

General Information

The dimension and version of the butt-joint couplings are mainly based on DIN standards 74 313 to 74 319 Push-in couplings correspond mainly to DIN standard 2353. Butt-joint couplings are approved for use up to a pressure of 10 bar, push-in couplings up to a pressure of 100 bar.

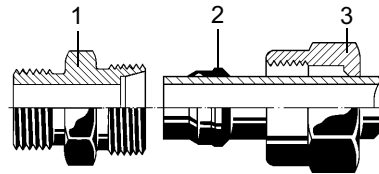
Steel couplings are used for steel and nylon pipes. The surface of adaptors and nuts are bondarized and oiled or **bright galvanized and and yellow passivated**.

For copper pipes brass couplings are available.

General Information for steel pipes

Push-in couplings are used for the following pipe diameters:

	Road vehicles
6 × 1	Instrumentation lines and control lines
8 × 1	Engine exhaust brake door actuating devices, special equipment
10 × 1	Control lines
12 × 1	Brake lines and supply lines

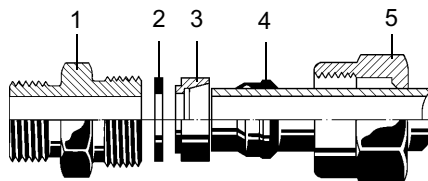


Consisting of the following parts:

- 1 Connector with internal taper
- 2 Cutting ring
- 3 Pipe nut

Butt-joint couplings are used for the following pipe diameters:

	Road vehicles
15 × 1.5	Brake lines and supply lines
18 × 2	Connection from compressor to pressure regulator, supply lines



Consisting of the following parts:

- 1 Connector
- 2 Sealing washer (internal)
- 3 Thrust ring
- 4 Cutting ring
- 5 Pipe nut

The function of the cutting ring is the same in both kinds of coupling. When the pipe nut is tightened, the cutting ring is compressed by the internal taper of the connector and cuts into the outer wall of the pipe to create a collar and form a sealed joint. The insulation of the pipe is made by the firm request of the cutting ring at the internal taper. The additional thrust ring in butt-joint couplings is sealed with a sealing washer normally made of fibre or of zinc in couplings exposed to high temperatures.

Please note

Before fitting the coupling check the thread for damages. Any damaged threads **must** be reworked. In order to prevent the thread seizing it should be greased using graphite grease, order number 830 503 004 4 (50 gr tube).

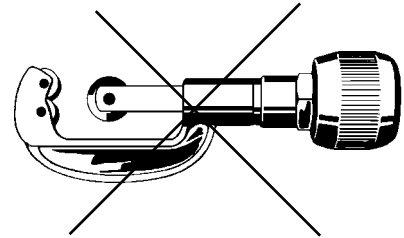
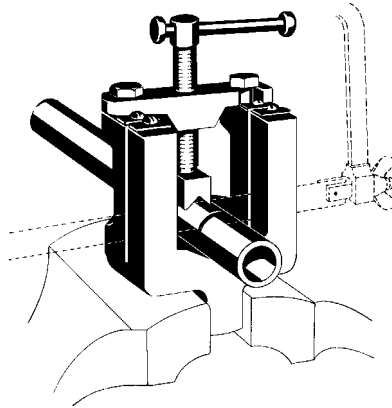
Since all sealing washers settle under load, the fitting of new vehicles or installations **must** be retightened after a short time. The same also applies after the replacement of devices since new sealing washers **must** always be used. Before retightening unions, first loosen the pipe nut to avoid damaging the pipe.

Any non-compliance could lead to loss of pressure within the system and thus to brake failure!

Installation Information for Steel Pipes

The pipe must be cut off at right angles. A pipe saw-jig should be used.

either of which would cause failure of the braking system.



After sawing the pipe the resulting burrs and swarf **must** be carefully removed. In order to avoid these parts getting into the piping system after fitting, thus destroying valve seats or blocking filters

Important!

Do not use a pipe cutter

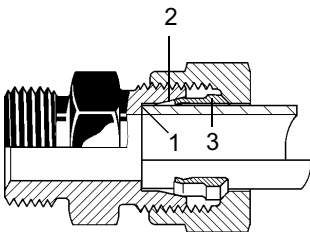
This would mean that no right angle is achieved in cutting and would result in excessive burrs both in and outside.

