001/500C | 95 | 130 | 2028 |
| 5" | 28001/500D | 103 | 150 | 2520 |
| 6" | 28001/500E | 110 | 180 | 2500 |

1/5 - 1= Black - 5= Galvanized



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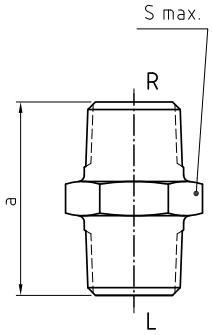
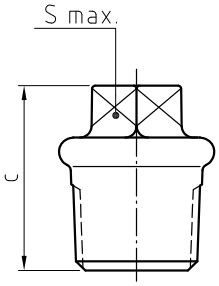
## 281 (N8 R-L) RIGHT (R) / LEFT (L) HEXAGON NIPPLE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | S.máx. | |
| 3/8" | 28101/5002 | 38 | 22 | 45 |
| 1/2" | 28101/5003 | 44 | 27 | 57 |
| 3/4" | 28101/5004 | 47 | 32 | 106 |
| 1" | 28101/5005 | 53 | 41 | 156 |
| 1 1/4" | 28101/5006 | 57 | 50 | 240 |
| 1 1/2" | 28101/5007 | 59 | 55 | 313 |
| 2" | 28101/5008 | 68 | 70 | 580 |

1/5 - 1= Black - 5= Galvanized

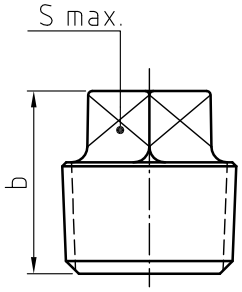
## 290 (T9) PLUG




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | c | S.máx. | |
| 1/8" | 29011/5000 | 20 | 7 | 14 |
| 1/4" | 29011/5001 | 22 | 8 | 28 |
| 3/8" | 29001/5002 | 24 | 10 | 33 |
| 1/2" | 29001/5003 | 26 | 11 | 58 |
| 3/4" | 29001/5004 | 32 | 17 | 79 |
| 1" | 29001/5005 | 36 | 19 | 142 |
| 1 1/4" | 29001/5006 | 39 | 22 | 205 |
| 1 1/2" | 29001/5007 | 41 | 22 | 252 |
| 2" | 29001/5008 | 48 | 27 | 408 |
| 2 1/2" | 29001/5009 | 54 | 32 | 610 |
| 3" | 29001/500A | 60 | 36 | 955 |
| 4" | 29001/500C | 70 | 41 | 1669 |

1/5 - 1= Black - 5= Galvanized

## 291 (T8) PLAIN PLUG




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | b | S.máx. | |
| 1/8" | 29111/5000 | 11 | 7 | 8 |
| 1/4" | 29111/5001 | 14 | 8 | 20 |
| 3/8" | 29101/5002 | 15 | 10 | 28 |
| 1/2" | 29101/5003 | 18 | 11 | 31 |
| 3/4" | 29101/5004 | 20 | 17 | 63 |
| 1" | 29101/5005 | 23 | 19 | 84 |
| 1 1/4" | 29101/5006 | 29 | 22 | 146 |
| 1 1/2" | 29101/5007 | 30 | 22 | 175 |
| 2" | 29101/5008 | 36 | 27 | 291 |
| 2 1/2" | 29101/5009 | 39 | 32 | 428 |
| 3" | 29101/500A | 44 | 36 | 725 |
| 4" | 29101/500C | 58 | 41 | 1450 |

1/5 - 1= Black - 5= Galvanized



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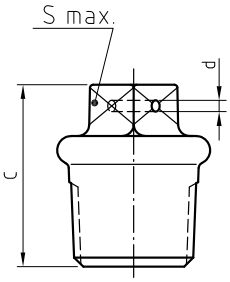
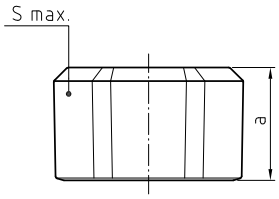
## 294 PLUG WITH HOLE IN SQUARE HEAD




| SIZE | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | c | S. máx. | d | |
| 1/2" | 29401/5003 | 32 | 11 | 4 | 40 |
| 3/4" | 29401/5004 | 34 | 16 | 4 | 77 |
| 1" | 29401/5005 | 37 | 19 | 5 | 109 |
| 1 1/4" | 29401/5006 | 41 | 21 | 5 | 185 |
| 1 1/2" | 29401/5007 | 46 | 20 | 5 | 217 |
| 2" | 29401/5008 | 50 | 27 | 5 | 326 |

1/5 - 1= Black - 5= Galvanized

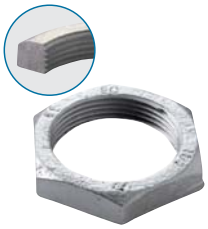
## 300 (T1) CAP

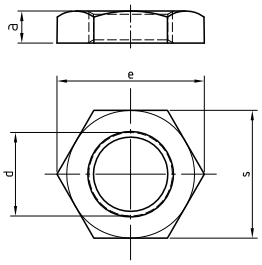



| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | S.máx. | |
| 1/8" | 30011/5000 | 13 | 15 | 16 |
| 1/4" | 30011/5001 | 15 | 18 | 23 |
| 3/8" | 30011/5002 | 17 | 22 | 37 |
| 1/2" | 30001/5003 | 19 | 26 | 45 |
| 3/4" | 30001/5004 | 22 | 32 | 78 |
| 1" | 30001/5005 | 24 | 39 | 102 |
| 1 1/4" | 30001/5006 | 27 | 48 | 156 |
| 1 1/2" | 30001/5007 | 27 | 54 | 185 |
| 2" | 30001/5008 | 32 | 66 | 326 |
| 2 1/2" | 30001/5009 | 35 | 84 | 531 |
| 3" | 30001/500A | 38 | 96 | 942 |
| 4" | 30001/500C | 45 | 123 | 1841 |

1/5 - 1= Black - 5= Galvanized

## 310 (P4) BACKNUT






| SIZE d | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | e aprox. | s | |
| 1/4" | 31011/5001 | 6 | 22 | 19 | 14 |
| 3/8" | 31001/5002 | 8 | 28 | 24 | 20 |
| 1/2" | 31001/5003 | 8 | 37 | 32 | 32 |
| 3/4" | 31001/5004 | 9 | 42 | 36 | 38 |
| 1" | 31001/5005 | 10 | 53 | 46 | 72 |
| 1 1/4" | 31001/5006 | 11 | 62 | 54 | 95 |
| 1 1/2" | 31001/5007 | 12 | 68 | 60 | 116 |
| 2" | 31001/5008 | 13 | 86 | 75 | 199 |
| 2 1/2" | 31001/5009 | 19 | 110 | 95 | 430 |
| 3" | 31001/500A | 22 | 120 | 105 | 538 |

1/5 - 1= Black - 5= Galvanized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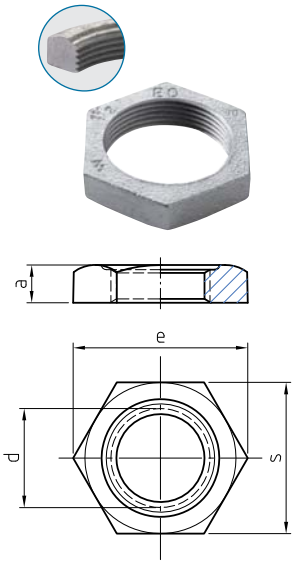
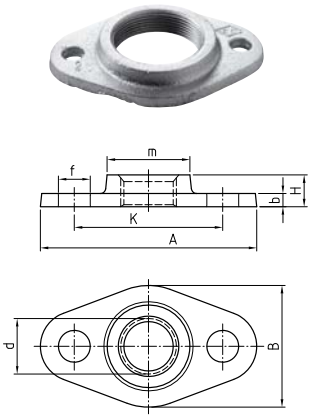
## 312 (P4) BACKNUT, RECESSED




| SIZE d | CODE | DIMENSIONS (mm) | | | Weight (gr) |
|---|---|---|---|---|---|
| | | a | e aprox. | s | |
| 1/4" | 31211/5001 | 6 | 25 | 22 | 13 |
| 3/8" | 31211/5002 | 7 | 30 | 27 | 21 |
| 1/2" | 31201/5003 | 8 | 36,9 | 32 | 31 |
| 3/4" | 31201/5004 | 9 | 41,6 | 36 | 37 |
| 1" | 31201/5005 | 10 | 53,1 | 46 | 74 |
| 1 1/4" | 31201/5006 | 11 | 63,5 | 55 | 92 |
| 1 1/2" | 31201/5007 | 12 | 69,3 | 60 | 124 |
| 2" | 31201/5008 | 13 | 86,5 | 75 | 222 |
| 2 1/2" | 31201/5009 | 16 | 110,0 | 95 | 430 |
| 3" | 31201/500A | 19 | 126,0 | 109 | 620 |
| 4" | 31201/500C | 21 | 158,0 | 136 | 952 |

1/5 - 1= Black - 5= Galvanized

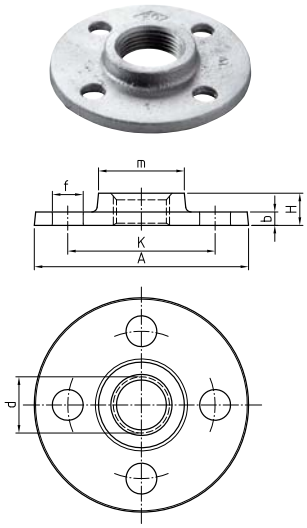
## 320 FLANGE




| SIZE | CODE | DIMENSIONS (mm) | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| | | d | m | K | A | B | H | b | f | (gr) |
| 1/2" | 32001/5003 | Rp 1/2 | 32 | 55 | 80 | 45 | 12 | 5 | 11,5 | 101 |
| 3/4" | 32001/5004 | Rp 3/4 | 38 | 65 | 90 | 64 | 13 | 5 | 11,5 | 172 |
| 1" | 32001/5005 | Rp 1 | 46 | 75 | 100 | 72 | 14 | 6 | 11,5 | 237 |
| 1 1/4" | 32001/5006 | Rp 1 1/4 | 56 | 90 | 120 | 85 | 15 | 6 | 14 | 352 |
| 1 1/2" | 32001/5007 | Rp 1 1/2 | 63 | 100 | 130 | 95 | 16 | 7 | 14 | 446 |
| 2" | 32001/5008 | Rp 2 | 77 | 110 | 140 | 100 | 18 | 8 | 14 | 580 |
| 2 1/2" | 32001/5009 | Rp 2 1/2 | 92 | 130 | 160 | 118 | 20 | 9 | 14 | 800 |
| 3" | 32001/500A | Rp 3 | 106 | 150 | 190 | 140 | 22 | 10 | 18 | 1155 |
| 4" | 32001/500C | Rp 4 | 132 | 170 | 210 | 160 | 24 | 11 | 18 | 1503 |

1/5 - 1= Black - 5= Galvanized

## 321 FLANGE




| SIZE | CODE | DIMENSIONS (mm) | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | d | m | K | A | H | b | f | (gr) |
| 1/2" | 32101/5003 | Rp 1/2 | 32 | 55 | 80 | 12 | 5 | 11,5 | 191 |
| 3/4" | 32101/5004 | Rp 3/4 | 38 | 65 | 90 | 13 | 5 | 11,5 | 245 |
| 1" | 32101/5005 | Rp 1 | 46 | 75 | 100 | 14 | 6 | 11,5 | 355 |
| 1 1/4" | 32101/5006 | Rp 1 1/4 | 56 | 90 | 120 | 15 | 6 | 14 | 558 |
| 1 1/2" | 32101/5007 | Rp 1 1/2 | 63 | 100 | 130 | 16 | 7 | 14 | 670 |
| 2" | 32101/5008 | Rp 2 | 77 | 110 | 140 | 18 | 8 | 14 | 850 |
| 2 1/2" | 32101/5009 | Rp 2 1/2 | 93 | 130 | 160 | 20 | 9 | 14 | 1226 |
| 3" | 32101/500A | Rp 3 | 107 | 150 | 190 | 22 | 10 | 18 | 1812 |
| 4" | 32101/500C | Rp 4 | 133 | 170 | 210 | 24 | 11 | 18 | 2440 |

1/5 - 1= Black - 5= Galvanized



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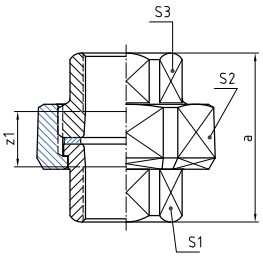
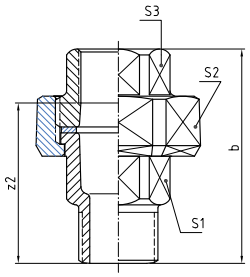
## 330 (U1) UNION FLAT SEAT F/F


| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | a | z1 | s1 | s2 | s3 | s2 máx | |
| 1/2" | 1 1/8 | 33001/5003 | 48 | 22 | 26 | 44 | 26 | 46 | 213 |
| 3/4 " | 1 1/4 | 33001/5004 | 52 | 22 | 32 | 48 | 32 | 50 | 291 |
| 1" | 1 1/2 | 33001/5005 | 58 | 24 | 38 | 54 | 38 | 55 | 363 |
| 1 1/4 " | 2 | 33001/5006 | 65 | 27 | 48 | 68 | 48 | 70 | 614 |
| 1 1/2 " | 2 1/4 | 33001/5007 | 70 | 32 | 54 | 74 | 54 | 75 | 729 |
| 2" | 2 3/4 | 33001/5008 | 78 | 30 | 66 | 89 | 66 | 90 | 1071 |
| 2 1/2 " | 3 1/2 | 33001/5009 | 85 | 31 | 86 | 110 | 86 | 110 | 1899 |
| 3" | 4 | 33001/500A | 95 | 36 | 95 | 130 | 95 | 130 | 2528 |
| 4" | 5 | 33001/500C | 110 | 38 | 121 | 150 | 121 | 150 | 3436 |

1/5 - 1= Black - 5= Galvanized

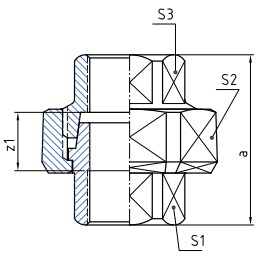
## 331 (U2) UNION FLAT SEAT M/F


| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | b | z2 | s1 | s2 | s3 | s2 máx | |
| 3/8" | 3/4 | 33101/5001 | 58 | 48 | 22 | 32 | 22 | 36 | 118 |
| 1/2" | 1 1/8 | 33101/5002 | 66 | 53 | 26 | 44 | 26 | 46 | 235 |
| 3/4" | 1 1/4 | 33101/5003 | 72 | 57 | 32 | 48 | 32 | 50 | 332 |
| 1" | 1 1/2 | 33101/5004 | 80 | 63 | 38 | 54 | 38 | 55 | 438 |
| 1 1/4" | 2 | 33101/5005 | 90 | 71 | 48 | 68 | 48 | 70 | 718 |
| 1 1/2" | 2 1/4 | 33101/5006 | 95 | 76 | 54 | 74 | 54 | 75 | 889 |
| 2" | 2 3/4 | 33101/5007 | 106 | 82 | 66 | 89 | 66 | 90 | 1333 |
| 2 1/2" | 3 1/2 | 33101/5008 | 116 | 89 | 86 | 110 | 86 | 110 | 2268 |
| 3" | 4 | 33101/5009 | 127 | 97 | 95 | 130 | 95 | 130 | 3071 |

1/5 - 1= Black - 5= Galvanized

## 340 (U11) UNION TAPER SEAT F/F


| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | a | z1 | s1 | s2 | s3 | s2 máx | |
| 1/8" | 1/2 | 34001/5000 | 38 | 24 | 15 | 26 | 15 | 26 | 69 |
| 1/4" | 3/4 | 34001/5001 | 42 | 22 | 17 | 31 | 17 | 32 | 104 |
| 3/8" | 7/8 | 34001/5002 | 45 | 25 | 22 | 35 | 22 | 36 | 146 |
| 1/2" | 1 1/8 | 34001/5003 | 48 | 22 | 26 | 44 | 26 | 46 | 226 |
| 3/4" | 1 1/4 | 34001/5004 | 52 | 22 | 32 | 48 | 32 | 50 | 293 |
| 1" | 1 1/2 | 34001/5005 | 58 | 24 | 38 | 54 | 38 | 55 | 364 |
| 1 1/4" | 2 | 34001/5006 | 65 | 27 | 46 | 68 | 46 | 70 | 625 |
| 1 1/2" | 2 1/4 | 34001/5007 | 70 | 32 | 53 | 74 | 53 | 75 | 749 |
| 2" | 2 3/4 | 34001/5008 | 78 | 30 | 66 | 89 | 66 | 90 | 1116 |
| 2 1/2" | 3 1/2 | 34001/5009 | 85 | 31 | 83 | 110 | 83 | 110 | 1926 |
| 3" | 4 | 34001/500A | 95 | 36 | 95 | 130 | 95 | 130 | 2594 |
| 4" | 5 | 34001/500C | 110 | 38 | 121 | 150 | 121 | 150 | 3617 |

1/5 - 1= Black - 5= Galvanized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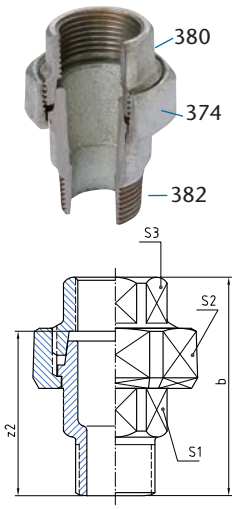
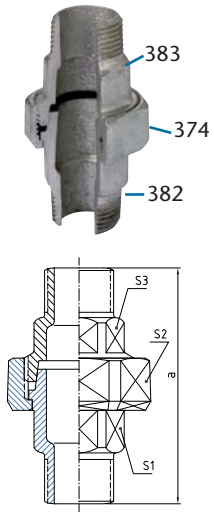
## 341 (U12) UNION TAPER SEAT M/F




| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|
| | | | b | z2 | s1 | s2 | s3 | s2 máx | |
| 1/4" | 3/4 | 34101/5001 | 55 | 45 | 17 | 31 | 17 | 32 | 117 |
| 3/8" | 7/8 | 34101/5002 | 58 | 48 | 22 | 35 | 22 | 36 | 156 |
| 1/2" | 1 1/8 | 34101/5003 | 66 | 53 | 26 | 44 | 26 | 46 | 246 |
| 3/4" | 1 1/4 | 34101/5004 | 72 | 57 | 32 | 48 | 32 | 50 | 332 |
| 1" | 1 1/2 | 34101/5005 | 80 | 63 | 38 | 54 | 38 | 55 | 449 |
| 1 1/4" | 2 | 34101/5006 | 90 | 71 | 46 | 68 | 46 | 70 | 703 |
| 1 1/2" | 2 1/4 | 34101/5007 | 95 | 76 | 53 | 74 | 53 | 75 | 911 |
| 2" | 2 3/4 | 34101/5008 | 106 | 82 | 66 | 89 | 66 | 90 | 1338 |
| 2 1/2" | 3 1/2 | 34101/5009 | 118 | 91 | 83 | 110 | 83 | 110 | 2248 |
| 3" | 4 | 34101/500A | 130 | 100 | 95 | 130 | 95 | 130 | 3120 |
| 4" | 5 | 34101/500C | 152 | 112 | 121 | 150 | 121 | 150 | 5094 |