"Consequences:

The internal diameter would be reduced and the union not be tight.

Push-in coupling

Before tightening the pipe nut



With pipes with an external diameter up to 10 mm it is advisable to screw the connector of the coupling into the device and to assemble the pipe directly at the place of installation.

The prepared pipe end with pipe nut and cutting ring is pushed directly into the connector with the cutting ring is felt.

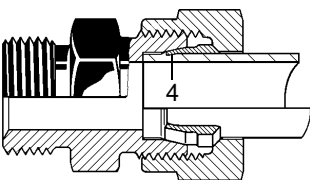
The pipe must now be pushed against the stop into the connector and the pipe nut must be tightened by about three-quarters of a turn. The pipe must not rotate with the nut. Since the cutting ring has now gripped the pipe, further pushing of the pipe is unnecessary. Final tightening is effected by turning the

nut by about one turn. Then loosen the pipe nut and check whether the cutting ring has penetrated the outer skin of the pipe and the raised collar is visible in front of the edge. If necessary the pipe nut must be tightened further.

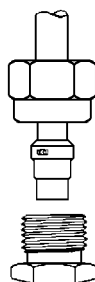
It does not matter if the cutting ring can be rotated on the pipe end.

After completion of the joint or after loosening the pipe nut is to be tightened with a normal spanner without applying any excessive force.

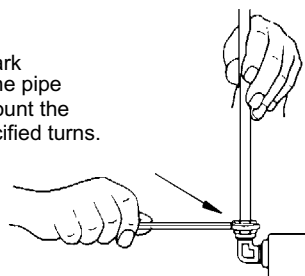
After tightening the pipe nut



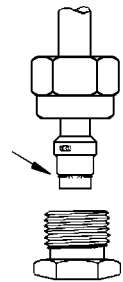
- 1 Butt end
- 2 Internal taper
- 3 Cutting ring
- 4 Visible collar



a mark on the pipe to count the specified turns.



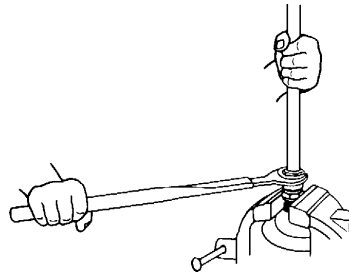
Visible collar



Butt-joint couplings

Pre-assembly must be carried out in a vice. The screw spanner must have a length which approx. 15 times the width across flats (if necessary it should be extended using a pipe).

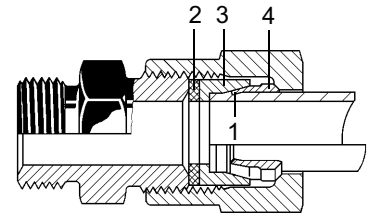
Tighten the coupling in the vice first. Screw on pipe nut by hand up to stop at cutting ring. Press pipe with thrust ring against front side of connector. Then tighten pipe nut with $\frac{3}{4}$ turn. **(Caution: Pipe must not turn at the same time.)** The cutting ring now grips the pipe and further pressing is no longer necessary. Final tightening is carried out if the pipe nut is tightened again with $\frac{3}{4}$ turn. The ring now cuts into the pipe visibly bunching in front of its first cutting edge.



Final tightening is facilitated if the pipe nut is loosened a several times so that oil can find its way again between the friction surface. During final assembly please check that each pipe end and the corresponding thrust ring get back to the coupling where pre-assembly has been carried out.

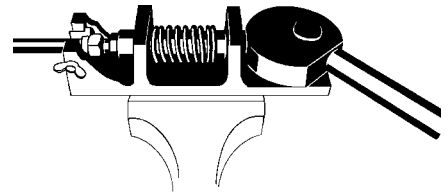
Insert thrust ring and sealing washer.

After tightening the pipe nut



- 1 Visible collar
- 2 Sealing washer
- 3 Thrust ring
- 4 Cutting ring

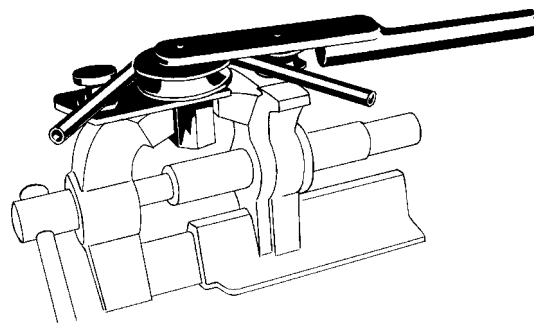
These pre-assemblies in large numbers require an enormous amount of time if they are to be produced in the way described above. In such cases a pre-assembly unit is advisable. With it the cutting ring can be fitted quickly. The device is not tied to one work-place but can be used where desired.