1/5 - 1= Black - 5= Galvanized

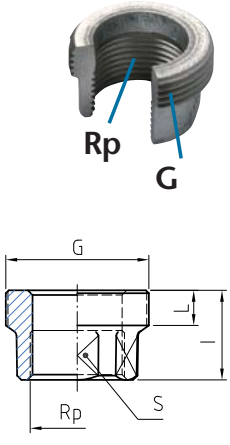
## 344 UNION TAPER SEAT M/M




| SIZE | 374G | CODE | DIMENSIONS (mm) | | | | Weight (gr) | |
|---|---|---|---|---|---|---|---|---|
| | | | a | s1 | s2 | s3 | | |
| 1/4" | 5/8 | 34401/5001 | 69 | 18 | 28 | 15 | 109 | |
| 3/8" | 3/4 | 34401/5002 | 75 | 22 | 32 | 20 | 146 | |
| 1/2" | 1 | 34401/5003 | 85 | 26 | 39 | 23 | 256 | |
| 3/4" | 1 1/4 | 34401/5004 | 93 | 32 | 48 | 30 | 381 | |
| 1" | 1 1/2 | 34401/5005 | 103 | 38 | 55 | 36 | 555 | |
| 1 1/4" | 2 | 34401/5006 | 114 | 48 | 67 | 48 | 845 | |
| 1 1/2" | 2 1/4 | 34401/5007 | 123 | 54 | 74 | 54 | 1063 | |
| 2" | 2 3/4 | 34401/5008 | 136 | 66 | 90 | 67 | 1575 | |

1/5 - 1= Black - 5= Galvanized

## 370 UNION BUSH




| UNION MEASUREMENT | Rp | CODE | G | DIMENSIONS (mm) | | | tightening | Weight (gr) |
|---|---|---|---|---|---|---|---|---|
| | | | | I | L | S | | |
| 1/2" | 1/2 | 37001/5003 | 1 1/8 | 24 | 8,3 | 26 | hexagon | 66 |
| 3/4" | 3/4 | 37001/5004 | 1 1/4 | 26 | 9 | 32 | hexagon | 98 |
| 1" | 1 | 37001/5005 | 1 1/2 | 29 | 12 | 38 | hexagon | 132 |
| 1 1/4" | 1 1/4 | 37001/5006 | 2 | 31 | 10,3 | 48 | hexagon | 204 |
| 1 1/2" | 1 1/2 | 37001/5007 | 2 1/4 | 34 | 11 | 54 | hexagon | 265 |
| 2" | 2 | 37001/5008 | 2 3/4 | 40 | 14,5 | 66 | hexagon | 420 |
| 2 1/2" | 2 1/2 | 37001/5009 | 3 1/2 | 45 | 14,5 | 86 | hexagon | 764 |
| 3" | 3 | 37001/500A | 4 | 49 | 15,5 | 95 | hexagon | 917 |
| 4" | 4 | 37001/500C | 5 | 57 | 19 | 121 | octogon | 1314 |

1/5 - 1= Black - 5= Galvanized



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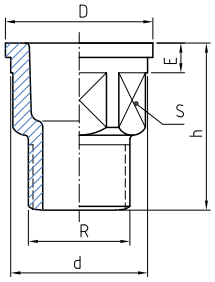
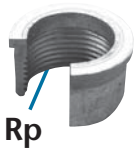
## 371 MALE UNION END

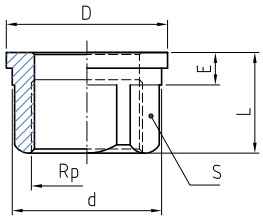




| SIZE UNIÓN | R | CODE | 374G | DIMENSIONS (mm) | | | | | tightening | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | h | E | d | D | S | | |
| 1/2" | 1/2 | 37101/5003 | 1 1/8 | 40 | 7,5 | 31,60 | 34,3 | 26 | hexagon | 82 |
| 3/4" | 3/4 | 37101/5004 | 1 1/4 | 44 | 7,8 | 35,60 | 38,4 | 32 | hexagon | 117 |
| 1" | 1 | 37101/5005 | 1 1/2 | 49 | 9,0 | 40,90 | 44,2 | 38 | hexagon | 176 |
| 1 1/4" | 1 1/4 | 37101/5006 | 2 | 56 | 10,3 | 52,20 | 56,0 | 48 | hexagon | 270 |
| 1 1/2" | 1 1/2 | 37101/5007 | 2 1/4 | 58 | 10,5 | 58,10 | 62,0 | 54 | hexagon | 380 |
| 2" | 2 | 37101/5008 | 2 3/4 | 65 | 10,8 | 73,00 | 77,8 | 66 | hexagon | 581 |
| 2 1/2" | 2 1/2 | 37101/5009 | 3 1/2 | 70 | 11,5 | 90,00 | 96,0 | 86 | hexagon | 892 |
| 3" | 3 | 37101/500A | 4 | 75 | 11,5 | 104,00 | 109,0 | 95 | hexagon | 1249 |

1/5 - 1= Black - 5= Galvanized

## 372 FEMALE UNION END

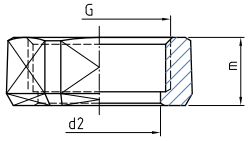


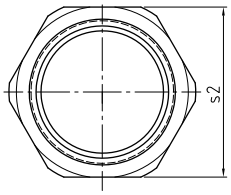




| SIZE UNIÓN | Rp | CODE | 374G | DIMENSIONS (mm) | | | | | tightening | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | d | D | E | S | | |
| 1/2" | 1/2 | 37201/5003 | 1 1/8 | 22,00 | 31,60 | 34,3 | 7,5 | 26 | hexagon | 60 |
| 3/4" | 3/4 | 37201/5004 | 1 1/4 | 24,00 | 35,60 | 38,4 | 7,8 | 32 | hexagon | 76 |
| 1" | 1 | 37201/5005 | 1 1/2 | 26,50 | 40,90 | 44,2 | 9,0 | 38 | hexagon | 101 |
| 1 1/4" | 1 1/4 | 37201/5006 | 2 | 31,00 | 52,20 | 56,0 | 10,3 | 48 | hexagon | 166 |
| 1 1/2" | 1 1/2 | 37201/5007 | 2 1/4 | 33,00 | 58,10 | 62,0 | 10,5 | 54 | hexagon | 220 |
| 2" | 2 | 37201/5008 | 2 3/4 | 34,00 | 73,00 | 77,8 | 10,8 | 66 | hexagon | 319 |
| 2 1/2" | 2 1/2 | 37201/5009 | 3 1/2 | 38,00 | 90,00 | 96,0 | 11,5 | 86 | hexagon | 528 |
| 3" | 3 | 37201/500A | 4 | 43,00 | 104,00 | 109,0 | 11,5 | 95 | hexagon | 706 |

1/5 - 1= Black - 5= Galvanized

## 374 (P1) UNION NUT


| SIZE UNIÓN | CODE | G | DIMENSIONS (mm) | | | | tightening | Weight (gr) |
|---|---|---|---|---|---|---|---|---|
| | | | m | d2 | s2 | s2 máx | | |
| 1/2" | 37401/5003 | 1 1/8 | 19 | 32,2 | 44 | 46 | hexagon | 87 |
| 3/4" | 37401/5004 | 1 1/4 | 20 | 36,2 | 48 | 50 | hexagon | 117 |
| 1" | 37401/5005 | 1 1/2 | 22 | 41,8 | 55 | 55 | hexagon | 130 |
| 1 1/4" | 37401/5006 | 2 | 24 | 52,9 | 70 | 68 | hexagon | 244 |
| 1 1/2" | 37401/5007 | 2 1/4 | 25 | 59,1 | 73 | 74 | hexagon | 244 |
| 2" | 37401/5008 | 2 3/4 | 27 | 73,9 | 89 | 90 | hexagon | 332 |
| 2 1/2" | 37401/5009 | 3 1/2 | 30 | 90,5 | 110 | 110 | hexagon | 596 |
| 3" | 37401/500A | 4 | 31 | 104,5 | 126 | 130 | hexagon | 905 |
| 4" | 37401/500C | 5 | 36 | 129,5 | 150 | 150 | hexagon | 1118 |

1/5 - 1= Black - 5= Galvanized

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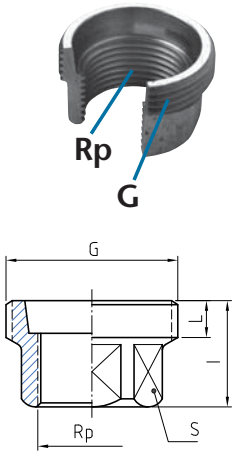
ATUSA

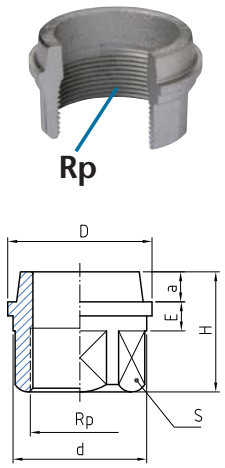
## 380 FEMALE TAPER UNION




| SIZE UNIÓN | Rp | G | DIMENSIONS (mm) | | | tightening | |
|---|---|---|---|---|---|---|---|
| | | | I | L | S | | |
| 1/8" | 1/8 | 1/2 | 19,00 | 9,50 | 15 | hexagon | |
| 1/4" | 1/4 | 3/4 | 19,00 | 7,80 | 17 | hexagon | |
| 3/8" | 3/8 | 7/8 | 24,00 | 7,80 | 22 | hexagon | |
| 1/2" | 1/2 | 1 1/8 | 24,00 | 8,30 | 26 | hexagon | |
| 3/4" | 3/4 | 1 1/4 | 26,00 | 9,00 | 32 | hexagon | |
| 1" | 1 | 1 1/2 | 29,00 | 11,00 | 38 | hexagon | |
| 1 1/4" | 1 1/4 | 2 | 31,00 | 11,00 | 46 | hexagon | |
| 1 1/2" | 1 1/2 | 2 1/4 | 34,50 | 11,00 | 53 | hexagon | |
| 2" | 2 | 2 3/4 | 40,00 | 14,50 | 66 | hexagon | |
| 2 1/2" | 2 1/2 | 3 1/2 | 45,00 | 14,50 | 83 | hexagon | |
| 3" | 3 | 4 | 49,00 | 15,50 | 95 | hexagon | |
| 4" | 4 | 5 | 57,50 | 19,00 | 121 | octogon | |

1/5 - 1= Black - 5= Galvanized

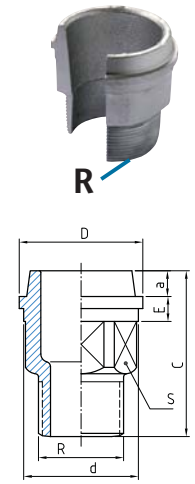
## 381 FEMALE TAPER END




| SIZE UNIÓN | Rp | 374G | DIMENSIONS (mm) | | | | | | tightening |
|---|---|---|---|---|---|---|---|---|---|
| | | | H | E | a | d | D | S | |
| 1/8" | 1/8 | 1/2 | 24,00 | 10,5 | 6,50 | 15,80 | 18,20 | 15 | hexagon |
| 1/4" | 1/4 | 3/4 | 23,00 | 7,00 | 6,00 | 20,80 | 23,50 | 17 | hexagon |
| 3/8" | 3/8 | 7/8 | 26,00 | 7,00 | 7,00 | 24,70 | 27,60 | 22 | hexagon |
| 1/2" | 1/2 | 1 1/8 | 29,00 | 7,50 | 7,00 | 31,60 | 34,30 | 26 | hexagon |
| 3/4" | 3/4 | 1 1/4 | 32,00 | 7,80 | 8,00 | 35,60 | 38,40 | 32 | hexagon |
| 1" | 1 | 1 1/2 | 36,00 | 9,00 | 9,50 | 40,90 | 44,20 | 38 | hexagon |
| 1 1/4" | 1 1/4 | 2 | 41,50 | 10,30 | 10,00 | 52,20 | 56,00 | 46 | hexagon |
| 1 1/2" | 1 1/2 | 2 1/4 | 44,00 | 10,50 | 11,00 | 58,10 | 62,00 | 53 | hexagon |
| 2" | 2 | 2 3/4 | 46,00 | 10,80 | 12,00 | 73,00 | 77,80 | 66 | hexagon |
| 2 1/2" | 2 1/2 | 3 1/2 | 50,00 | 11,50 | 12,00 | 90,00 | 96,00 | 83 | hexagon |
| 3" | 3 | 4 | 55,50 | 11,50 | 12,00 | 104,00 | 109,00 | 95 | hexagon |
| 4" | 4 | 5 | 65,00 | 12,50 | 14,00 | 128,00 | 134,00 | 121 | hexagon |

1/5 - 1= Black - 5= Galvanized

## 382 MALE TAPER END




| SIZE UNIÓN | R | 374G | DIMENSIONS (mm) | | | | | | tightening |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | E | a | d | D | S | |
| 1/4" | 1/4 | 3/4 | 33,0 | 7,00 | 6,00 | 20,80 | 23,50 | 17 | hexagon |
| 3/8" | 3/8 | 7/8 | 39,0 | 7,00 | 7,00 | 24,70 | 27,60 | 22 | hexagon |
| 1/2" | 1/2 | 1 1/8 | 47,0 | 7,50 | 7,00 | 31,60 | 34,30 | 26 | hexagon |
| 3/4" | 3/4 | 1 1/4 | 51,5 | 7,80 | 8,00 | 35,60 | 38,40 | 32 | hexagon |
| 1" | 1 | 1 1/2 | 59,0 | 9,00 | 9,50 | 40,90 | 44,20 | 38 | hexagon |
| 1 1/4" | 1 1/4 | 2 | 66,5 | 10,30 | 10,00 | 52,20 | 56,00 | 46 | hexagon |
| 1 1/2" | 1 1/2 | 2 1/4 | 67,5 | 10,50 | 11,00 | 58,10 | 62,00 | 53 | hexagon |
| 2" | 2 | 2 3/4 | 77,0 | 10,80 | 12,00 | 73,00 | 77,80 | 66 | hexagon |

1/5 - 1= Black - 5= Galvanized



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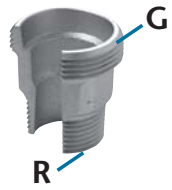
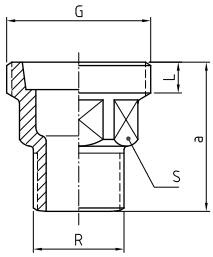
## 383 MALE TAPER UNION

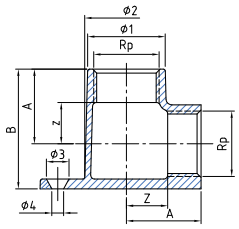


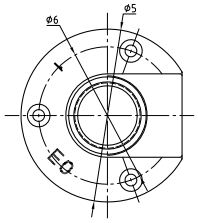




| SIZE UNIÓN | R | G | DIMENSIONS (mm) | | | tightening | |
|---|---|---|---|---|---|---|---|
| | | | a | L | S | | |
| 1/4" | 1/4 | 5/8 | 35 | 7,80 | 19,00 | hexagon | |
| 3/8" | 3/8 | 3/4 | 39 | 7,80 | 22,00 | hexagon | |
| 1/2" | 1/2 | 1 | 44 | 8,30 | 26,00 | hexagon | |
| 3/4" | 3/4 | 1 1/4 | 48 | 9,00 | 32,00 | hexagon | |
| 1" | 1 | 1 1/2 | 54 | 11,00 | 38,00 | hexagon | |
| 1 1/4" | 1 1/4 | 2 | 58 | 11,00 | 48,00 | hexagon | |
| 1 1/2" | 1 1/2 | 2 1/4 | 61 | 11,00 | 54,00 | hexagon | |
| 2" | 2 | 2 3/4 | 71 | 14,50 | 66,00 | hexagon | |

1/5 - 1= Black - 5= Galvanized

## 471 BRACKET ELBOW

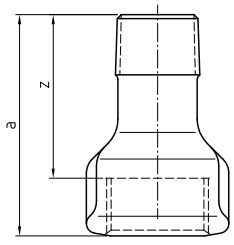



| SIZE | CODE | DIMENSIONS (mm) | | | | | | | | | | Weight (gr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rp | A | B | z | Φ1 | Φ2 | Φ3 | Φ4 | Φ5 | Φ6 | |
| 1/2" | 47101/5003 | 1/2 | 28 | 46 | 15 | 27 | 29 | 10 | 5 | 60 | 46 | 185 |
| 3/4" | 47101/5004 | 3/4 | 33 | 53 | 18 | 34 | 37 | 11 | 6 | 74 | 58 | 322 |
| 1" | 47101/5005 | 1 | 38 | 61 | 21 | 40 | 43 | 12 | 6 | 88 | 70 | 448 |

1/5 - 1= Black - 5= Galvanized

## 526 EXTENSION TUBE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) | |
|---|---|---|---|---|---|
| | | a | z | | |
| 3/8" - 30 | 52601/5302 | 30 | 20 | 36 | |
| 1/2" - 30 | 52601/5303 | 30 | 19 | 42 | |
| 3/8" - 40 | 52601/5402 | 40 | 30 | 42 | |
| 1/2" - 40 | 52601/5403 | 40 | 27 | 50 | |
| 3/4" - 40 | 52601/5404 | 40 | 25 | 87 | |
| 1/2" - 50 | 52601/5503 | 50 | 37 | 87 | |
| 3/4" - 50 | 52601/5504 | 50 | 35 | 101 | |