Instructions for Bending and Fitting of Pipes

Basically pipes for braking systems **must never be hot-worked** since this will destroy the surface protection and the scaling of the pipe can cause breakdowns.

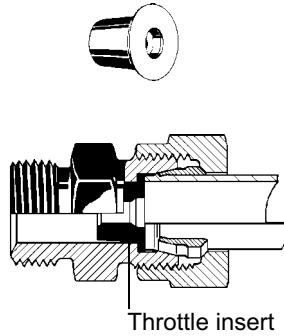
Bending of the pipe is best carried out with a commercial pipe bender.



Assembly instructions:

for throttle inserts

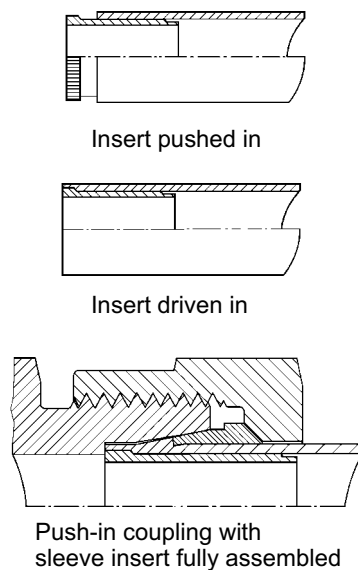
By the use of throttled inserts the charging and exhausting can be adjusted to the particular requirements. The throttle can be inserted into the push-coupling if the pipe nut has been loosened and the pipe pulled out. Please make sure that the pipe end is shortened by the thickness of the insert's rim.



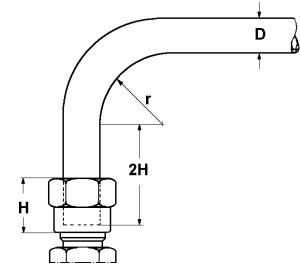
for copper pipe

The assembly instructions above are intended for the use of steel pipe. If soft-annealed copper pipe (Cu soft) is to be used, sleeve inserts must be used in the pipe ends to prevent crushing the pipe when tightening the pipe nut.

The insert is to be lightly driven into the pipe until it is flush with the pipe end. The teeth on the insert are pressed into the inner wall of the pipe so that the insert prevented from moving or falling out during assembly of the pipe.



The bending radius must never be less than $2D$. The pipe end behind the bend should as far as possible have a total length of at least $2H$.



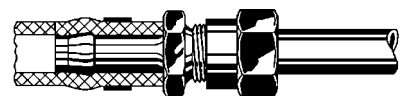
When fitting the pipes care must be taken that they are without stresses after the pipe nuts have been tightened. That means before tightening the pipes fit so well that the tightening process does not serve to position them properly.

Any non-compliance of this could result in damage to the units e.g. cause fissures in the cylinder base.

Hose couplings

Within a compressed air installation the transition from pipe to hose or conversely from hose to pipe will repeatedly occur if moving parts have to be connected. If the pipe ends cannot be formed into a satisfactory standard hose nozzle, a hose coupling must be used for such a joint. **It is not permissible to push the hose onto a plain cut-off pipe end.**

Any non-compliance can result in the hose slipping off the pipe when pressurized. This would result in a sudden failure of the braking system.



Cut off a hose at right-angles and push onto the hose nozzle as far as the stop. The hose must be secured with a hose clamp.

The tools illustrated in the comments on steel pipes are available from ERMETO ARMATUREN GmbH, 33652 Bielefeld, Germany.

General Information for Nylon Pipes

Use and Installation in Automotive Vehicles

The physical and mechanical properties of nylon pipe are very different from those of steel pipe.

Extensive tests and sample installations in motor vehicles using various grades of nylon have shown that because of the special properties of the material, flexible nylon pipe of black polyamide 11 is best suited for pneumatic braking systems and associated equipment.

Properties

Material

Black polyamide 11, flexible, resistant to heat and light, even to intense ultra-violet radiation.