1/5 - 1= Black - 5= Galvanized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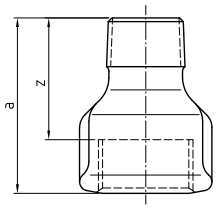
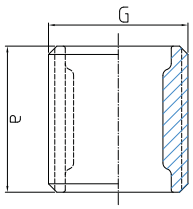
## 529A (M4) EXTENSION TUBE




| SIZE | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | a | z | |
| 3/8″ | 529A01/5002 | 35 | 25 | 45 |
| 1/2″ | 529A01/5003 | 43 | 30 | 71 |
| 3/4″ | 529A01/5004 | 48 | 33 | 98 |
| 1″ | 529A01/5005 | 55 | 38 | 153 |
| 1 1/4″ | 529A01/5006 | 60 | 41 | 230 |
| 1 1/2″ | 529A01/5007 | 63 | 44 | 280 |
| 2″ | 529A01/5008 | 70 | 46 | 464 |

1/5 - 1= Black - 5= Galvanized

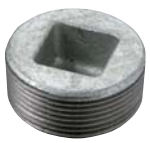
## 531 INTERNAL NIPPLE

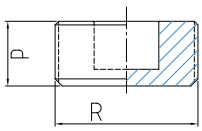


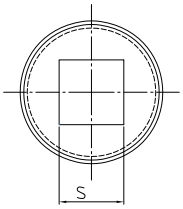

| SIZE G | CODE | DIMENSIONS (mm) | Weight (gr) |
|---|---|---|---|
| | | a | |
| 1/8″ | 53111/5000 | 19 | 9 |
| 1/4″ | 53111/5001 | 17 | 11 |
| 3/8″ | 53101/5002 | 23 | 36 |
| 1/2″ | 53101/5003 | 25 | 28 |
| 3/4″ | 53101/5004 | 30 | 45 |
| 1″ | 53101/5005 | 35 | 72 |
| 1 1/4″ | 53101/5006 | 40 | 109 |
| 1 1/2″ | 53101/5007 | 45 | 191 |
| 2″ | 53101/5008 | 50 | 280 |
| 2 1/2″ | 53101/5009 | 56 | 410 |
| 3″ | 53101/500A | 69 | 690 |
| 4″ | 53101/500C | 82 | 842 |

1/5 - 1= Black - 5= Galvanized

## 596 (T11) PLUG SQUARE INSIDE






| SIZE R | CODE | DIMENSIONS (mm) | | Weight (gr) |
|---|---|---|---|---|
| | | d | S | |
| 3/8″ | 59601/5002 | 10 | 8 | 12 |
| 1/2″ | 59601/5003 | 15 | 10 | 26 |
| 3/4″ | 59601/5004 | 17 | 12 | 48 |
| 1″ | 59601/5005 | 19 | 16 | 82 |
| 1 1/4″ | 59601/5006 | 22 | 22 | 140 |
| 1 1/2″ | 59601/5007 | 22 | 22 | 202 |
| 2″ | 59601/5008 | 27 | 27 | 380 |

1/5 - 1= Black - 5= Galvanized

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# 4 ASSEMBLY INSTRUCTIONS

## 4.1. BASIC ASSEMBLY

The basic operations for the joining of threaded fittings and steel pipes are:

- Secure the pipe: the pipe must be secured at every moment in order to avoid deformations in the tightening ( pipes that are very long will require additional support)

- Cut of the pipe: this must be made perpendicular to the axis of the pipe.

- Threading of the pipe. The following have to be taken into account:

  • The thread (male) will be initiated in an extreme perpendicular to the axis.

  • The oil to be used is appropriate :

    - Good lubrication and refrigeration capabilities.
    - Good solubility in water. (in order to be removed) .
    - It is not contaminating.

  • Centring the threads.
  • The diameter of the threads is adequate, for which the use of standardised calibrated alloys is necessary. (EN 10226-3)

- Curvature of the pipe. The following aspects need to be taken into account:

  • Steel pipes with a DN superior to 50 (2 inches) should not be bent.
  • The curving process must always be carried out in cold temperatures.
  • In soldered pipes, the soldering must be in the upper part so that its reaction can be observed.
  • The length of the starting straight pipe is adequate.

- Assembling the joint: to ensure the sealing of the joint, the following aspects need to be taken into account:

  • Remove any shavings or foreign bodies in the interior and exterior of the pipe and in the fitting.
  • Assure that both fittings are free from foreign bodies (shavings, dirt, dry oil,..).
  • Apply the liquid or solid sealing material (Teflon, hemp, hemp paint, etc.) to the male thread in a homogenous and thorough way (if it is a solid, it should follow the direction of the threads).
  • During the manual assembly, assure that the longitudinal axes are aligned adequately.

- Tightening of the joint: the following aspects need to be taken into account:

  • Apply the appropriate torque.

| DIAMETER | | APPROXIMATE TURQUE (Nm) |
|---|---|---|
| 3/8 | DN 10 | 65 |
| 1/2 | DN 15 | 65 |
| 3/4 | DN 20 | 125 |
| 1 | DN 25 | 125 |
| 1 1/4 | DN 32 | 185 |
| 1 1/2 | DN 40 | 185 |
| 2 | DN 50 | 245 |
| 2 1/2 | DN 65 | 245 |
| 3 | DN 80 | 245 |
| 4 | DN 100 | 300 |

  • After the final tightening, remove those unions where the washout thread has been used.

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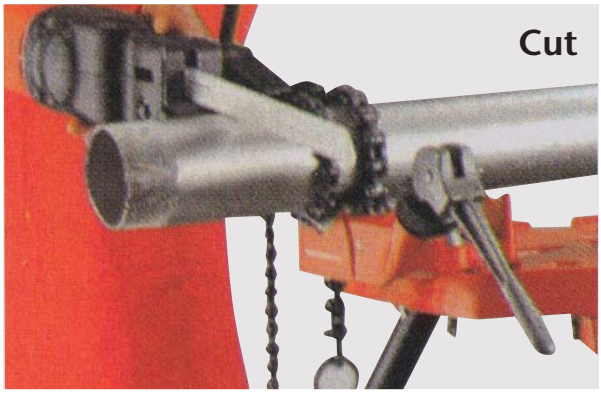






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## 4.2. LINEAR EXPANSION

The temperature changes in the fluid that circulates through the pipe have an impact on the length of this as well as all on its elements (fittings, valves, clamps and alignment,…)

The calculation of the length increase ($\Delta L$ ) associated with the increase in the temperature ($\Delta T$) is given by the expression:

$$\Delta L = \alpha \, Lo \, \Delta T$$

$\Delta L$ = increase in the length of the pipe (mm)
$Lo$ = initial length of the pipe (mm)
$\Delta T$ = increase in the temperature (ºC)
$\alpha$ = linear expansion coefficient of steel ($ºC^{-1}$) whose value is 1.2 X $10^{-5}$ (between 0ºC and 100 ºC)

| LINEAR EXPANSION IN STEEL PIPES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial length pipe (m) | Increase in temperature ΔT (ºC) | | | | | | | | | | |
| | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| | Increase in length of the pipe ΔL (mm) | | | | | | | | | | |
| 1 | 0,012 | 0,060 | 0,120 | 0,180 | 0,240 | 0,300 | 0,360 | 0,420 | 0,480 | 0,540 | 0,600 |
| 2 | 0,024 | 0,120 | 0,240 | 0,360 | 0,480 | 0,600 | 0,720 | 0,840 | 0,960 | 1,080 | 1,200 |
| 3 | 0,036 | 0,180 | 0,360 | 0,540 | 0,720 | 0,900 | 1,080 | 1,260 | 1,440 | 1,620 | 1,800 |
| 4 | 0,048 | 0,240 | 0,480 | 0,720 | 0,960 | 1,200 | 1,440 | 1,680 | 1,920 | 2,160 | 2,400 |
| 5 | 0,060 | 0,300 | 0,600 | 0,900 | 1,200 | 1,500 | 1,800 | 2,100 | 2,400 | 2,700 | 3,000 |
| 6 | 0,072 | 0,360 | 0,720 | 1,080 | 1,440 | 1,800 | 2,160 | 2,520 | 2,880 | 3,240 | 3,600 |
| 7 | 0,084 | 0,420 | 0,840 | 1,260 | 1,680 | 2,100 | 2,520 | 2,940 | 3,360 | 3,780 | 4,200 |
| 8 | 0,096 | 0,480 | 0,960 | 1,440 | 1,920 | 2,400 | 2,880 | 3,360 | 3,840 | 4,320 | 4,800 |
| 9 | 0,108 | 0,540 | 1,080 | 1,620 | 2,160 | 2,700 | 3,240 | 3,780 | 4,320 | 4,860 | 5,400 |
| 10 | 0,120 | 0,600 | 1,200 | 1,800 | 2,400 | 3,000 | 3,600 | 4,200 | 4,800 | 5,400 | 6,000 |

Figure 4

## 4.3. ASSEMBLY LENGTH (Z dimension)

In the joints between pipes and fittings, **the assembly length or Dimension "Z"** is defined as the distance between the pipe end and the axis of the fitting (diagrams 1 and 2) or the distance between the ends of two pipes joined to a fitting (diagram 3) and is regulated so as to guide and help with the installation.

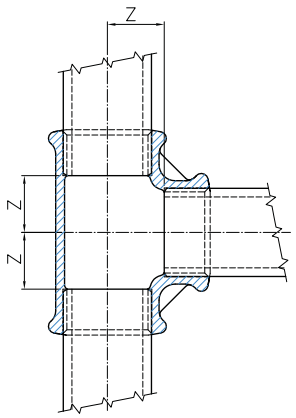


Figure 1

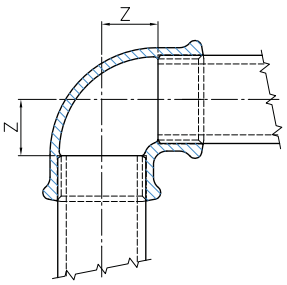


Figure 2

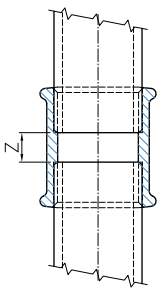


Figure 3

In order for this to be calculated, we will use the concepts of length coupling, distance between faces and axes, and parameters whose values will have been established as an EN 10242 standard of the product.