Physical Properties

Density at +20°C	1.04 g/cm ³
Humidity photo at +20°C (between 30 up to 100% relative air humidity)	0.5 to 1.9%
Specific heat	2.44 J/gK
Thermal conductivity	1.05 kJ/m.h.K.
Linear extension coefficient between 20°C and +100°C	15×10 ⁻⁵ (1/°C)
Melting point	+186°C

Mechanical Properties

Tensile strength	4800 N/cm ²
Tensile strain at break at 20°C	250%
Elastic Stretching	3.7%

Pipe measurements	min. burst pressure in bar	Operating pressure at 20°C in bar
6 × 1	81	27
8 × 1	57	19
10 × 1	45	15
12 × 1.5	57	19
15 × 1.5	45	15
18 × 2	51	17

Permissible temperatures

In normal vehicle operation temperatures of -40°C to +60°C are permissible.

The indicated temperature of +60°C during continuous loading for the flexible

grade was selected so that no changes in the property of the material do occur. At temperatures over +60°C the softening agent contained in this material can slowly disappear and the material assumes the properties of the semi-rigid grade (constant temperatures loading capacity +100°C)

The physical properties of the semi-rigid and flexible pipes are the same. The values for mechanical properties such as tensile strength, elastic elongation and working pressure are in the case of semi-rigid pipes. By reasons of their greater mechanical resistance to deformation (bending), semi-rigid pipes are more difficult to lay than flexible ones.

Because of the limited temperatures loading capacity of polyamide 11 it is advisable **not to use nylon pipe in the vicinity of the engine or exhaust system**. Particular care should be taken when welding to ensure that the pipes are not damaged and if necessary they should first be dismantled.

If a sprayed vehicle is dried in a braking chamber or using radiant heaters the unpressurized pipework **must not be subjected to temperatures up to 130°C for longer than 60 minutes**.

To prevent damages of the nylon pipes while carrying out the works mentioned above, we recommend to attach the following plate on the vehicle:

Vehicle is

W

WABCO-Tecalan nylon pipes

Caution during Welding

Permissible influence of heat on pressureless lines:
max. 130°C and max. 60 min.

WABCO

The order number is
899 144 050 4

Chemical Resistance

Polyamide 11 is resistant to all media used in motor vehicles such as petroleum products, oils and greases. The tubes are also resistant to alkalis, unchlorinated solvents, organic and inorganic acids and diluted oxidising agents. **(The use of cleaning agents containing chlorine should be avoided.)** Advice on resistance to

chemicals other than those indicated can be provided on request.

Change in Length

When installing nylon pipes particular attention should be paid to their change in length at different temperatures. It is approx. 13 times higher than that for steel pipes.

The extension coefficients are:

for steel pipes	$1.15 \times 10^{-5} (1/^{\circ}\text{C})$
for nylon pipes	$15 \times 10^{-5} (1/^{\circ}\text{C})$

This indicates a change of length per meter of 1.5 mm for every 10°C difference in temperature. This change in length must not be restricted by the fittings holding the pipe.

To fasten the pipes in position, plastic-lined pipes clamps, clamps or holders made entirely out of plastic should be used. It should be possible for the pipe to move easily in the fastenings, so that temperatures induced changes in length can be distributed uniformly over the entire length of the pipe. The pipe should be clamped at approx. 50 cm intervals.

Couplings

The range of couplings from WABCO used in vehicles can also be used for nylon pipes. Clamping rings represent similarly effective unions for pipes. To ensure good seal and tight fit of the couplings, sleeve inserts should be used for all assemblies with cutting rings and thrust rings. The sleeves should not be forced or driven in as otherwise the pipes expand and the cutting rings can no longer be pushed on. The couplings are made push-in couplings and butt-joint

couplings.

The function of the cutting ring is the same in both kinds of coupling. When the pipe nut is tightened, the cutting ring is compressed by the internal taper of the connector and cuts into the outer wall of the pipe to create a collar and form a sealed joint. The insulation of the pipe is made by the firm request of the cutting ring at the internal taper.

The additional thrust ring in butt-joined couplings is sealed with a sealing washer which normally consists of fibre.

Before fitting male couplings the threads of the connecting pieces should be checked for damage. Damaged threads must be reworked. In order to prevent the thread seizing it should be greased using graphite grease.

The seal can be made with fibre or aluminium sealing rings or with thrust rings and O-rings. **Do not use hemp or liquid jointing compounds.**

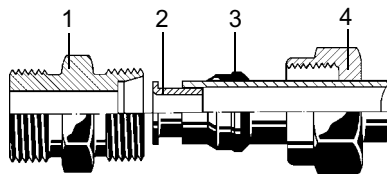
Since all sealing washers settle under load the couplings of new vehicles or installations must be retightened after a short period of time. The same also applies after the replacement of devices since **new sealing washers** must always be used. Before retightening fittings, first loosen the pipe nut to avoid damaging the pipe.

When assembling the couplings it is important that the end of the pipe is trimmed at right-angles and inserted into the coupling as far as the stop. To trim the pipe properly at right-angles cutting devices can be used which can be obtained for pipes with an external diameter of up to 22 mm.

Installation Information for Nylon Pipes

Push-in couplings are used for the following pipe diameters:

6 × 1	as instrumentation lines
8 × 1	as auxiliary systems e.g. air suspensions
10 × 1	as control line with limited volumetric throughput
12 × 1.5	as control line with larger volumetric throughput as general lines within a brake system or as lines to the brake actuator

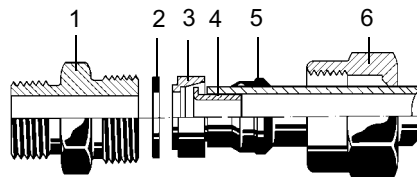


Consisting of the following parts:

- 1 Connector with internal taper
- 2 sleeve insert
- 3 Cutting ring
- 4 Pipe nut

Butt-joint couplings are used for the following pipe diameters:

15 × 1.5	Lines for general supply and to braking cylinders in braking systems
18 × 2	Supply line between air reservoir and relay valve for high air flow



Consisting of the following parts:

- 1 Connector
- 2 Sealing washer
- 3 Thrust ring
- 4 sleeve insert
- 5 Cutting ring
- 6 Pipe nut

Push-in couplings

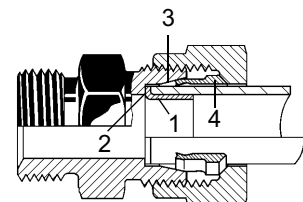
With pipes with an external diameter up to 10 mm it is advisable to screw the connector of the coupling into the device and to assemble the pipe directly at the place of installation. The prepared pipe end with insert, pipe nut and cutting ring is pushed directly into the connector and the pipe nut is screwed up by hand until contact with the cutting ring is felt. (See illustration p.153)

The pipe must now be pushed against the stop into the connector and the pipe nut must be tightened according to the torque table below. The pipe must not rotate with the nut.

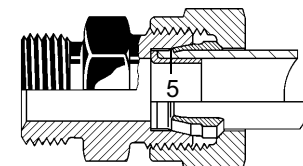
Table of the permissible tightening torques:

Pipe dimensions	Tightening torques	Loosening forces at
6 × 1	13 to 14 Nm	13 N = 460 N
8 × 1	15 to 18 Nm	15 N = 580 N
10 × 1	20 to 30 Nm	20 N = 870 N
12 × 1.5	25 to 35 Nm	30 N = 1200 N

If the indicated torques are not achieved the force required for loosening is reduced and if they are exceeded the sleeve insert will be deformed. Before tightening the pipe nut



After tightening the pipe nut



- 1 sleeve insert
- 2 Butt end
- 3 Internal taper
- 4 Cutting ring
- 5 Visible collar

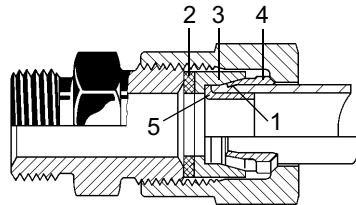
The following method can be used to keep as close as possible to the correct tightening torques when they cannot be accurately measured: Tighten the pipe nut of the coupling fingertight and then 1½ to 1¾ turns with a spanner. It is necessary for the thread to be in a good condition.

Then loosen the pipe nut and check whether the cutting ring has penetrated the outer skin of the pipe and the raised collar is visible in front of the edge.

Butt-joint couplings

Butt-joint couplings are assembled as described under push-in couplings. An additional thrust ring and sealing washer however must be used.