In this way the "*z*" dimension can be calculated as:

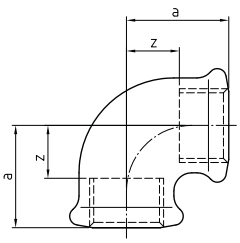
***Z = (distance pipe-pipe or distance pipe-axis) – length of the coupling***

Here are some examples :

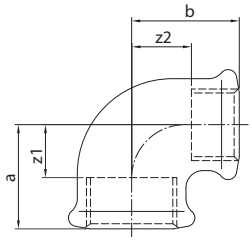
- 1 inch A1 Elbow (Ref.90)
  z = a – coupling length = 38-17 = 21
- 1 ¾ inch A1 Reducing Elbow (Ref. 90)
  z 1 = a – coupling length = 35-17 = 18 (1 inch mouth)
  z 2 = b – coupling length = 36-15 = 21 (3/4 inch mouth)

- 1 ½ ½ inch B1 Tee (Ref. 130)
  z 1 = a – coupling length = 32-17 = 15 (1 inch mouth)
  z 2 = b – coupling length = 34-13 = 21 (1/2 inch mouth)
  z 3 = c – coupling length = 28-13 = 15 (1/2 inch mouth)

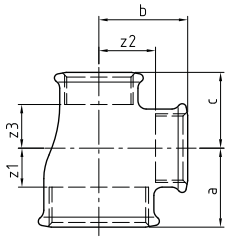
- ½ inch M2 socket (Ref. 270)
  z = a – 2 *(coupling length) = 36- 2 * (13)= 10 (1/2 inch mouth)



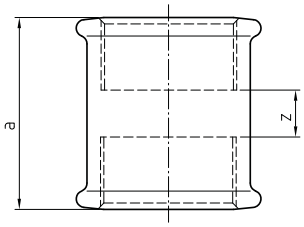
A1 (90)



A1 (90R)



B1 (130R)



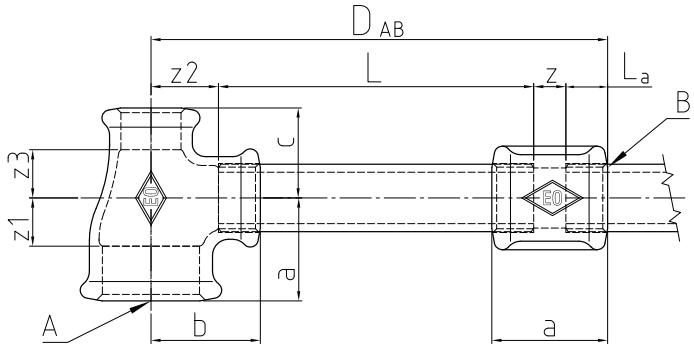
M2 (270)

| LENGHT OF COUPLING ACCORDING TO EN 10242 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Designation of each thread | 1/8 | 1/4 | 3/8 | 1/2 | 3/4 | 1 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 3 | 4 | 5 | 6 |
| Length of coupling (mm) | 7 | 10 | 10 | 13 | 15 | 17 | 19 | 19 | 24 | 27 | 30 | 36 | 40 | 40 |

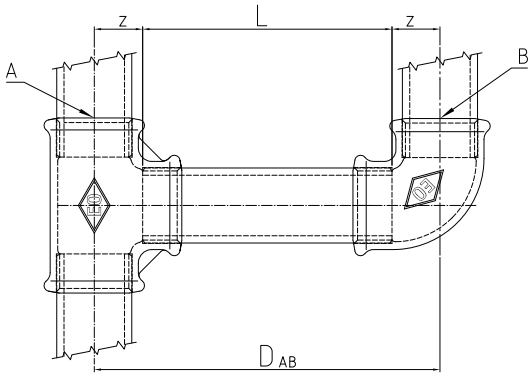
Nota: los valores de las cotas a, b, c, etc se especifican en las tablas dimensionales del capítulo 3 (DIMENSIONS)

By using the aforementioned concepts, the length of the pipes needed can be calculated before the installation.

Hence, the value of L (**length of the pipe**) to perform the union of the fittings between two known points A and B situated (for example) 1 meter apart, can be calculated as follows:




*130-1-1/2-1/2 (A) --- (B) 270-1/2*
*L = Distance (A-B) – ($Z_2$+Z+$L_a$)*
*L = 1000 – (21+10+13) = 956 mm*




*130-1 (A) --- (B) 90-1*
*L = Distance (A-B) – ($Z_{130}$+$Z_{90}$)*
*L = 1000 – (21+21) = 958 mm*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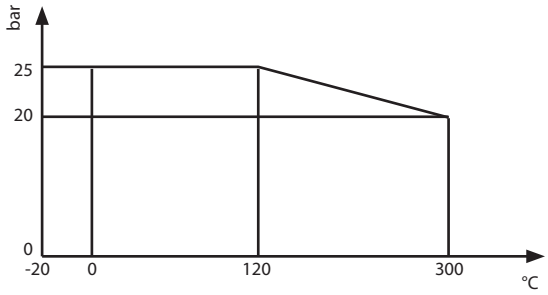
# 5 APPLICATIONS

The fittings, for general use, are ideal for transmission of fluids and gases up to the following limits of pressure and temperature. By design, they are capable of resisting the tensions involved during the threading operations of other elements of conduction:

a) normal use




| Working temperature (ºC) | Máxima presión de trabajo admisible (bar) |
|---|---|
| -20 to 120 | 25 |
| between 120 y 300 | Interpolated values |
| 300 | 20 |

b) special uses

ATUSA provides fittings which are apt for working under conditions which exceed the limit specified for normal use.

These special types of fittings are used in fire protection systems with inert gases which operate under high pressures. For the provision of these fittings, a type of test has to be undertaken to satisfy the **VdS 2093 07.83 regulation**. (These pieces are provided with a special marking and can be specially certified).

## BASIC SECTORS OF USE

As regards their use, the fittings provide great versatility. So, sectors such as industry, agriculture, civil engineering and construction, have been using our products for a long time.

Examples of installations (of conduction):

- Heating and sanitation
- Air conditioning
- Fire protection
- Agricultural watering systems
- General conduction of water and gases
- Gas distribution networks and connections
- Boilers and industrial fridges
- Capital goods (machine tools, ovens,…)

Classical, but not so technical, examples are their use in railings, scaffolding, land enclosure, decoration, etc.

## DIFFERENTIAL CHARACTERISTICS

### High mechanical resistance

As the following tables show, the malleable cast iron fittings and steel pipes offer high mechanical resistance values when compared with other materials, demonstrating much better behaviour when faced with high pressure requirements, expansion tension, pressure overload due to fluid hammer, etc.

| | MATERIAL | | | | |
|---|---|---|---|---|---|
| | Galvanized steel | Cast iron | Cupper | Hard PVC | Thermoresisten PVC |
| Resistencia Tracción ( Kg/cm²) | 5000 | 4000 | 2470 | 530 | 550 |
| Alargamiento (%) | 22 | 5 | 53 | 100 | 30 |
| Dureza Brinell (HB) | 140 | 210 | 64 | - | - |

| | Comparative example (same elements) | |
|---|---|---|
| | Allowable pressure (bar) | Observation |
| Steel tube DN20 medium series | 258 | Para el cálculo se ha utilzado el mismo coeficiente de seguridad y la resistencia reflejada en la tabla anterior |
| Steel tube DN20 heavy series | 336 | |
| Malleable elbow 3/4" | 330 | |
| Copper tube 20x22 | 50 | |
| PVC hard tube 21x25 | 20 | |
| Thermoresistant tube 21x25 | 21 | |

**High resistance to fire**

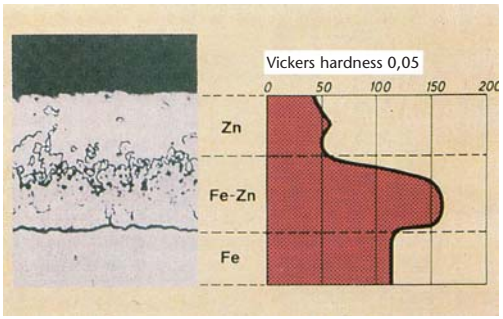
As the following table shows, the malleable cast iron fittings and steel pipes offer low expansion coefficients in comparison with other materials, which means they yield fewer tension problems and deformations. Moreover, a high melting point, much higher than other materials, allows the mechanical properties to be maintained at much higher temperatures, which means that these fittings are much more appropriate than others for fire protection systems, security conductions, etc.

| | MATERIAL | | |
|---|---|---|---|
| | Steel / Casting | Copper | PVC |
| Dilation Coef x $10^{-6}$ ( $ºC^{-1}$) | 11,6 | 17,6 (+52%) | 70 (+503%) |
| Melting point (ºC) | 1540 | 1078 (-30%) | aprox 120 (-92%) |

**High resistance to corrosion – abrasion**

The hot dip galvanized coating (external Zn + internal Fe-Zn alloys + Fe base) offers the metal base very high protection against corrosion.

The internal Fe-Zn alloys are even harder than steel, while the external layer of pure zinc is softer. This means that the system acts as a type of "cushion" which is very resistant to blows and scratches.




**100 % recyclable material**

Once removed from the installation, the material can be used and taken advantage of as raw material in the making of new metallic products, thus avoiding the use of new raw materials and subsequent energy waste.

**Versatility**

The wide range of existing references and the ease with which the installations are performed means that the fittings can be adapted to any design requisite.

**Quality**

The manufacturing of the fittings is undertaken in accordance with the UNE-EN-ISO 9011 standard for Quality Control Systems. This standard undergoes regular checks by highly recognised European control organisations.

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# 6 USEFUL INFORMATION

## 6.1. FACTORS REGARDING CORROSION

Most occurrences of metallic corrosion are, by nature, electrochemical (the contact of metals with means which provide conductivity such as salt solutions, water, humidity, etc.).

In these circumstances, and due to the electrochemical potentials which are present in different parts of the metal, anodic and cathodic areas are generated making the water act as an electrolyte. The consequence is the destruction of the metal which ends up turning into corrosive products (generally hydroxides or metal hydrated oxides).

By applying it to galvanized products, zinc has the capacity to form passivation layers which insulate the iron from the harmful agent. Thus, by being more electronegative than iron, it will act as an anode zone, which will mean that the corrosion will attack this and will leave the iron protected.

Passivation products (basically simple hydrated carbonates) are more insoluble in water, very adherent and not very porous, forming a thin layer on the surface of the fitting which prevents the advance of possible corrosion.

### BASIC PREVENTION OF CORROSION IN THE EXTERIOR OF THE PIPES

Experience has shown that the principal agents which cause corrosion in the exterior of the pipes are certain aggressive building materials (gypsum, plaster, scoria,….) which usually act only in the presence of humidity.

Thus, it is essential to avoid as much as possible the presence of humidity when installing the pipes in the open or in exposed areas. If this is not possible, the following is recommended:

- Before covering the installation:

  - Carry out a pressure test to ensure the absence of any type of leakage.
  - Clean appropriately and avoid any contact with gypsum, plaster….
  - Avoid contact between the pipes and heterogeneous materials (Gravel, rubble….) which allow air pockets and also avoid the forming of differential aeration.

- Cover the hot water pipes with an insulating covering or wrapper which does not absorb humidity and which allows adjustment to temperature changes (expansion, contraction). Avoid fibreglass wool lagging or mineral fibres because these absorb and retain humidity. Waterproof materials should be used.

- Cover the cold water pipes with cement slurry (Portland for example), especially the parts which are in contact with the ground and walls.

- Apply a final layer of cement mortar (this must not contain any unwashed beach sand or additives with chlorides).

Apart from the nature of the water used (pH, concentration of salts and gases, aggressiveness, contamination …), the following is recommended in order to minimize the risk of corrosion.

- Use treated waters.

- Use joints of the same nature (do not mix galvanized parts with non galvanized parts). Soldering carried out on galvanized parts will cause damage (especially to interior surfaces).

  - Avoid the presence of materials in the interior of the pipes ( shavings, burr, etc).
  - Avoid the use of metals of different nature (steel-copper).
  - Avoid air getting in by using the correct design for the installation (necessary pumping and purges, etc).

- Encourage the creation of a passivation layer ( at the beginning clean and let the water run a while, do not empty or leave the installation half empty, etc).

  - Control the temperature of the hot water.
  - Avoid the use of the pipes as earth in electrical installations.

All in all, both interior and exterior installations should be carried out in accordance with the technical instructions and code of good practice and also follow the legal requisites applicable.

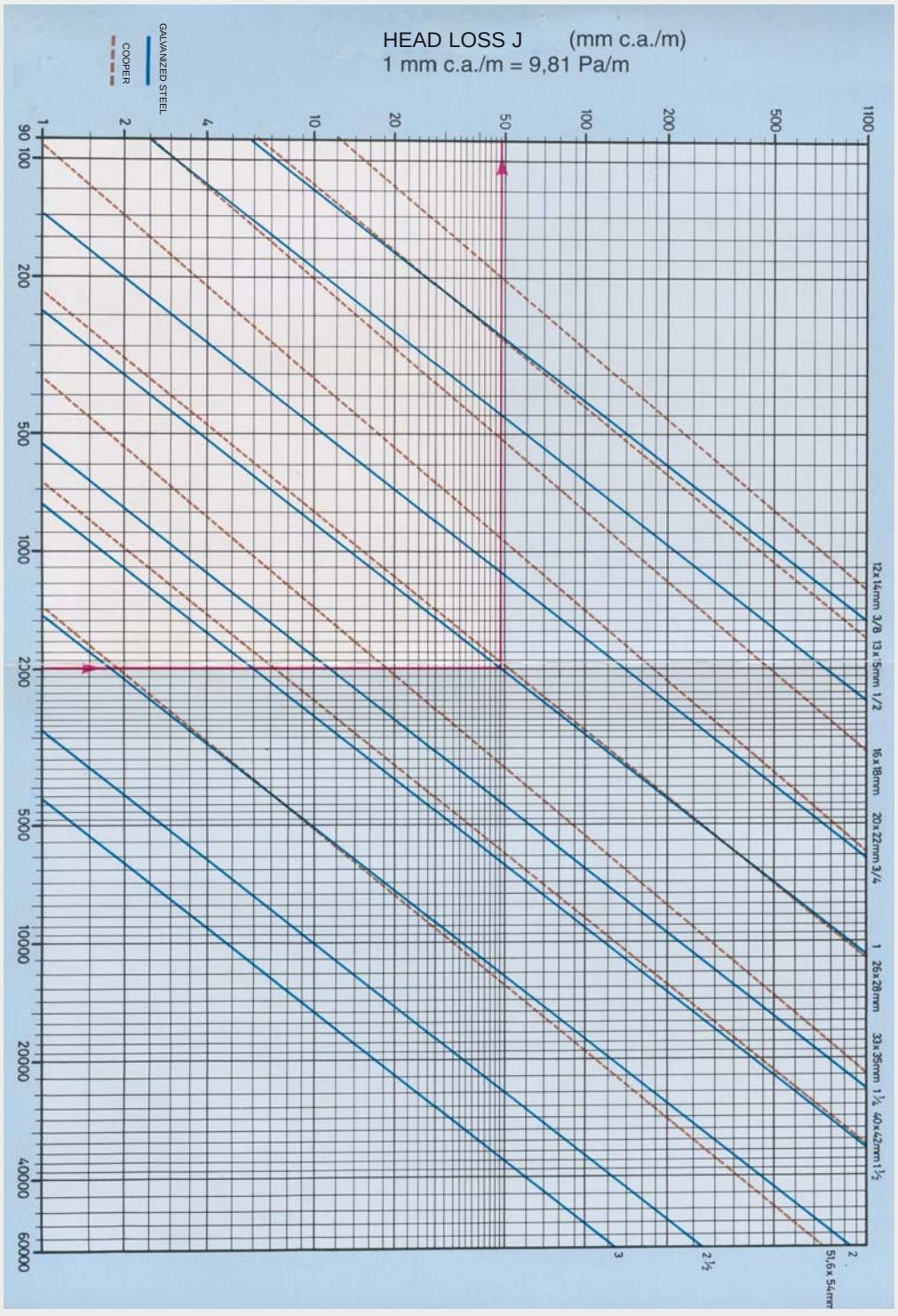
## 6.2. HEAD LOSS

In fluid conduction installations it is necessary to carry out, at all times, the adequate service pressure at the lowest energetic cost. For this reason, head loss is one of the most important factors to bear in mind for the correct calculation and dimensionality of the installations.

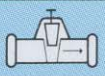
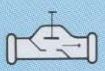
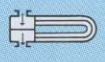
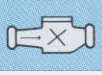
As it advances, the fluid must overcome the resistance of the friction against the walls (LOCALIZED losses – "linear loss") and the resistance when it passes through special sections in valves, expansions, reductions, elbow joints, etc. (SINGULAR losses – losses through "equivalent length") .

The energy loss to overcome these resistances is called head loss. In order to be calculated, certain empirical expressions are used (Darcy-Weisbach, Hazen-Williams, etc) along with experimental calculations. However, for a fast and approximate calculation the following framework can be used:

HEAD LOSS IN HYDRAULIC CONDUCTIONS DIAGRAM



Equivalent lenghts (in mm) of head loss corresponding to different elemnts of hydraulic systems.