After tightening the pipe nut



- 1 Visible collar
- 2 Sealing washer
- 3 Thrust ring
- 4 Cutting ring
- 5 sleeve insert

Table of the permissible tightening torques:

Pipe dimensions	Tightening torques	Loosening forces at
15 × 1.5	30 to 45 Nm	30 N = 2,100 N
18 × 2	40 to 60 Nm	40 N = 2,450 N

Bending of the nylon pipes

The pipe can be bent cold, keeping to the bending radii indicated below. Since, however it has a tendency to straighten it should be fastened before and after the bend. To avoid kinking, the minimum bending radii shown in the table must be adhered to.

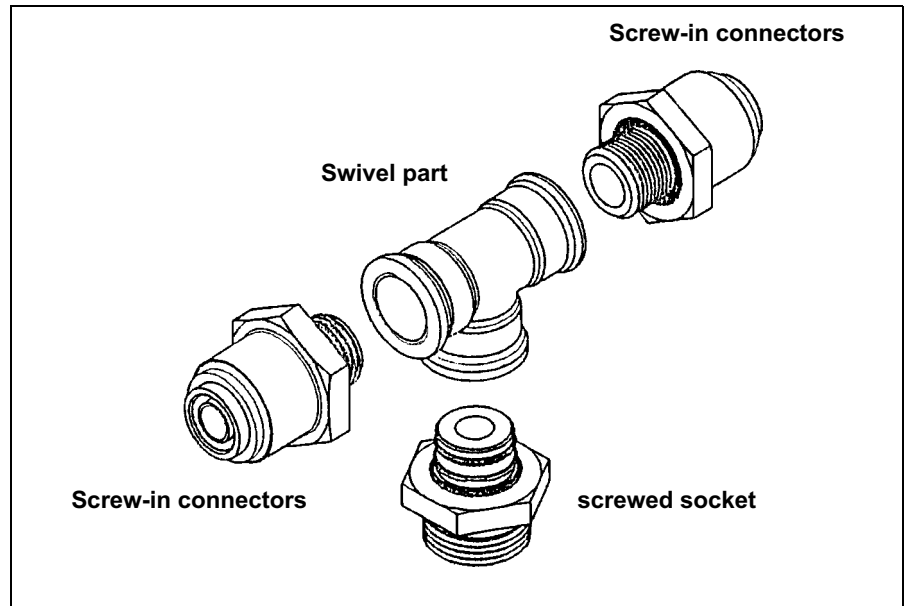
Pipe dimensions	min. bending radius r
6 × 1	30 mm
8 × 1	40 mm
10 × 1	60 mm
12 × 1.5	60 mm
15 × 1.5	90 mm
18 × 2	110 mm

Technical Inspection of the Braking System

Inspecting authorities have given their approval in principle to the use of nylon pipe for pneumatic lines in vehicles as an alternative to the steel pipe and brake hose previously used. This approval is subject to the connection that suitable material is used for this purpose and that the installation instructions applicable to nylon piping are complied with.

By marking their nylon pipe with the inscription "WABCO", WABCO provides a guarantee that the material is suitable in accordance with terms of delivery. Correct installation of the nylon piping can be checked at the time of final inspection of the vehicle using the installation instructions mentioned above.

WABCO - Direct Quick Connection Fitting System for Air Braking Systems



General Information

The connecting elements offer the following benefits:

- A high degree of leakage protection.
- No corrosion since the individual components are made of brass or stainless steel.
- Quick assembly: No time-consuming fitting of sleeves, fastening of union nuts and reworking in the case of leakages is needed.
- The seal against the pipe is effected by means of a special seal located in front of the clamping element, which means that the clamping element

cannot damage the sealing area on the plastic pipe. The seal prevents both air getting out and dirt getting in.

- The threaded screw-in portions have an integrated seal suitable for threaded connections to DIN 3852, for connections in wells in accordance to ISO 4039-1, ISO 4039-2, VOSS.
- The throughout resistance is similar to that of the cutting-ring coupling.
- Temperature range -45°C to +100°C (peak +125°C).

Applications

The quick connection fitting systems is suitable for all air lines in vehicles using plastic pipes.