| Type of isolated resistance \ Nominal diameter of pipe | | 3/8<br>10 | 1/2<br>15 | 3/4<br>20 | 1<br>25 | 1 1/4<br>32 | 1 1/2<br>40 | 2<br>50 | 2 1/2<br>65 | 3<br>80 | 4<br>100 |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Socket | 0,00 | 0,00 | 0,02 | 0,03 | 0,04 | 0,05 | 0,06 | 0,09 | 0,12 | 0,15 |
|  | Reducing taper | 0,20 | 0,30 | 0,50 | 0,65 | 0,85 | 1,00 | 1,30 | 2,00 | 2,30 | 3,00 |
|  | Sweep bend 90º | 0,20 | 0,34 | 0,43 | 0,47 | 0,56 | 0,70 | 0,83 | 1,00 | 1,18 | 1,25 |
|  | Elbow 90º | 0,18 | 0,33 | 0,45 | 0,60 | 0,84 | 0,96 | 1,27 | 1,48 | 1,54 | 1,97 |
|  | Tee 45º | 0,38 | 0,50 | 0,63 | 0,76 | 1,01 | 1,32 | 1,71 | 1,94 | 2,01 | 2,21 |
|  | Twin Elbow | 1,02 | 0,84 | 0,90 | 0,96 | 1,20 | 1,50 | 1,80 | 2,10 | 2,40 | 2,70 |
|  | Reducing tee | 1,50 | 1,68 | 1,80 | 1,92 | 2,40 | 3,00 | 3,60 | 4,20 | 4,80 | 5,40 |
|  | Branching tee | 0,10 | 0,15 | 0,20 | 0,30 | 0,40 | 0,50 | 0,60 | 0,70 | 0,80 | 0,90 |
|  | Check valve swing with piston | 1,80 | 2,50 | 3,00 | 3,60 | 4,10 | 4,60 | 5,00 | 5,50 | 6,20 | 6,90 |
|  | Válvula de retención paso de escuadra | 0,20<br>1,33 | 0,30<br>1,70 | 0,55<br>2,32 | 0,75<br>2,85 | 1,15<br>3,72 | 1,50<br>4,67 | 1,90<br>5,75 | 2,65<br>6,91 | 3,40<br>8,40 | 4,85<br>11,1 |
|  | Válvula de compuerta abierta | 5,10 | 5,40 | 6,50 | 8,50 | 11,50 | 13,0 | 16,5 | 21,0 | 25,0 | 36,0 |
|  | Válvula de paso recto y asiento reclinado | 0,14 | 0,18 | 0,21 | 0,26 | 0,36 | 0,44 | 0,55 | 0,69 | 0,81 | 1,09 |
|  | Válvula de paso recto y asiento reclinado | 1,10 | 1,34 | 1,74 | 2,28 | 2,89 | 3,46 | 4,53 | 5,51 | 6,69 | 8,80 |
|  | Ball valve | 4,05 | 4,95 | 6,25 | 8,25 | 10,8 | 13,0 | 17,0 | 21,0 | 25,0 | 33,0 |
|  | Corner or angled valve (open) | 1,90 | 2,55 | 3,35 | 4,30 | 5,60 | 6,85 | 8,60 | 11,1 | 13,7 | 17,1 |
|  | Válvula de asiento (paso recto) | – | 3,40 | 3,60 | 4,50 | 5,65 | 8,10 | 9,00 | – | – | – |
|  | Exchanger | – | – | – | 2,1 | 5 | 12,5 | 13,2 | 14,2 | 25 | – |
|  | Radiator | 2,50 | 3,00 | 3,50 | 4,00 | 4,50 | 5,00 | 5,75 | 6,50 | 7,00 | 7,50 |
|  | Radiator with valves | 3,75 | 4,40 | 5,25 | 6,00 | 6,75 | 7,50 | 8,80 | 10,10 | 11,40 | 12,70 |
|  | Boiler | 2,50 | 3,00 | 3,50 | 4,00 | 4,50 | 5,00 | 5,75 | 6,50 | 7,00 | 7,50 |
|  | Boiler with valves | 3,00 | 4,20 | 4,90 | 5,60 | 6,30 | 7,00 | 8,00 | 8,75 | 9,50 | 10,00 |
|  | Meter general 45 m c.a.<br>individual or divisional 10 m c.a. | | | | | | | | | | |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## 6.3. PRESSURE SURGE

Incompressible fluids have a certain amount of elasticity. Because of this, when the circulation of the fluid is stopped suddenly (a sudden closure of a component, e.g. a valve) part of the fluid hits against the element reducing its velocity to zero. At the same time, the "previous part" of the fluid continues its motion and hits against the "stopped " part generating an overpressure which tends to "compress" the fluid and "tense" the walls of the tube. This makes the fluid circulate in the opposite direction to the overpressure and at the same time generate a depression in the area of the valve.

This overpressure can become a pressure wave which reaches the other end of the tube. If energy of this pressure wave does not dissipate (e.g. in an atmospheric pressure tank), it will be reflected and will tend to lose its energy by compressing the fluid and dilating the tube.

This phenomenon will always be produced when the time taken to close the valve is less than the time of the expansion of the impact of the waves (from the valve to the end of the tube and back again to the valve). This phenomenon can be very dangerous given that it can increase the pressure in the tube 100 times.

Its energy is directly proportional to the length of the tube and inversely proportional to the time taken to close the valve. The shorter the time taken to close the valve, the greater the impact.

**Possibility of a pressure surge**

Being Tp the time of the expansion of the impact (s) and Tc the time taken to close the valve (s) , it may happen that:

Tc <= Tp : what amounts to an instantaneous closure, given that the time taken for the pressure wave to return is greater than that of the closure. A pressure surge will be produced.

Tc > Tp : . A pressure surge will not occur, given that the pressure wave will return to the valve while it is still partially open.

**Calculating the increase in pressure (ΔP) produced by a pressure surge**

The increase in pressure is calculated as:

$$\Delta P = \rho c \Delta V$$

ΔP = change in the pressure (Pa)
ΔV = change in the velocity of the fluid flow as a result of the closure of the valve (m/s)
c = velocity of the pressure wave (m/s)
ρ = density of the fluid (kg/m³)

with $$c = S_1 \sqrt{\frac{Es}{\rho\,[1 + (Es/E) + (d/e)]}}$$

con Es = módulo de electricidad volumétrico (Pa) del fluido
E = módulo Young del material de la tubería (Pa)
d,e = diameter and thickness of the tube (mm)

and $Tp = 2L/c$

with L = length of the tube (m)

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## 6.4. UNIT CONVERSION TABLE

| PRESSURE (MKS INTERNATIONAL SYSTEM): $ML^{-1}T^{-2}$ | bar | atm | $kg_F/cm^2$ | $N/m^2$ | kPa | psi | mm Hg a 0ºC | mm H2O a 4ºC |
|---|---|---|---|---|---|---|---|---|
| 1 bar | 1 | 0,9869 | 1,0197 | 1xE05 | 100 | 14,5038 | 750,0627 | 10.197,4477 |
| 1 atm física (atm) | 1,0132 | 1 | 1,0332 | 1,0132xE05 | 101,325 | 14,6959 | 760 | 10.332,28 |
| 1 atm tca ($kgF/cm^2$) | 0,9806 | 0,9678 | 1 | 0,9807xE05 | 98,0665 | 14,2233 | 735,5602 | 10.000,28 |
| 1 Pa (1 $N/m^2$) | 1xE-05 | 0,9869xE-05 | 1,0197xE-05 | 1 | 0,001 | 0,000145 | 0,0075 | 0,1019 |
| 1 kPa | 0,01 | 0,0099 | 0,01019 | 1xE03 | 1 | 0,1450 | 7,5006 | 101,9745 |
| 1 psi ($lbF/in^2$) | 0,0689 | 0,0681 | 0,0703 | 6.894,7573 | 6,8947 | 1 | 51,7150 | 703,6 |
| 1 mm Hg a 0ºC | 1,3332xE-03 | 0,0013 | 1,3595xE-03 | 133,3222 | 0,1333 | 0,0193 | 1 | 13,5955 |
| 1 mm $H_2O$ a 4ºC | 9,8064xE-05 | 0,9678xE-04 | 1xE-04 | 9,8064 | 0,0098 | 0,0014 | 0,0735 | 1 |

| EBERGY (MKS INTERNATIONAL SYSTEM): $ML^2T^{-2}$ | Kcal | kWh | kJ | BTU | HPh | CVh |
|---|---|---|---|---|---|---|
| 1 Kcal | 1 | 1,163xE-03 | 4,184 | 3,9682 | 0,00156 | 1,5812xE-03 |
| 1 kW h | 860,3 | 1 | 3.600 | 3.412,96 | 1,3410 | 1,3596 |
| 1 kJ (1 kWs) | 0,2390 | 2,777xE-04 | 1 | 0,9487 | 3,7251xE-04 | 3,7767xE-04 |
| 1 BTU | 0,2519 | 2,9307xE-04 | 1,054 | 1 | 3,9301xE-04 | 3,9847xE-04 |
| 1 HP h (USA) | 641,1865 | 0,7457 | 2684,5195 | 2.544,43 | 1 | 1,0139 |
| 1 CV h (métrico) | 632,42 | 0,7355 | 2.647,7955 | 2.509,63 | 0,9863 | 1 |

| TEMPERATURE SCALE | | | | |
|---|---|---|---|---|
| ºC: Celsius | -273,16 | 0 | 50 | 100 |
| K: Kelvin | 0 | 273,16 | 323,16 | 373,16 |
| F: Fahrenheit | -459,68 | 32 | 122 | 212 |
| R ó Ra: Rankine | 0 | 0 | 581,68 | 671,68 |
| R: Reamur | -218,52 | 0 | 40 | 80 |

| TEMPERATURE CONVERSION | | | |
|---|---|---|---|
| **C => F: F = 1.8 C + 32** | F => C: C = (F-32)/1,8 | K => C: C = K - 273,16 | R => C: C = 1,25 C |
| **C => K: K = C + 273,16** | F => K: K = (F+459,68)/1,8 | K => F: F = 1,8 K - 459,68 | R => F: F = (9/4) R + 32 |
| **C => Ra: Ra = 1,8 C + 491,68** | F => Ra: Ra = F + 459,68 | K => Ra: Ra = 1,8 K | R => K: K = 1,25 C +273,16 |
| **C => R: R = 0,8 C** | F => R: R = (F-32)*(4/9) | K => R: R = 0,8 K - 218,52 | R => Ra: Ra = (9/4) R + 491,68 |

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