Any type of plastic pipes can be used:

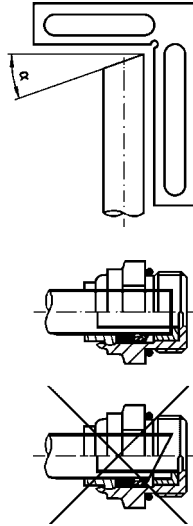
WABCO part number	External- Ø x wall thickness	Operatin g pressure at 20°C in bar
828 251 908 6	6 × 1	27
828 251 907 6	8 × 1	19
828 251 906 6	10 × 1	15
828 251 905 6	12 × 1.5	19
828 251 904 6	15 × 1.5	15
828 251 903 6	18 × 2	17

Assembly instructions:

Tube in a connector

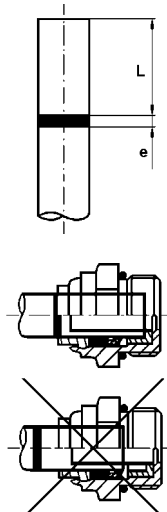
All connectors are stamped with tube dimension and a batch number for traceability.

The pipes have to be cutted at right angle. A maximum deviation of 5° is permissible.



The pipes must be fully pushed to the bottom into the push-in connector. No tool is needed. While pushing in the pipe turn it slightly to ease the connection.

We recommend to mark the length pushed in to be able to check it later.



The push-in lengths and the forces required for pushing the pipe into the push-in connectors are shown in the table below.

Push-in lengths:

External pipe- Ø × wall thickness	Push-in length in mm (± 0,5)	Push- in forces in N
6 × 1	20	< 100
8 × 1	21	< 120
10 × 1	25	< 120
10 × 1.25	25	< 120
10 × 1.5	25	< 120
12 × 1.5	25	< 150
15 × 1.5	27	< 150
15 × 2	27	< 150
16 × 2	27	< 180
18 × 2	28	< 200

After inserting the pipe check the clamp by applying a pulling force of at least 20 to 50 N.

Tightening torques

Thread	Tightening torques
M 10 × 1	16 to 20 Nm
M 12 × 1.5	22 to 26 Nm
M 14 × 1.5	26 to 30 Nm
M 16 × 1.5	32 to 38 Nm
M 22 × 1.5	36 to 44 Nm

For reasons of safety the connection cannot be severed once the pipe has been pushed in.

If the device is to be changed the connection must be unscrewed from the device. The connection will turn on the pipe in the process. In the event of the sealing ring between the unit and the connection joint being damaged, it has to be replaced.

For elbows and tees fixed to the unit by means of a counter-nut, the same O-rings and counternuts are used as for the cutting-ring couplings.

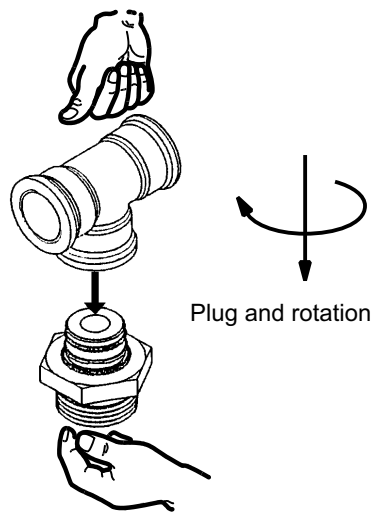
RO Connections

The range includes two sizes of RO Connectors: RO 13 and RO 15.

The RO Connection: Plug- In pivot and (male RO) and Plug-On Swivel part (female RO) = Building Block

The Plug-In pivots are straight parts where as the Plug-In Swivel parts a numerous form parts: Elbows, tees, crosses...

The connection should be done manually by plugging two parts together to the bottom with a combined rotation.



A twisting pull should then be applied for control

The RO connection must not be used as:

- connection between the towing vehicle and its trailer or the axles and the chassis.
- To connect a brake device precariously balanced.

When a RO connection is already used in kit (swivelling combination). A male/female screwed connection with a counternut for firm locking after orientation, being the alternative solution.

Replacement and Interchangeability

The interchangeability is possible provided that:

- The threads are used according to ISO 4039-1 or ISO 4039-2 (metric).
- The pipes used are in accordance with DIN 74 324, DIN 73 378, ISO 7628 or NFR 12-632 (metric).

Only the connection RO (between pivots and swivel parts) is not interchangeable with parts from other manufacturers because of an exclusive design.

The WABCO quick connection fitting system can consequently be used in replacement of both:

- The traditional 24° screwed compression fitting range.
- All types of other quick connection fitting systems.